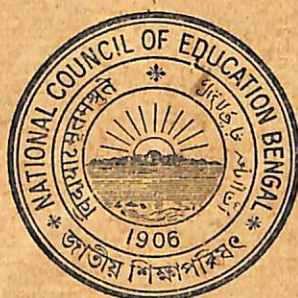


College of Engineering & Technology, Bengal



PROSPECTUS
SESSION 1953-54

P.O. JADAVPUR COLLEGE, CALCUTTA 32, BENGAL

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HISTORY OF THE COLLEGE

The years 1905-06 are memorable ones in the annals of Bengal and indeed in the annals of India. The attempt by the Government to partition Bengal led to a country-wide agitation and intense nationalist movement, which, although political at the outset, had important economic and cultural aspects as well. The economic aspect of the movement found expression in the production and use of "Swadeshi" goods. The cultural aspect found expression in many forms, in the regeneration of Indian art and music, but most of all in the boycott of the then prevalent system of education and the establishment of a new system based entirely on national lines and intended to serve only national purposes.

It was in this way that the National Council of Education was started in 1906 "to impart education—literary and scientific as well as technical and professional—on national lines and exclusively under national control, not in opposition to, but standing apart from the existing system of primary, secondary and collegiate education, attaching special importance to a knowledge of the country, its literature, history and philosophy, and designed to incorporate with the best Oriental ideals of life and thought the best assimilable ideals of West, and inspire students with the genuine love for and desire to serve the country". The foundation of the National Council of Education was rendered possible by the munificence of three generous donors, the late Raja Subodh Chandra Mallick, S. Brojendra Kishore Roy Choudhury of Gouripur and the late Maharaja Suryya Kanta Acharya Choudhury Bahadur of Mymensingh. The first President of the Council was Sir Rash Behari Ghosh, and with the early days of the N. C. E. were associated nearly all the notable figures of the time, some of whom later won world recognition, men like Poet Rabindranath Tagore, Sri Aurobindo and others.

In 1906, the year of the foundation of the National Council of Education, Bengal, there was established another body known as the Society for the Promotion of Technical Education in Bengal, also under the Presidentship of the late Sir Rash Behari Ghosh, with the object of imparting scientific and technical

education to the Indian people, calculated to further their industrial progress. Under the auspices of this Society there was started the Bengal Technical Institute (now known as the College of Engineering and Technology, Bengal), financed mainly by the late Sir Taraknath Palit. In 1910, the Society for the Promotion of Technical Education in Bengal was amalgamated with the National Council of Education.

The National Council at first maintained both Arts and Science and Technical Departments, but finding that public demand for Technical education was more insistent, the Council has been devoting for the last 43 years almost the whole of its resources to technical education through its College of Engineering & Technology.

In 1921 the Council had the good fortune to secure a donation of about 13 lacs (13,00,000) of rupees under the Will of the late Sir Rash Behari Ghosh. This princely bequest enabled the Council in 1924 to erect extensive buildings and workshops on its present site at Jadavpur. Besides the donations and endowments of the founders mentioned above, the Council has received up to date a sum of about 10 lacs of rupees as donations from various persons. The present site of the College of Engineering & Technology is a gift of the Corporation of Calcutta, which leased out to the Council 192 bighas of lands on a nominal rent. Besides this extensive plot of land, the Corporation has been making an annual grant of Rs. 30,000/- since 1927. Later on the Corporation made a non-recurring grant to the College of nearly 1½ lacs of rupees, partly as a loan and partly as a gift.

The Government of West Bengal have made a non-recurring grant of 3.88 lacs of rupees and a research grant of 10 thousand rupees and a recurring one of 70 thousand rupees per annum for the further development of the Chemical Engineering Department of this College. The Government have also granted an interest-free loan of 3.2 lacs of rupees to acquire land for hostel buildings.

The Government of India have sanctioned the following very handsome grants and loans:—

(a) Capital grant—

(i) for College buildings	... Rs. 3,83,000
(ii) for Equipments	... Rs. 21,77,000

(b) Recurring Annual Grant	... Rs. 5,98,000
(c) Interest-free Loan for Construction of Students' Hostels	... Rs. 16,41,000

These grants by the Central Government will enable the College to serve the country in a far more effective way than she is doing now.

COLLEGE OF ENGINEERING & TECHNOLOGY BENGAL

Principal :

Dr. Trigunacharan Sen, Dr. Ing. (Munich), A.M.M.E. (B. Tech.),
M.I.E. (Ind.)

Registrar :

Sri Prabir Chandra Vasu Mallik, M.A. (Cantab).

THE FACULTY

DEPARTMENT OF MECHANICAL ENGINEERING

Sir Rash Behari Ghosh Professor :

Dr. Satish Chandra Bhattacharyya, M.Sc. (Cal.),
Dr. Ing. (Berlin), A.M.M.E., A.M.E.E., V.D.I., M.I.E. (Ind.)

Professors :

Dr. Jatindra Nath Basu, Dr. Ing. (Berlin), A.M.M.E., A.M.E.E.,
M.I.E. (Ind.), V.D.I.
Sri Sudhir Kumar Chakravarti, B.S. (Worcester),
M.S. (Michigan), A.M.M.E., A.M.I.E. (Ind.)
Sri Amiya Kumar Basu, B.Sc. (Cal.), A.M.M.E.
Sri Gopal Chandra Sen, M.S.E. (Michigan), A.M.M.E.
Dr. Sivasundar Deb, Dr.-es-Sc. (Paris).

Assistant Professors :

Sri Nirendra Nath Chattopadhyay, B.Sc. (Cal.), B.M.E.
Sri Bibhu Charan Mukherjee, B.M.E., E.I.H. (Grenoble).

Lecturers :

- Sri Sailaja Charan Sen Gupta, A.M.E.E.
 Sri Ananga Mohan Chatterjee, A.M.M.E.
 Sri Pravash Chandra De, B.M.E.
 Sri Binode Lal Das, B.M.E., A.M.I.E. (Ind.),
 Lt. 8 Bengal Engr. Pl.N.C.C.
 Sri Girindra Nath Das, B.M.E., A.M.I.E. (Ind.)
 Sri Amulya Prosad Ghosh, B.M.E., A.M.I.E. (Ind.)
 Sri Bibhuti Bhusan Majumdar, B.M.E., A.M.I.E. (Ind.)
 Sri Protap Chandra Roy, B.M.E.
 Sri Madhu Sudan Sen Gupta, B.Sc. (Cal.), B.M.E., M.S. (Wash.)
 Sri Bimaladas Banerjee, B.M.E., A.M.I.E. (Ind.)
 Sri Hari Das Banerjee, B.M.E., A.M.I.E. (Ind.)
 Sri Bireswar Prosad Ghosh, B.M.E.
 Dr. Santosh Kumar Banerjee, B.M.E., Dr.Ing. (Paris),
 (on study leave in France).
 Sri Sachindra Nath Bhaduri, B.COM., B.M.E., A.M.I.E. (Ind.)
 Sri Joydeb Chandra Das, B.M.E.
 Sri Krishna Chandra Chatterjee, B.M.E., A.M.I.E. (Ind.)
 Lt. 3 Bengal Signal Sec. N.C.C.
 Sri Joytish Chandra Sarkar, B.M.E.
 Sri Anil Kumar Chowdhury, B.M.E., M.S. (Wash.)
 (on study leave in U.S.A.)
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 Sri Sukumar Datta, B.M.E., M.S. (W. Virginia), A.S.M.E.
 Sri Amarendra Nath Chakraborty, B.M.E., A.M.I.E. (Ind.)
 Sri Narayan Chandra Kundu, B.M.E., A.M.I.E. (Ind.)
 Sri Rajat Kumar Chakraborty, B.Sc., B.M.E., A.M.I.E. (Ind.)
 Sri Prafulla Chandra Choudhury, B.M.E., A.M.I.E. (Ind.)
 Sri Probodh Kumar Chakraborty, B.M.E., A.M.I.E. (Ind.)
 Sri Sudhir Kumar Das, B.M.E.
 Sri Probhash Kumar Sen, B.M.E.
 Sri Kartick Chandra Das, B.M.E., A.M.I.E. (Ind.)
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 Sri Tarun Kumar Bhattacharyya, M.Sc.
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 Sri Monojendra Narayan Bhowmik, B.Sc., B.M.E.
 Sri Amiya Kumar Banerjee, B.M.E., M.S. (Wash.)
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- Sri Girija Bhusan Pal, B.M.E., Lt. 8 Bengal Engr. Pl.N.C.C.
 Sri Anil Kumar Chatterjee, B.M.E., M.S. (Virginia)
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 Sri Nitai Chandra Das, B.M.E.
 Sri Bankim Chandra Mookherjee, M.Sc. (Cal.), F.G.S.,
 A.M. Inst. Fuel. (London).
 Sri Anil Kumar Das, B.M.E., A.M.I.E. (Ind.).

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Raja Subodh Mallik Professor :

- Sri Hem Chandra Guha, B.Sc. (Edin.), Mem.A.I.E.E. (U.S.A.),
 A.M.I.E.E. (London), M.I.E. (Ind.).

Professor Emeritus :

- Sri Surendra Kumar Roy, M.E.E. (Harvard),
 Mem.A.I.E.E. (U.S.A.), M.I.E. (Ind.).

Professors :

- Sri Manmatha Nath Chakraborty, B.Sc. (Cal.),
 B.S. (Worcester), M.S. (Purdue), A.M.E.E., A.M.I.E. (Ind.).
 Dr. Moti Lal Jain, D.Sc. (Harvard), M.E.E. (Cornell),
 B.Sc. Hon. Eng. (Benares), A.M.I.E. (Ind.), A.M.A.I.E.E.

Assistant Professors :

- Sri Debendra Nath Chakraborty, B.E.E., A.M.I.E. (Ind.), A.M.A.E.
 Sri Mohi Mohan Mukherji, M.S. (Washington), A.M.E.E.,
 A.A.I.E.E. (U.S.A.), M.I.E.E., A.M.I.E. (Ind.)
 Sri Sailesh Chandra Das Gupta, A.M.E.E. (on study leave in U.K.)
 Sri Dharendra Kumar Deb, M.S. (Northwestern, U.S.A.),
 A.M.E.E., A.A.I.E.E. (U.S.A.), A.M.I.E. (Ind.)
 Sri Jyotsna Kumar Choudhury, M.Sc. (Cal.), M.Sc. (Tech.)
 (Manch.), Grade I.E.E. (Lond.)

Visiting Lecturers :

- Dr. Manoranjan Dutta, M.Sc. (Cal.), M.Sc.Tech. (Manch.),
 Ph.D. (Edin.), A.M.I.E.E. (Lond.)
 Sri Amulya Nath Sen Gupta, B.E.E., A.M.I.E. (Ind.).

Lecturers :

- Sri Mriganka Mohan Kar, B.Sc. (Cal.), B.E.E., A.A.I.E.E. (U.S.A.),
A.M.I.E. (Ind.).
- Sri Danindra Nath Roy Bardhan, B.E.E., A.A.I.E.E. (U.S.A.),
A.M.I.E. (Ind.).
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- Sri Probhat Kumar Sadhukhan, B.E.E., A.M.I.E. (Ind.).
- Sri Amar Nath Das, B.E.E., A.M.I.E. (Ind.).
- Sri Shyamapada Patra, B.E.E.
- Sri Gobinda Prosad Purkayastha, B.E.E.
- Sri Amal Kanta Goswami, B.E.E., Lt. 8 Bengal Sig. Sec. N.C.C.
- Sri Anil Baran Dalal, B.E.
- Sri Manmatha Kumar Das, B.E.E.
- Sri Dwija Pada Chakraborty, B.E.E.
- Sri Biswarup Choudhury, B.Sc. (Hons.), B.Sc. (Engg.), (B.H.U.).

Instructor :

- Sri Nitish Narayan Roy, B.E.E.

DEPARTMENT OF CHEMICAL ENGINEERING

Maharaja Suryya Kanta Acharyya Professor :

(Vacant)

Professor Emeritus :

- Dr. Hira Lal Roy, A.B. (Harvard), Dr. Ing. (Berlin),
M.I.Ch.E., M.I.E. (Ind.), M.I.I.Ch.E.

Professors :

- Dr. Sachindra Nath Mukherjee, D.Sc.
- Dr. Anil Kumar Majumdar, D.Sc., A.R.I.C.
- Dr. Dilip Kumar Banerjee, D.Sc.
- Dr. Bidyut Kamal Bhattacharyya, D.Sc.
(on study leave in U.S.A.).
- Dr. Arabinda Nath Bose, M.Sc. (Cal.), Ph.D. (M.I.T.),
A.M.I.I.Ch.E.
- Sri Gopal Chandra Banerjee, M.Sc.
- Dr. Tuhin Kumar Roy, M.Sc. (Cal.), S.M. (M.I.T.),
Sc.D. (M.I.T.).

Assistant Professors :

- Sri Provat Kusum Ray, M.Sc.
- Sri Dilip Kumar Dutta, B.Sc. (Cal.), B.Ch.E., M.S. (Carnegie),
A.M.I.I.Ch.E.
- Sri Hari Gopal Ganguli, A.M.M.E.
- Sri Aswini Kumar Pal, B.M.E., A.M.I.E. (Ind.).
- Sri Jatindra Mohan Palit, B.E.E., A.M.M.E., A.M.I.E. (Ind.),
A.M.A.E., A.A.I.E.E. (U.S.A.).
- Dr. Bimalendu Ghosh, M.Sc. (Cal.), M.S. (Carnegie),
D.Sc. (Carnegie).

Lecturers :

- Sri Bimal Chandra Chanda, B.Ch.E., A.M.I.I.Ch.E.
(on study leave in Germany).
- Sri Kamalendu Sen Gupta, M.Sc.
- Sri Sudhir Chandra Das Gupta, B.Sc.
- Sri Tarun Kumar Ghosh, B.Ch.E., A.M.I.I.Ch.E.
(on study leave in Switzerland).
- Sri Prasun Kumar Dey, M.Sc.
- Sri Lochhu Pachhali, M.Sc.
- Sri Nitish Chandra Chakraborty, B.Ch.E., A.M.I.I.Ch.E.
(on study leave in Germany).
- Dr. Ramendra Nath Sen Sarma, M.Sc., D.Phil.
- Sri Kshirod Chandra Roy Chaudhury, B.Sc. (Cal.), B.Ch.E.,
A.M.I.I.Ch.E.
- Sri Buddhadev Sen, M.Sc.
- Dr. Probodh Ranjan Sinha, M.Sc., D.Phil.
- Dr. Kalyan Kumar Mitra, B.Sc. (Cal.), Ph.D. (Bombay),
A.I.I.Sc., Dip.Ch.E.
- Sri Aditya Prosad Sinha, B.Ch.E.

PHYSICS

Professor :

- Sri Purna Chandra Biswas, M.Sc.

Assistant Professors :

- Sri Naresh Chandra Sen, M.Sc., B.L.
- Sri Hari Pada Sen, M.Sc.

Lecturers :

Sri Upendra Nath Banerjee, M.Sc., B.A.
Sri Lakshmi Kanta Coondoo, M.Sc.
Sri Sudhish Kumar Mukherji, M.Sc.

MATHEMATICS

Professor :

Dr. Sudhangshu Kumar Banerji, D.Sc., F.N.I.

Assistant Professor :

Sri Amar Nath Pramanik, M.A.

Lecturers :

Sri Dibendra Nath Mukherjee, M.Sc.
Sri Rampada Bhattacharyya, M.Sc.

HISTORY AND ENGLISH

Assistant Professor :

Dr. Siba Pada Sen, B.A. HONS. (London), D.Phil. (Cal.).

Lecturer :

Sri Khagendra Nath Das Gupta, M.A.

ENGINEERING ECONOMICS

Visiting Professor :

Sri Kshitish Chandra Roy, M.A., A.C.A., A.S.A.A.

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Dr. Probodh Chandra Bagchi, PH.D., Hem Chandra Basu Mallik
Professor of Indian History.
Dr. Nalini Kanta Brahma, PH.D., Probodh Chander Basu Mallik
Professor of Indian Philosophy.

LIBRARY

Sri Niranjana Chandra Maitra, B.Sc., B.A., Dip. Lib., *Librarian*.
Sri Purna Chandra Chakravorty, (Certificate in Librarianship
Training), *Assistant Librarian*.
Sri Prafulla Kumar Sen, *Library Assistant*.

PHYSICAL CULTURE

Sri Provash Chandra Banerjee.
Sri Jahar Paul.

Mechanical Supervisor :

Sri Hara Mohan Bose, A.M.E.E.

Electrical Supervisor :

Sri Bhawani Charan Mitra, F.M. & U.S.

Head Assistant :

Sri Paresh Nath Chakraborty.

Hostel Superintendent :

Sri Gopal Chandra Sen, M.S.E. (Michigan), A.M.M.E.,

Medical Officer :

Dr. T. J. Gupta, M.B.

COLLEGE CAMPUS

Location. The College stands on a fine piece of land at Jadavpur within 5 miles by rail from the Sealdah Railway Station (Calcutta). The location is in the immediate vicinity of the Jadavpur Station and is also approachable by bus from Calcutta.

Buildings. The arrangements for instruction in the several departments of the College have been made in six spacious buildings. The main building, which is a three-storied one, occupies a floor space of 39,000 sq. feet. The Main Chemical Engineering Building has a total floor space of 18,200 sq. feet, and the Chemical Technology building covers a total floor space of 13,000 sq. feet. The Physics and the Electrical Engineering Department are housed in a two-storied building; the ground floor, which has a total floor space of 12,000 sq. feet, is occupied by the Electrical Engineering Laboratory and the first floor, occupied by the Physics Laboratory, has a floor space of 10,000 sq. feet. The Mechanical Engineering Laboratory and the Power Plant have a floor space of 15,000 sq. feet in another building. The workshops are in spacious corrugated sheds with a floor space of 48,000 sq. ft. There is another corrugated-shed for Foundry and Smithy. Elaborate extensions of the Mecha-

nical Engineering and the Electrical Engineering Laboratories are ahead. Besides there is a separate Store-shed.

There are fifteen staff quarters at present within the campus.

The College hostel is situated on a separate plot of land measuring some ten bighas by the side of the campus. There are four three-storied buildings accommodating over 500 students, two dining halls and a Superintendent's quarters.

There is a two-storied building with a floor space of 4,000 sq. feet comprising the Old Boys' Home and the Pavilion of the College Sporting Club. There is also a covered gymnasium with a floor space of 4,100 sq. feet. Two new sheds with a total floor space of 7,800 sq. feet have recently been constructed to accommodate different classes.

COURSES OF STUDY

The College offers :

1. Post Graduate Courses in Electrical, Mechanical and Chemical Engineering, leading to the degrees of Master of Electrical Engineering (M.E.E.), Master of Mechanical Engineering (M.M.E.) and Master of Chemical Engineering (M.Ch.E.) respectively. Minimum requirement of attendance for these courses is one year.
2. Degree Courses in Electrical, Mechanical and Chemical Engineering, leading to the Degrees of Bachelor of Electrical Engineering (B.E.E.), Bachelor of Mechanical Engineering (B.M.E.) and Bachelor of Chemical Engineering (B.Ch.E.) respectively. Each of these is a four years' course.

ADMISSION REQUIREMENTS

1. ADMISSION TO THE POST GRADUATE COURSES :

Honours Graduates in Electrical, Mechanical and Chemical Engineering of recognised universities and engineering graduates engaged in teaching work in this College for a period of at least two years are eligible for admission into these Courses.

Students who have passed the I.Sc. or equivalent Examination of any recognised University with Physics, Chemistry and Mathematics (atleast with 50% marks in Mathematics) and those who have passed the B.Sc. Examination with Physics, Chemistry and Mathematics of any recognised University are eligible for admission into the Engineering First Year Class of any of the Degree Courses. The Pre-Engineering Examination of the Delhi Polytechnic Institute which has been recognised by the Calcutta University as equivalent to their I.Sc. Examination, is recognised for purposes of admission into the Degree Course of this College.

Candidates are required to study for two years before they are allowed to go up for the examination for the other Degree subject.

The age of candidates who have passed the B.Sc. and I.Sc. Examinations must not exceed 22 and 20 years respectively on the date of admission, minimum age being 17 years.

ADMISSION PROCEDURE

Candidates seeking admission into the College for any of the Courses should apply to the Principal giving particulars required in the printed Admission Form obtainable on application from the College Office.

The Admission Form, duly filled in, must be submitted with a Registration Fee of Rs. 5/- in postal order for the Degree Courses by the 30th April.

Admission forms must be properly filled in. Incomplete or irregular Admission Forms will not be entertained.

Registration of name does not confer any right on the applicant for being called for interview ; a candidate is called for interview only when the Selection Board deem that an interview is warranted. Registration fee is not refunded under any circumstances.

Applicants must communicate to this office the results of the examination, at which they appeared last, as soon as they are published, if not previously communicated. Certificates of any description (original or copy) excepting University

preliminary selection of candidates will be upon the total number of marks obtained by a candidate (who has passed the I.Sc. Examination) in Physics, Chemistry and Mathematics, provided at least 50% of marks have been secured in Mathematics and final selection will be made in an interview of candidates by the Admission Board.

ALLOCATION OF SEATS FOR DIFFERENT STATES OTHER THAN WEST BENGAL

Mechanical Engineering -

Assam	- 6	...	2
Orissa	- 8	...	4
Part 'C' & 'D'		...	10
States (Excluding Delhi)	- 6	...	1
Unreserved	- 4	...	5
	<u>24</u>	...	24

Electrical Engineering -

Assam	- 6	...	3
Orissa	- 8	...	5
Part 'C' & 'D'		...	5
States (Excluding Delhi)	- 2	...	1
Unreserved	- 2	...	3
	<u>18</u>	...	18

Chemical Engineering -

Assam	- 2	...	7
Bihar	- 6	...	5
Orissa	- 3	...	2
Jammu & Kashmir	- 1	...	4
Pepsu	- 1	...	18
Part 'C' & 'D'		...	
States (Excluding Delhi)	- 2	...	
Unreserved	- 3	...	

FEES AND DEPOSITS

1. TUITION FEE for students getting admitted into the Post Graduate Courses of this College is Rs. 240/- per annum payable in ten monthly instalments of Rs. 24/-.
 2. TUITION FEE for all students taking admission into the Engineering Courses of the College is Rs. 180/- per annum payable in nine equal instalments of Rs. 20/-.
 3. (i) TUITION FEE must be paid on the dates to be notified by submitting the Fee-book which may be obtained from the Office on payment of annas four (-/4/-) per Fee-book per year.
(ii) Students who will be in default in paying their dues within the month will have to pay a late fine of As. -/2/- per month (under no circumstances it will be excused) and their names are liable to be struck off the Rolls.
(iii) Defaulters whose names have been struck off may be readmitted on payment of tuition fees for the session due up to and inclusive of the month of such re-admission together with a re-admission fee of Re. 1/-.
(iv) Re-admission fee and fines may be remitted wholly or partly in special cases on good and sufficient grounds.
 4. No student shall be permitted to appear in the Annual Examinations unless he has paid his tuition fees and other dues including Hostel charges, if any, for the whole session.
 5. Admission once taken into any class shall be counted to be for one complete session.
 6. All students excepting the newly admitted students will have to pay a Medical Examination Fee of Re. 1/- in July.
 7. The caution money deposit for the students of the Chemical Engineering Course and Post Graduate Courses is Rs. 25/- and for the students of the other two Degree Courses is Rs. 10/-.
- Caution money deposit for working in the laboratories, workshops and other practical classes is refundable at the end of the College career after deduction for breakage or dues, if any. The Student must apply for its refund from the College within two years after he leaves the College and if he fails to do so, his deposit money will be forfeited.
- At the beginning of each session students are to pay their respective breakage charges of the previous session.

8. At the time of admission to the College the following fees are payable by new entrants :

	Admission Fee	Tuition Fee for July Instalment	Magazine Fee	Contingency Fee	Students' Union Fee	Sporting Fee	Students' Aid Fee	Caution Money Deposit	Medical Examination Fee	Registration Fee	TOTAL
Students admitted into the Post-Graduate Classes	24/-	24/-	2/8	2/-	2/-	5/-	/8/-	25/-	1/-	—	86/-
New students admitted into the First Year Classes	20/-	20/-	2/8	2/-	2/-	5/-	/8/-	10/-	1/-	2/-	65/-
All students shall pay the following fees in July every year along with the Tuition Fee for the month			2/8	2/-	2/-	5/-	/8/-	—	1/-	—	13/-

N.B.—Caution Money Deposit for Chemical Engineering Course is Rs. 25/- and for other Degree Courses Rs. 10/-.

9. When a student has been admitted he shall not ordinarily be allowed to take transfer or withdraw his name except on payment of tuition fees for the unexpired portion of the session and arrears of tuition fees and other charges, if any.

10. Remission of tuition fees for the unexpired portion of the session and other charges, if any, may be made by the Managing Committee wholly or partly in special cases on good and sufficient grounds.

STIPENDS, SCHOLARSHIPS AND FREE STUDENTSHIPS

Stipends, Scholarships and Free Studentships are awarded to poor and meritorious students and the continuance of the same depends on good progress, regular attendance and good behaviour.

Scholarships in the form of Half-free Studentships are awarded for two years to teachers of this College prosecuting studies in Post Graduate Courses.

Scholarships in the form of Free Studentships are awarded to students who passing in all subjects, head the lists of successful candidates in the First and Intermediate Engineering Examinations in the following way :

Examination	Position	Minm. Marks in Annual Examination	Tenure
<i>First Engineering—</i>			
Chemical ...	1st	70%	One year.
Mechanical & Electrical ...	1st, 2nd & 3rd	70%	One year.
<i>Intermediate Engineering—</i>			
Chemical ...	1st	70%	Two years.
Mechanical & Electrical ...	1st, 2nd & 3rd	70%	Two years.

Free-students, if they leave the College without sufficient and satisfactory reasons, must pay fees for the full period for which they were allowed exemption.

Loan scholarships, in lump sums, to meet Examination and College fees are awarded by the Alumni Association, N. C. E., Bengal, to deserving Final Year students under straitened pecuniary circumstances. Loans are also given to deserving students from the Students' Aid Fund.

Deserving students may also avail of the following stipends and Scholarships :

- Goopee Kristo Bose Stipend.
- Nemai Chand Chatterjee Stipend.
- Kristo Mohan Bose Stipend.
- Rasul Memorial Scholarship.
- Dwijendra Memorial Scholarship.
- Mani Lal Chatterjee Stipend.
- Nabanalini Debi Stipend.
- Mary K. Das & Taraknath Das (Loan) Scholarship.
- Sreemat Bhagabat Scholarship.
- 48 West Bengal Government Stipends of the value of Rs. 300/- each per year for Degree Courses.

S. Ghose Memorial Scholarship of the value of not less than Rs. 700/- a year is awarded to a deserving Bengali Hindu candidate who has passed the Final Examination of the National Council of Education, Bengal, in Electrical Engineering to enable him to obtain Practical training in the subject abroad.

Prizes are awarded to students securing not less than 60 per cent marks in the aggregate according to the following scheme :—

First & Intermediate Engineering Examinations :—(on the results of the 1st & 2nd semester Examinations).

(i) For Chemical Engineering Candidates—1st to 5th places for each examination.

(ii) For Electrical & Mechanical Engineering Candidates for each examination—1st to 10th places.

For Final Engineering Examination (3rd year) :—

For each of the Chem., Elec. and Mech. Engineering 3rd year classes—1st to 5th places.

Prizes are awarded only to those students who have passed in all papers of their respective examinations.

A sufficient number of Industrial Training Stipends to the graduates are awarded by the Government of India every year for practical training in different factories for two years. Six stipends are also awarded by the Government of West Bengal to the graduates for practical training under the Government for one year.

COLLEGE HOSTELS

There are College Hostels with accommodation for over 500 students.

RULES AND REGULATIONS OF THE HOSTEL

I. ADMISSION

1. Applications for admission to the College Hostel from new students will only be considered after they have been admitted into the College. Every admission shall be subject to the approval of the Principal of the College of Engineering & Technology, Bengal.

2. All admissions are understood to be for a complete session and boarders are liable for all charges from the beginning of the session.

II. FEES

3. A Caution money of the amount of Rs. 50/- and a Messing Deposit of Rs. 40/- are payable in advance with every application for admission. The sum will be refunded in case a seat is not provided or when a boarder finally leaves the Hostel but in the latter case only after all dues have been paid up by him.

4. Admission fee of Rs. 5/- for a complete term shall be paid by every student on admission into the Hostel. Substitutes when permitted, may however be exempted from such fees. No boarder will be readmitted into the Hostel in the following session if he is not promoted to the next higher class.

5. Each boarder shall have to pay the following scale of rent including charges for medical attendance by the 10th of every month. For each day's delay, a fine of one anna per day will be realised up to the 20th of the month, after which his name will be struck off the Hostel register and he shall have to leave the Hostel.

Two-seated rooms ... Rs. 144/- per annum.

Four-seated rooms ... Rs. 120/- per annum.

6. The above rents will be realised in 9 equal monthly instalments beginning from the month of July in every session.

7. Monthly instalment of seat rent etc. for the current month and boarding charges for the previous month, must be paid at the office of the College in one sum by the 10th of every month. Failure to pay messing dues by the above date will make a boarder liable to have his meals stopped.

8. Boarders will have to pay for the total cost of the board including charges for electricity.

9. Withdrawal from the Hostel will require the sanction of the Principal of the College. Application for withdrawal must be countersigned by the guardian of the boarder.

III. ACCOUNTS

10. Separate books of account will be maintained for all deposits, receipts and expenditure of the Hostel.

11. A separate current bank account will be maintained to be operated upon by the Superintendent and the College authorities.

12. The monthly statement of expenditure will be drawn up by the Mess Assistant in collaboration with the Secretary of the Mess Committee and placed before the Mess Committee by the 5th of the subsequent month for adoption.

IV. FURNITURE

13. A bedstead, a table and a chair will be provided for each student. Wardrobe space will also be provided.

14. Furniture must not be removed from one room to another. In case of any damage wilfully or carelessly caused to any furniture, electric fixtures, utensils or any property belonging to the Hostel, it must be made good by the boarder or boarders causing it and fines shall be imposed on party or parties concerned.

15. Lights must be put out when a boarder leaves his room.

16. Extension of the existing electric wiring by any boarder is not permitted. Violation of this rule will be severely dealt with.

17. Boarders will have to provide their own electric bulbs. Bulbs must not exceed the wattage of 60 except with the express permission of the Superintendent and subject to such extra charges as may be fixed.

18. Electric fans, heaters, irons and other appliances must not be used except with the express permission of the Superintendent and subject to such extra charges as may be fixed.

19. A set of utensils for the dining-room and kitchen will be supplied to the Mess Committee which will be held responsible for its proper use and safe custody.

V. DISCIPLINE

20. The Hostel is divided into 4 blocks named as follows :

KIRON CHANDRA ROY MEMORIAL BLOCK

BENOY KUMAR SARKAR MEMORIAL BLOCK

GOORODAS BANDOPADHYAYA MEMORIAL BLOCK

SARAT DUTT MEMORIAL BLOCK

21. There are Wardens in the different blocks nominated by the Principal.

22. The Wardens will assist the Hostel Superintendent in maintaining discipline.

23. The Wardens will enjoy free accommodation.

24. The Wardens will call the roll at 7 o'clock in the morning and 8 o'clock in the evening. Boarders should return to the Hostel before evening roll call. In case of delay in their return after 8 p.m. they will be fined in the following scale :

Between 8 and 9 p.m. ... 1 anna

Between 9 and 11 p.m. ... 8 annas

After 11 p.m. they will be fined Re. 1/- and their names will be sent to the Principal of the College.

24. In case of absence from the Hostel, previous permission from the Hostel Superintendent is necessary.

26. There will be periods in the morning and in the evening fixed as study hours by the Superintendent.

27. Boarders will be expected to remain in their respective rooms and should behave in such a manner as not to cause any disturbances to others, specially during study hours.

28. Boarders must always confine to their respective seats after 11 p.m.

29. Allotment of seats for the boarders will rest entirely on the discretion of Hostel Superintendent.

30. Remaining in the Hostel, without sufficient reason, during College period is considered to be against Hostel discipline.

31. Any insubordination or incivility on the part of the menials should be at once reported to the Block Warden or the Mess Assistant.

32. If the conduct of any boarder is found unsatisfactory, he may be asked to leave the Hostel immediately without assigning any reason whatsoever.

VI. MESSING

33. The arrangement for meals will be made by a Mess Committee composed of :

- President* : Hostel Superintendent (ex-officio)
Vice-Presidents : Wardens (ex-officio)
Student Members : One member for every 30 boarders
Mess Assistant

The Committee will meet regularly once at the beginning of the month to adopt the mess account and on other occasions as necessary. The Secretary will convene the meetings after consultation with the Superintendent.

34. The Mess Committee will have the following functions :

- (a) Checking of the suppliers' rates with market rates of different commodities.
- (b) Inspection and checking of the quality and quantities of all articles supplied for messing as well as the receipts and issue of articles in and from the stores.
- (c) Fixing menus for meals and to seeing that utensils are properly cleaned, spices properly ground, cooking and serving of food done properly and in a hygienic manner.

The above functions will be discharged by different sub-committees appointed by the Mess Committee in a general meeting to be held immediately after election as provided under rule 35.

35. The Mess Committee will be formed twice during a session. Election of its members will take place once in July, and again in January.

36. Secretary of the Mess Committee will be elected from amongst its elected members once in every month. Mess Committee will be responsible for management of messing affairs.

37. The following deductions from messing charges are allowed :

- (a) Full remission of meal charges, other than establishment charge which will be determined by the Mess Committee for absence from 30 consecutive meals in a month.

(b) Deduction of two annas per meal for absence from 15 or more consecutive meals in a month.

(c) No deduction will be granted to any boarder who is absent on leave from the Hostel but attends the College from outside.

38. Boarders must take their meals in the dining hall between a certain specified time in the morning and in the evening as notified by the Hostel Superintendent.

39. Meals will not be served in the rooms unless recommended by the Medical Officer and intimation for such should be made to the Mess Assistant before 9 a.m. and 7-30 p.m.

VII. MISCELLANEOUS

40. All appointments and dismissals of servants and cooks will be made by the Hostel Superintendent.

41. Boarders, when ill, will be attended by the Medical Officer, who attends the Hostel every morning. Boarders requiring medical attention are to have their names entered in the register kept for the purpose.

42. In the case of infectious diseases like plague, small-pox etc., the patient will be at once removed from the Hostel.

43. Visitors will not be allowed to stop in the Hostel overnight.

44. The Hostel will remain closed during Puja vacation and Summer vacation.

45. In all other matters not covered by the above rules the decision of the Principal will be final.

46. Any additions or alterations in the above rules will be made by the Principal as and when he thinks such to be necessary.

GENERAL INFORMATION

(a) College Regulations :—

(i) *The New Student's Responsibility.*—With a student's first registration in the College there begins for him a period of great responsibility, greater in most instances, than he has ever before been called upon to face. He should recognise that the success of his college career depends in large measure upon his own purpose, his own industry, and his own determination

to make good use of his opportunities. The College offers instruction and the use of its equipments, teachers and other officers are ready to help with encouragement and advice ; but after all, the responsibility for success or failure must rest with the student himself.

(ii) *Discipline*.—All students are subject to the disciplinary control of the authorities of the College. In any case of serious breach of discipline, the student concerned may be suspended from attendance by the Principal, and the Managing Committee may at its discretion expel any student from the College without assigning any reason.

(iii) *Attendance*.—The normal hours of attendance during the session are from 10-30 A.M. to 5 P.M. with half an hour's recess with slight modification in the winter.

Students must attend 70 per cent of the lectures in theoretical classes and 70 per cent of the exercises in practical classes. Percentage of attendance is strictly observed.

Percentage rules being binding on all students, applications for leave from the students or from the guardians on their behalf are unnecessary, as a student failing to be present in his class on any account has necessarily to be marked 'absent' in the Attendance Registers, and no commutation is permissible under any circumstances without contravention of the Rules.

(iv) *Damage to College Property*.—Each student is held accountable for any apparatus or equipment that may be assigned to him and for any damage to College Property for which he is responsible. Damage to property that cannot be charged to individuals will be charged against all the students in the class (or section) where the loss occurs.

(v) *Accidents*.—The College Authorities cannot accept any liability in respect of any accident which a student may sustain when engaged in practical work in the laboratories or workshops.

(b) Students' Organisations and Activities :—

Reasonable participation in extra-curricular activities is a worthwhile part of a well rounded education. Opportunities for extra-curricular activities are provided through :

1. The Students' Union.

2. The Sporting Club.

3. The College Journal.

The Students' Union

All students of the College are members of the Students' Union. They meet and elect an Executive Committee of which the Principal is the President and two members of the teaching staff are Vice-Presidents. The Vice-Presidents act as Faculty Advisers to the Executive Committee of the Students' Union, while the management of the Union's affairs are left entirely to that body.

The Union control the disposal of the Students' Welfare Fund, organise debates, essay competitions, dramatics, and other literary activities and hold one 'social' every year.

The Sporting Club

Of the Sporting Club the Principal is the President and two members of the teaching staff act as Vice-President and General Secretary respectively. As in the Students' Union the Vice-President and the General Secretary act as Faculty Advisers leaving the management of the affairs of the Sporting Club to the elected student Secretaries of the various sections which comprise :—

1. The Football Section.

2. The Cricket Section.

3. The Hockey Section.

4. The Tennis Section.

5. The Gymnasium Section.

All students are expected to make use of the sports facilities provided for keeping themselves fit amidst a heavy academic programme and for recreation.

The College Journal

The College Journal is a four-monthly publication managed by an elected student body under the guidance of a Faculty Advisory Committee of which the Principal is the President and a member of the teaching staff is the Secretary.

A senior student is elected every year the Editor of the College Journal and is assisted by student sub-editors.

The 'Tech'.

The final year students publish every year a Year Book of their class called "TECH" containing life history and a photograph each, of the graduating students.

The Tech-Committee is elected every year from the final year classes and work under the guidance of a Tech. Adviser who is the Chairman of the Committee.

(c) National Cadet Corps (N.C.C.) :—

This College has got two Technical Units N.C.C.

(i) 8 Bengal Engineer Platoon N.C.C.

(ii) 3 Bengal Signal Section N.C.C. providing for training 240 cadets at the present.

Students applying for admission in N.C.C. are selected every year after proper test, and they are given three years' training leading to 'B' and 'C' certificates which help the cadets to enter as an officer in the Armed Forces.

Cadets are required to attend 80 per cent of the parades and Technical Classes and join the camps which are held generally during the College vacations.

Privileges :

1. Cadets attending parades regularly are given benefit in the College percentage upto 10 per cent if they are short in class percentage.

2. A certain percentage of marks scored by the cadets in the B & C certificate Examination of the N.C.C. are added in the result of the Final Degree Examination to upgrade the cadets.

(d) The Alumni Association :—

The Alumni Association is the Association of the "Old Boys" of the College. In addition to other activities directed to benefit the College the Loan Scholarship Fund for final year students of the College and the Placement Service may be specially mentioned. On the termination of their college career all students become members of the Association.

EXAMINATION RULES

1. Only those students of classes other than Engineering 1st and 2nd Year who have satisfactorily completed their practical work, satisfied the attendance requirements and paid all dues for the whole session, are eligible to sit for the examination.

2. At the end of each Academic Session, all students must appear at the Annual Examinations held by the National Council of Education, Bengal, in papers as stated in the Prospectus.

3. In addition to the above examinations, every student shall, during each year of study, appear at three written Periodical Examinations in each theoretical paper. He shall also appear at Periodical Oral Examinations, if such are held.

4. All examinations will be held on "Compartmental System". Students must pass separately in every paper in the above examinations. A student who has passed the examination in any paper will not have to sit for examination in that paper again.

5. Every candidate will be declared to have passed the examination in any paper if he obtains—

(a) 50 per cent of the total marks of Periodical Examinations in that paper, and

(b) 50 per cent of the marks at the Annual Examination. Provided that if a candidate fails to obtain pass marks either at the Periodical Examinations or at the Annual Examination, he may be credited with not more than 5 marks transferred from either part of the examination, in excess of the pass marks in the paper, in order to enable him to pass.

6. Students, who have passed the Final Engineering Examination, will be declared to have graduated (i) with First Class Honours if they have obtained at least 70 per cent marks on the average in the Periodical Examinations and at least 70 per cent marks on the average in the Annual Examinations in the Final Engineering papers and at least 70 per cent in practical class works of the Third and Fourth Year Classes, (ii) with Second Class Honours if they have obtained at least 60 per cent marks on the average in the Periodical Examinations and at least 60 per cent marks on the average in the Annual Examinations in the Final Engineering papers and at least 60 per cent in

practical class works of Third and Fourth Year Classes provided always that they have passed in all the papers of the Final Engineering Examinations in the first chance.

7. Students who have passed the Post Graduate Examinations will be declared to have passed with First Class Honours if they have obtained at least 70 per cent marks on the average and with Second Class Honours if they have obtained at least 60 per cent marks on the average.

8. If any student fails to get promotion to the next higher class he will be required to attend the classes and pay the regular tuition and other fees. Students eligible for readmission must apply to the Principal for his readmission by the 31st of July, after which no further application will be entertained.

9. (i) Students of the 1st and 2nd Year Classes who fail to get promotion to the next higher class on the result of the Annual Examinations will be allowed to study again in the 1st and 2nd Year Classes respectively for another session only and the students detained for two years in the same Class will not be allowed to continue their studies in the College any further.

(ii) Students of the 3rd year classes, who have been detained in the same class for two years, will be allowed to appear at another Annual Examination as non-collegiate students by paying only the examination fees, as current for the Supplementary Examination and such students need not be admitted into the College in that session and need not, therefore, pay tuition and other regular fees. Such students as have failed to pass, after availing of all the chances mentioned above, will not be allowed to continue their studies in the College any further.

(iii) Students of the 4th year classes, who have been detained in the same class for two years will be allowed to appear at subsequent Annual Examinations, as non-collegiate candidates, by paying only the examination fees as current for the Supplementary Examination and such students need not be admitted into the College and need not, therefore, pay tuition and other regular fees.

10. Students belonging to Engineering Third Year Classes, who have passed in all papers of the Intermediate Engineering Examination, will be promoted to the Engineering Fourth Year

Classes with a maximum of three papers in which they had failed to pass.

11. Only those students of Final Year Classes, who fail to pass in not more than three papers of the Final Engineering Examination will be permitted to appear and pass in those papers in two subsequent and consecutive examinations, including Supplementary Examination, without attending the classes, provided they can satisfy the Authorities of the College that they are employed in some recognised firm. Intimation of such employment should reach the College on or before the 1st day of September of the year in which they completed the study of the Final Year Class. They will also have to register their names in the College by paying an enrolment fee of Rs. 10/- (Rupees ten) only and will have to pay a fee of Rs. 20/- (Rupees twenty) only for each examination they sit for. Students of this category not engaged in any factory will have to take admission in the College and attend classes and pay all fees for the session.

12. Students of the Final Year Classes, who fail to pass in more than three papers of the Final Engineering Examination will be required to attend the classes and pay regular tuition and other fees. They will have to pass in all remaining papers in the next Supplementary and Annual Examinations.

13. Those students who duly cleared their dues up to the end of the session and duly paid the examination fees, but owing to some accident or unavoidable circumstances could not appear in any of the examinations of the Council, are allowed to appear in the next Annual examination without attending the classes and without paying any further tuition fees, excepting the examination fees. But they will have to enrol their names for the classes with payment of a fee of Rs. 5/- (Rupees five) only within a month after the beginning of the session.

14. A Supplementary Examination will be held each year between two Annual Examinations for the benefit of the students who, having failed to pass in one or more subjects at the Annual Examination, are permitted to prosecute their studies in the next higher class. Such students can appear at the Supplementary Examinations only in those papers in which they had failed to pass.

15. Students shall pay examination fees as follows :

I. For Annual Examinations and examinations at the end of each semester :

(a) Post Graduate Courses :

Rs. 15/- per paper and Rs. 60/- for the thesis.

(b) Final Engineering Examinations :

Rs. 4/- per paper subject to a minimum of Rs. 15/-.

(c) All other examinations :

Rs. 3/- per paper subject to a minimum of Rs. 12/-.

II. For Supplementary Examinations :

Degree Courses :

Rs. 4/- per paper of Final Engineering and

Rs. 3/- per paper for other examinations both subject to a minimum of Rs. 20/-.

Students admitted prior to the commencement of the session 1951-52 shall pay examination fees according to the old rates. Detained students of the First Year Classes, however, shall pay examination fees at the enhanced rates.

16. Examination fees once paid shall in no case be refunded.

17. Applications for re-examination of answer papers will not be entertained if submitted later than the last date announced. Those candidates who intend to have their papers re-examined may apply for the same with a fee of Rs. 5/- for each paper. No re-examination of papers other than written papers will be held. Re-examination fees are not refundable.

18. No certificate will be issued by the Council on the results of any examinations except the Final. Degrees will be granted to students who pass the Final Examinations of the Post-Graduate and Degree Courses.

19. Fees for Annual and Supplementary Examinations must be paid within the dates to be fixed for the purpose.

Fifteen days' grace with a penalty of Rs. 5/- may be allowed at the discretion of the Controller of Examinations.

20. Examination rules for Engineering First and Second Year Classes are given under "Subjects of examination" of the respective classes.

PROGRAMME OF STUDY

I. POST GRADUATE COURSES

Chemical Engineering

		FULL MARKS
1. Chemical Engineering Thermodynamics	One Paper	100
2. & 3. Any two from the following :		
(i) Evaporation ; (ii) Distillation ;		
(iii) Refrigeration ; (iv) Absorption and Adsorption ; (v) Any other unit operation that may be arranged for ; (vi) Heat transmission ; (vii) Higher Mathematics as in M.E.E. & M.M.E. Syllabus ; (viii) Food Technology or Oil Technology	Two Papers	200
4. One Foreign Language : German, French or Russian	One Paper	100
5. Research Work and a Thesis on it		300
6. Oral Examination on the Thesis		100
TOTAL		800

Electrical Engineering

		FULL MARKS
1. Higher Mathematics	One Paper	100
2. Advanced Physics	One Paper	100
3. Any one from the following :		
(i) Electrical Machines ; (ii) Electric Power ; (iii) Electrical Communications ; (iv) (a) Symmetrical components ; (b) Power system Measurements & Relaying	One Paper	100
4. One Foreign Language : German, French or Russian	One Paper	100
5. Research Work and a Thesis on it		300
6. Oral Examination on the Thesis		100
TOTAL		800

*Mechanical Engineering*FULL
MARKS

1. Higher Mathematics ...	One Paper	100
2. Advanced Technical Mechanics ...	One Paper	100
3. Any one from the following:		
(i) Advanced Thermodynamics ; (ii) Advanced Hydraulics ; (iii) Advanced Machine Tools ; (iv) Production Engineering ; (v) Power Plant Engineering ; (vi) Internal Combustion Engine ; (vii) Refrigeration & Air-conditioning ; (viii) Heat Transmission ; and (ix) Measuring Instruments ...	One Paper	100
4. One Foreign Language: German, French or Russian ...	One Paper	100
5. Research Work and a Thesis on it ...		300
6. Oral Examination on the Thesis ...		100
TOTAL ...		800

The examination will be on the compartmental system and will be held once a year along with the Annual Examinations. The thesis on the research work may not be finished in one year in all cases but that will not debar the students from sitting for examination in the theoretical papers. They may continue their research work and prepare the thesis after the written examination in such cases. The students will be entitled to the Master's Degree on fulfilment of all the conditions (*i.e.* passing in the four written papers, the Thesis and the oral Examination). As long as they do not fulfil these conditions they will have to remain as students and pay the usual tuition fees.

There will be no observance of percentage in attendance, and the minimum pass marks shall be 50%.

II. ENGINEERING COURSES

(1) FIRST YEAR CLASS

Students who are admitted to the First Year Class of the Electrical, Mechanical and Chemical Engineering Courses after passing the I.Sc. or B.Sc. examinations of any recognised University, study the following subjects in the Engineering First Year Class:

Electrical and Mechanical Engineering

First Semester (11th July to 30th November)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK		
		Theore- tical	Prac- tical	Tutorial/ Guided Study
M. 1	Co-ordinate Geometry ...	4	—	2
M. 2A	Differential Calculus ...	4	—	2
P. 1	Physics (Heat, Light & Sound) ...	4	—	1
G. 1	English ...	2	—	—
E.M. 1	Engineering Mechanics I ...	4	—	2
D. 1	Drawing ...	—	6	—
D. 2	Descriptive Geometry ...	—	3	—
W. 1	Carpentry and Moulding ...	—	3	—
P. 1A	Physics Laboratory ...	—	4	—
Total ...		18	16	7

Second Semester (1st January to 15th April)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK		
		Theore- tical	Prac- tical	Tutorial/ Guided Study
M. 2B	Integral Calculus ...	4	—	2
P. 2	Physics (Electricity & Magnetism) ...	4	—	1
E.M. 1	Engineering Mechanics I ...	4	—	2
O. 1	Surveying ...	2	—	—
G. 1	English ...	2	—	—
G. 2	Modern World I ...	2	—	—
D. 1	Drawing ...	—	6	—
D. 2	Descriptive Geometry ...	—	3	—
W. 1	Carpentry and Moulding ...	—	3	—
P. 1A	Physics Laboratory ...	—	4	—
	Practical Survey ...	—	3	—
Total ...		18	19	5

Chemical Engineering

First Semester (11th July to 30th November)

SUBJECTS OF INSTRUCTION	PERIODS PER WEEK		Tutorial/ Guided Study
	Theore- tical	Prac- tical	
M. 1 Co-ordinate Geometry ...	4	—	1
M. 2A Differential Calculus ...	4	—	1
P. 1 Physics (Heat, Light & Sound) ...	4	—	—
G. 1 English ...	2	—	—
E.M. 1 Engineering Mechanics I ...	4	—	—
Ch. 2 Inorganic Chemistry I ...	3	—	—
D. 1 Drawing ...	—	6	—
P. 1A Physics Laboratory ...	—	4	—
Ch. 2A Qualitative Analysis ...	—	6	—
W. 1 Carpentry ...	—	3	—
(Part)	—	—	—
Total ...	21	19	2

Second Semester (1st January to 15th April)

SUBJECTS OF INSTRUCTION	PERIODS PER WEEK	
	Theoretical	Practical
M. 2B Integral Calculus ...	4	—
P. 2 Physics (Electricity & Magnetism) ...	4	—
E.M. 1 Engineering Mechanics I ...	3	—
Ch. 2 Inorganic Chemistry I ...	3	—
Ch. 3 Organic Chemistry I ...	5	—
G. 1 English ...	2	—
G. 2 Modern World I ...	2	—
D. 1 Drawing ...	—	6
P. 1A Physics Laboratory ...	—	4
Ch. 2A Qualitative Analysis ...	—	9
Total ...	23	19

SUBJECTS OF EXAMINATION**I. ENGINEERING COURSES****(1) FIRST YEAR CLASS**

Students of the First Year Classes, who have completed the programme of study offered in the first semester will be allowed to appear in the following papers of the First Engineering Examinations of the National Council of Education, Bengal, held annually at the end of first semester, in the month of December.

First-Semester Examination**(1) Electrical and Mechanical Engineering**

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Co-ordinate Geometry ...	1	100
2. Differential Calculus ...	1	100
3. Heat, Light and Sound ...	1	100
	3	300

(2) Chemical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Co-ordinate Geometry ...	1	100
2. Differential Calculus ...	1	100
3. Heat, Light and Sound ...	1	100
	3	300

Students of the First Year Classes who have completed the programme of study offered in the second semester and have obtained at least 50 per cent marks in each of the practical subjects of instruction (which includes also any tutorial work) offered during the academic year and have satisfied the attendance rule will be allowed to appear in the following papers of the First Engineering Examination of the National Council of Education, Bengal, held annually at the end of Second semester in the month of April and May.

Students who fail to complete their class works satisfactorily will not be allowed to sit for the examination.

Second Semester Examination

(1) *Electrical and Mechanical Engineering*

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Modern World I ...	1	100
2. English ...	1	100
3. Integral Calculus ...	1	100
4. Electricity and Magnetism ...	1	100
5. Engineering Mechanics I ...	1	100
6. Surveying ...	1	100
7. Drawing (6 hours) ...	1 (Practical)	100
8. Descriptive Geometry (3 hours) ...	1 „	100
9. Physics Laboratory ...	1 „	100
	9	900

(2) *Chemical Engineering*

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Modern World I ...	1	100
2. English ...	1	100
3. Inorganic Chemistry I ...	1	100
4. Organic Chemistry I ...	1	100
5. Integral Calculus ...	1	100
6. Electricity and Magnetism ...	1	100
7. Engineering Mechanics I ...	1	100
8. Drawing (6 hours) ...	1 (Practical)	100
9. Physics Laboratory ...	1 „	100
	9	900

Students, who have passed in all papers of the First Engineering Examinations subject to rules 3 and 5 of Examination Rules are promoted to the Engineering Second Year Class.

For the benefit of the students who have failed to get promotion to the Second Year Class due to their being absent or being unable to secure pass mark in one or more papers of the examination held at the end of First and, or Second Semes-

ters, a Supplementary Examination will be held in the last week of June. Students passing in this examination will also be promoted to the Second Year Class. Those students who cannot secure promotion will be allowed to study again in the same class as regular students for another session only, or will be given one more chance to clear the paper or papers in the supplementary examination held at the end of the next session as non-collegiate students who will have to pay only examination fees but no tuition fees.

PROGRAMME OF STUDY

II. ENGINEERING COURSES

(2) SECOND YEAR CLASSES

Students, who have been promoted from the First Year Class, study the following subjects in the Second Year Classes :

Electrical and Mechanical Engineering

First Semester (11th July to 30th November)

	SUBJECTS OF INSTRUCTION	PERIODS PER WEEK		
		Theore- tical	Prac- tical	Tutorial Guided Study
M. 3	Calculus and Differential Equations ...	4	—	1
E.E. 1	Principles of Electrical Engineering I ...	2	—	1
E.E. 2	Electrical Wiring and Installations ...	2	—	—
E.E. 3	Direct Current Machines ...	4	—	—
E.M. 2	Engineering Mechanics II ...	3	—	1
M.E. 1	Engineering Thermodynamics ...	2	—	1
G. 3	Modern World II ...	2	—	—
M.E. 19	Machine Drawing ...	—	6	—
E.M. 9	Engineering Computation ...	—	4	—
E.E. 22	Electrical Engineering Laboratory I ...	—	3	—
W. 2	Patterns and Forging ...	—	3	—
W. 3	Fitters' shop ...	—	3	—
Total ...		19	19	4

Second Semester (1st January to 15th April)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK		
		Theore- tical	Tutorial Guided Study	Prac- tical
E. M. 8	Engineering Materials & Processes ...	4	—	—
M. E. 1	Engineering Thermodynamics	2	1	—
M. E. 2	Mechanism ...	4	—	—
E. M. 2	Engineering Mechanics II ...	3	1	—
E. E. 1	Principles of Electrical Engineering I ...	2	1	—
E. E. 1A	Electrical Measuring Instruments	2	—	—
M. 4	Engineering Mathematics ...	2	1	—
M. E. 19	Machine Drawing ...	—	—	6
E. E. 22	Electrical Engineering Laboratory I ...	—	—	3
W. 2	Patterns and Forging ...	—	—	3
W 3	Fitters' Shop ...	—	—	3
E. M. 7	Mechanism Drawing ...	—	—	4
Total ...		19	4	19

Chemical Engineering

First Semester (11th July to 30th November)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK		
		Theore- tical	Prac- tical	Tuto- rial Guided Study
Ch. 5	Organic Chemistry II ...	6	—	—
Ch. 6	Physical Chemistry I ...	3	—	—
M 3	Calculus & Differential Equation	4	—	1
M. E. 3	Heat Engines ...	4	—	1
E. E. 17	Electrical Engineering ...	3	—	—
G 3	Modern World II ...	2	—	—
M. E. 19	Machine Drawing ...	—	6	—
Ch. 4A,	Inorganic Chemistry Laboratory	—	12	—
Ch. 5A & Ch. 11A				
Total ...		22	18	2

Second Semester (1st January to 15th April)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK		
		Theore- tical	Prac- tical	Tutorial Guided Study
E. M. 3	Engineering Mechanics	6	—	1
Ch. 6	Physical Chemistry I ...	3	—	—
Ch. 4	Inorganic Chemistry II	4	—	—
E. E. 17	Electrical Engineering	3	—	—
M. E. 19	Machine Drawing ...	—	6	—
E. E. 17A	Electrical Engineering Laboratory ...	—	3	—
Ch. 4A, Ch. 5A & Ch. 11A	Chemistry Laboratory	—	12*	—
M. 4	Engg. Mathematics ...	2	—	1
Total ...		18	21	2

SUBJECTS OF EXAMINATION

II. ENGINEERING COURSE

(2) SECOND YEAR CLASS

Students of the Engineering Second Year Classes, who have completed the programme of study offered in the first semester will be allowed to appear in the following papers of the Intermediate Engineering Examination of the National Council of Education, Bengal, held annually at the end of the First Semester, in the month of December.

First Semester Examination

Electrical and Mechanical Engineering

SUBJECTS		NO. OF PAPERS	FULL MARKS
1.	Calculus and Differential Equation ...	1	100
2.	Modern World II ...	1	100
3.	Direct Current Machines ...	1	100
4.	Electric Wiring and Installations ...	1	100
		4	400

* 9 Inorganic. 3 Organic.

Chemical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Calculus and Differential Equation ...	1	100
2. Modern World II ...	1	100
3. Heat Engines ...	1	100
4. Organic Chemistry II ...	1	100
	—	—
	4	400

Students of the Engineering Second Year Classes who have completed the programme of study offered in the Second Semester and have obtained at least 50 per cent marks in each of the practical subjects of instruction (which includes also any tutorial work) offered during the academic year, and have satisfied the attendance rule will be allowed to appear in the following papers of the Intermediate Engineering Examination of the National Council of Education, Bengal, held annually at the end of the Second Semester in the month of April and May.

Students, who fail to complete their class works satisfactorily, will not be allowed to sit for this examination.

*Second Semester Examination**Electrical and Mechanical Engineering*

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Engineering Materials and Processes	1	100
2. Engineering Thermodynamics ...	1	100
3. Mechanism ...	1	100
4. Engineering Mechanics II ...	1	100
5. Principles of Electrical Engineering I	1	100
6. Electrical Measuring Instruments ...	1	100
7. Engineering Mathematics ...	1	100
8. Machine Drawing (6 hours) ...	1 (Practical)	100
	—	—
	8	800

Chemical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
1. Engineering Mechanics ...	1	100
2. Inorganic Chemistry II ...	1	100
3. Physical Chemistry I ...	1	100
4. Electrical Engineering ...	1	100
5. Engineering Mathematics ...	1	100
6. Machine Drawing (6 hours) ...	1 (Practical)	100
	—	—
	6	600

Students, who have passed in all papers of the Intermediate Engineering Examinations subject to rules 3 and 5 of Examination Rules are promoted to the Engineering Third Year Class.

For the benefit of the students who have failed to get promotion to the Third Year Class due to their being absent or being unable to secure pass mark in one or more papers of the examination held at the end of First and, or, Second Semester, a supplementary examination will be held in the last week of June. Students passing in this examination will also be promoted to the Third Year Class. Those students, who cannot secure promotion due to failure to get pass mark or being absent in one or more papers, will be allowed to study again in the same class as regular students for another session only, or will be given one more chance to clear the paper or papers in the supplementary examination held at the end of the next session as non-collegiate students who will have to pay only examination fees but no tuition fees.

No student will be allowed to sit for any paper in the supplementary examination if he has not completed all class works satisfactorily. If a student is debarred from appearing in the Supplementary Examination held at the end of the Second Semester, due to incomplete class works, he will be given one more chance to attend the classes and will have to take admission in the College by paying readmission fee and attend regularly for the whole session those practical classes in which his progress was not satisfactory. He shall have to pay the full tuition and other fees. On satisfactory completion of class

works (which means securing at least 50 per cent marks) he will be allowed to sit for the Annual Examination held at the end of the Second Semester as well as in the Supplementary Examination if need be. If he fails to clear all papers in these two successive examinations he will not be allowed to study in the College any further. It should be noted that class work includes tutorial works in any subject when such are held.

This rule apply to both First and Second Year Engineering Classes.

PROGRAMME OF STUDY

II. ENGINEERING COURSES

(3) THIRD YEAR CLASS

Students, who have been promoted from the Second Year Classes, study the following subjects in the Third Year Classes :

Chemical Engineering

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E. M. 5	Strength of Materials	3	—
Ch. 7	Physical Chemistry II	2	—
Ch. 8	Electrochemistry	3	—
Ch. 11	Industrial Chemistry I	2	—
Ch. 12	Metallurgy and Engineering Materials	3	—
Ch. 10	Chemical Engineering I	3	—
Ch. 13	Fuels and Their Combustion	2	—
Ch. 10A	Chemical Engineering II	2	—
Ch. 9, Ch. 11A	Physico-Chemical Measurements	—	15*
Ch. 11A, Ch. 5A	Technical Analysis (Organic)	—	15*
M. E. 9C	Machine Drawing and Design	—	3
W 4A	Machine Shop	—	3
Total		20	21

* For half year.

Electrical Engineering

(Power Engineering option)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E. M. 5	Strength of Materials	3	—
M. E. 8	Hydraulics	2	—
M. E. 7	Prime Movers	3	—
E. E. 5	Differential Equation & Electrical Networks	2	—
E. E. 6	Alternating Current Machines I	4	—
E. E. 4	Principles of Electrical Engineering II	2	—
E. E. 4A	Electron Tubes and Circuits	2	—
E. E. 8	Electrical Measuring Instruments & Measurements	2	—
E. E. 21	Electrical Engineering Calculations	—	2
E. E. 19	Electrical Drawing & Design	—	3
E. E. 23	Electrical Engineering Laboratory II	—	3
M. E. 9B	Machine Drawing & Design	—	5
M. E. 21B	Mechanical Engineering Laboratory	—	3
W. 4A	Machine Shop	—	3
Total		20	19

(Communication Engineering Option)

Students will have to opt at the beginning of the Third Year

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E.M. 5	Strength of Materials ...	3	—
M.E. 7	Prime Movers ...	3	—
E.E. 5	Differential Equations and Electrical Networks ...	2	—
E.E. 6	Alternating Current Machines I	4	—
E.E. 4	Principles of Electrical Engineering II ...	2	—
E.E. 8	Electrical Measuring Instruments & Measurements ...	2	—
E.E. 15.05	Advanced Physics ...	2	—
E.E. 15.1	Theory & Application of Electron Tubes I ...	2	—
	German Language ...	1	—
E.E. 21	Electrical Engineering Calculations ...	—	2
E.E. 15.3	Computation ...	—	3
E.E. 23	Electrical Engineering Laboratory II ...	—	3
M.E. 21B	Mechanical Engineering Laboratory ...	—	3
M. 4A	Machine Shop ...	—	3
E.E. 15.2	Electronics Laboratory I ...	—	3
Total ...		21	17

Mechanical Engineering

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E.M. 4	Strength of Materials and Theory of Structures ...	4	—
M.E. 8	Hydraulics ...	2	—
M.E. 9	Theory of Machine Design ...	2	—
M.E. 4	Steam Engines & Boilers ...	4	—
M.E. 5	Steam Turbine ...	2	—
M.E. 6	Internal Combustion Engines ...	2	—
E.E. 16	A. C. Machines & Power Distribution ...	3	—
M.E. 9A	Machine Drawing & Design ...	—	9
M.E. 21A	Mechanical Engineering Laboratory ...	—	6
E.E. 23A	Electrical Engineering Laboratory ...	—	3*
W 4	Workshop Practice—Machine-shop ...	—	6
Total ...		19	21

SUBJECTS OF EXAMINATION

II. ENGINEERING COURSES

(3) THIRD YEAR CLASS

Students of the Engineering Third Year Classes, who have completed the above programme of study and have obtained at least 50 per cent marks in the Practical Subjects of Instruction, and have satisfied attendance rule are allowed to appear in the

* For half year instead of M.E. 21A.

following subjects of the Final Engineering Examination of the National Council of Education, Bengal, held annually at the end of the Academic Session :

Chemical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
Strength of Materials	1	100
Physical Chemistry II	1	100
Electro-Chemistry	1	100
Industrial Chemistry I	1	100
Metallurgy and Engineering Materials	1	100
Fuels & their Combustion	1	100
Chemical Engineering I	1	100
Machine Drawing & Design (6 hours) ...	1 (Practical)	100
Technical Analysis	1 "	100
	9	900

Electrical Engineering

(Power Engineering Option)

SUBJECTS	NO. OF PAPERS	FULL MARKS
Strength of Materials	1	100
Hydraulics	1	100
Prime Movers	1	100
Differential Equations & Electrical Networks	1	100
Alternating Current Machines I	1	100
Principles of Electrical Engineering II	1	100
Electrical Measuring Instruments and Measurements	1	100
Electron Tubes & Circuits	1	100
Machine Drawing & Design (6 hours) ...	1	100
	9	900

(Communication Engineering Option)

SUBJECTS	NO. OF PAPERS	FULL MARKS
Strength of Materials	1	100
Prime Movers	1	100
Differential Equations & Electrical Networks	1	100
Alternating Current Machines I	1	100
Principles of Electrical Engineering II	1	100
Electrical Measuring Instruments & Measurements	1	100
Advanced Physics	1	100
Theory and application of Electron Tubes I	1	100
Electronics Laboratory	1 (Practical)	100
	9	900

Mechanical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
Strength of Materials and Theory of Structures	1	100
Hydraulics	1	100
Theory of Machine Design	1	100
Steam Engines & Boilers	1	100
Steam Turbines	1	100
Internal Combustion Engines	1	100
A.C. Machines & Power Distribution ...	1	100
Machine Drawing & Design (6 hours) ...	1	100
	8	800

Students, who have passed in all subjects of the above Examination, subject to Rules 3 and 5 of the Examination Rules, are promoted to the Engineering Fourth Year Classes, provided they have also passed in all subjects of the Intermediate Engineering Examination.

Students, who have passed in all subjects of the Intermediate Engineering Examination and have got plucked in not more than three of the above subjects of the Final Engineering Examination, will also be promoted to the Engineering Fourth Year Classes. They will, however, have to pass in those subjects of the Third Year Class in which they failed to secure pass marks before they can be granted the Degree at the end of the Course.

PROGRAMME OF STUDY

II. ENGINEERING COURSES

(4) ENGINEERING FOURTH YEAR CLASS

Students, who have been promoted from the Engineering Third Year Classes, study the following subjects in the Fourth Year Classes :

Chemical Engineering

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
Ch. 14	Chemical Engineering III	... 4	—
Ch. 15	Industrial Chemistry II	... 3	—
Ch. 14A	Chemical Engineering IV	... 4	—
G. 4	Engineering Economics	... 2	—
Ch. 16	Chemical Engineering Laboratory	... —	14*
<i>Electives :</i>			
<i>Any one of the following three :</i>			
Ch. 17, 17A	Chemical Technology of Oils & Fats	... 3	} 3 9
Ch. 18	Glass Technology	... 3	
Ch. 19, 19A	Food Technology	... 3	
Total		... 16	23

* Students are required to work in the Mechanical Engineering Laboratory M. E. 21C for eight weeks as part of the work in Ch. 16.

Electrical Engineering

(Power Engineering Option)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
M.E. 24	Power Plant and Boiler	... 2	—
E.E. 7	Alternating Current Machines II	2	—
E.E. 10	Electric Power Transmission	... 2	—
E.E. 11	Electric Power Generation	... 2	—
E.E. 9	Electric Power Distribution	... 2	—
E.E. 12	Power Utilization and Traction	2	—
G. 4	Engineering Economics	... 2	—
M.E. 16	Industrial Administration	... 2	—

Electives :

Any one of the following four subjects :

E.E. 13.1	Advanced Electrical Measuring Instruments and Measurements		} 2 —
E.E. 13.2	Switch gear and Protective Devices		
E.E. 13.3	Industrial Electronics		
E.E. 13.4	Electrical Machine Design		
E.E. 18	Electrical Drawing	... —	3
E.E. 20	Electrical Project Design	... —	6
E.E. 24	Electrical Engineering Laboratory III	... —	6
E.E. 25	Computation & Design for Elective Course	... —	3
E.E. 26	Abstract	... —	2
		18	20

First Semester

(Communication Engineering Option)

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E.E. 15.4	Communication Networks ...	4	—
E.E. 15.5	Electroacoustics ...	3	—
E.E. 15.6	Electromagnetic Waves ...	3	—
E.E. 15.7	Theory and application of Electron Tubes II ...	4	—
E.E. 10	Electric Power Transmission	2	—
G. 4	Engineering Economics ...	2	—
	German Language ...	2	—
E.E. 15.8	Electronics Laboratory II ...	—	6
E.E. 15.9	Electronic Equipment shop I ...	—	3
E.E. 15.10	Electronic Design I ...	—	6
E.E. 15.11	Communication Laboratory I ...	—	3
Total ...		20	18

Second Semester

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E.E. 15.12	Telephone and Telegraph System ...	6	—
E.E. 15.13	Microwave Technique ...	4	—
E.E. 15.14	Measurement in Communica- tion ...	4	—
E.E. 10	Electric Power Transmission	2	—
G. 4	Engineering Economics ...	2	—
	German Language ...	2	—
E.E. 15.15	Communication Laboratory II ...	—	6
E.E. 15.16	Electronic Design II ...	—	6
E.E. 15.17	Electronic Equipment shop II ...	—	3
E.E. 15.18	Measurement Laboratory ...	—	3
E.E. 15.19	Seminar ...	—	1
Total ...		20	19

Mechanical Engineering

SUBJECTS OF INSTRUCTION		PERIODS PER WEEK	
		Theoretical	Practical
E.M. 6	Technical Dynamics ...	2	—
M.E. 11	Power Plant Engineering ...	2	—
M.E. 16	Industrial Administration ...	2	—
M.E. 15	Mechanical Handling of Materials	2	—
M.E. 14	Materials of Construction ...	2	—
M.E. 13	Machine Tools ...	2	—
G. 4	Engineering Economics ...	2	—
G. 5	General Geology ...	2	—

Electives :

Any two of the following six Subjects :

G. 6	Engineering Geology ...	2	4	—
M.E. 17	Refrigeration ...	2		
M.E. 18	Air Conditioning ...	2		
M.E. 12	Motor Car Engineering	2		
M.E. 10	Hydraulic Machines and Water Power ...	2		
M.E. 23	Railway Engineering, Mechanical ...	2		
	Or			
	the following two :			
M.E. 25	Production Engineering I (Quantity Production Methods) ...	2	2	
M.E. 26	Production Engineering II (Production Planning)	2		
W. 4	Advanced Workshop Practice ...	—		6
M.E. 21A	Mechanical Engineering Labora- tory ...	...	—	3
M.E. 20	Machine Design ...	...	—	9
M.E. 22	Abstract ...	...	—	2
Total ...				20
				20

SUBJECTS OF EXAMINATION

II. ENGINEERING COURSES

(4) FOURTH YEAR CLASS

Students of the Engineering Fourth Year Classes, who have completed the above Programme of Study and have obtained at least 50 per cent marks in the Practical Subjects of instruction and have satisfied the attendance rule are allowed to appear in the Final Engineering Examination of the National Council of Education, Bengal, held annually at the end of the Academic Session in the following remaining subjects of that Examination :

Chemical Engineering

SUBJECTS	NO. OF PAPERS	FULL MARKS
Chemical Engineering II ...	1	100
Chemical Engineering III ...	1	100
Industrial Chemistry II ...	1	100
Chemical Engineering IV ...	1	100
Engineering Economics ...	1	100
Chemical Engineering Design ...	1	100
General Knowledge in Chemistry and Chemical Engineering ...	1 (oral)	100
<i>Electives :</i>		
Chemical Technology of Oils and fats or Glass and Ceramic Technology ... or Food Technology	1	100
Chemical Engineering Laboratory ...	1	100
	9	900

Electrical Engineering (Power Engineering Option)

SUBJECTS	NO. OF PAPERS	FULL MARKS
Power Plant and Boiler ...	1	100
Alternating Current Machines II ...	1	100
Electric Power Transmission ...	1	100
Electric Power Generation ...	1	100
Electric Power Distribution ...	1	100
Power Utilization and Traction ...	1	100
Engineering Economics ...	1	100
Industrial Administration ...	1	100
<i>Electives : any one of the following :</i>		
Advanced Electric Measuring Instruments and Measurements ...	1	100
Switchgear and Protective Devices ...		
Industrial Electronics ...		
Electrical Machine Design ...		
Electrical Engineering Laboratory (Oral)	1	100
	10	1000

(Communication Engineering Option)

SUBJECTS	NO. OF PAPERS	FULL MARKS
<i>At the end of First Semester :</i>		
Communication Networks ...	1	100
Electroacoustics ...	$\frac{1}{2}$	50
Electromagnetic Waves ...	$\frac{1}{2}$	50
Theory and application of Electron Tubes I ...	1	100
<i>At the end of Second Semester :</i>		
Telephone & Telegraph Systems ...	1	100
Microwave Techniques ...	1	100
Measurements in Communication ...	1	100
Electric Power Transmission ...	1	100
Engineering Economics ...	1	100
German Language ...	1	100
Communication, Electronics and Measurement Laboratory ...	1 (Practical)	100
	10	1000

Mechanical Engineering

SUBJECTS	No. OF PAPERS	FULL MARKS
Power Plant Engineering ...	1	100
Industrial Administration ...	1	100
Mechanical Handling of Materials ...	1	100
Materials of Construction ...	1	100
Machine Tools ...	1	100
Technical Dynamics ...	1	100
General Study (General Geology) ...	1	100
Engineering Economics ...	1	100
Advanced Workshop Practice (oral) ...	1	100
Mechanical Engineering Laboratory (oral)	1	100

Electives : Any two of the following :

Engineering Geology ...	1	100	}	2	200
Refrigeration ...	1	100			
Air Conditioning ...	1	100			
Motor Car Engineering ...	1	100			
Hydraulic Machines & Water Power ...	1	100			
Railway Engineering, Mechanical ...	1	100			
or					
The following two :					
Production Engineering I (Quantity Production Methods) ...	1	100			
Production Engineering II (Production Planning) ...	1	100			
	12	1200			

Students, who have passed in all subjects of the Final Engineering Examinations, subject to rules 3 and 5 of the Examination Rules, held at the end of the Third and Fourth Year Classes, are granted Degrees in Chemical, Electrical or Mechanical Engineering, as the case may be, by the National Council of Education, Bengal.

After the publication of the Final Engineering Examination results the graduates will have to undergo practical training in recognised firms for at least one year. The College Administration will make all efforts to help the graduates in securing such practical training.

The students, who have obtained the B.M.E. Degree and want to obtain B.E.E. Degree, are to study the following subjects in their Electrical Engineering 3rd and 4th Year Classes respectively :—

Subjects for Electrical Engineering Third Year Class :

1. Differential Equations & Electrical Networks.
2. Alternating Current Machines—I.
3. Principles of Electrical Engineering—II.
4. Electrical Engineering Calculation.
5. Electrical Drawing & Design.
6. Electrical Engineering Laboratory II.
7. Electrical Measuring Instruments & Measurements.
8. Electron Tubes & Circuits.

Subjects for Electrical Engineering Fourth Year Class :

1. Electrical Power Transmission.
2. Power Utilization & Traction.
3. Electrical Power Generation.
4. A. C. Machines—II.
5. Electrical Power Distribution.
6. Electrical Engineering Laboratory—III.
7. Electrical Project & Design.
8. Abstract.
9. Electrical Drawing.
10. Any one of the following four elective subjects :
 - (i) Advanced Electrical Measuring Instruments and Measurement.
 - (ii) Switchgear and Protective Devices.
 - (iii) Industrial Electronics.
 - (iv) Electrical Machine Design.
11. Computation and Design for Elective Course.

The students, who have obtained the degree of B.E.E. and want to obtain B.M.E. degree are to study the following subjects in their 3rd and 4th year classes respectively.

Subjects for Mechanical Engineering Third Year Class :

1. Strength of Materials & Theory of Structures.
2. Theory of Machine Design.
3. Steam Engine & Boiler.
4. Steam Turbines.
5. Internal Combustion Engines.
6. Machine Drawing & Design.
7. Mechanical Engineering Laboratory.
8. Workshop Practice—Machine shop.

Subjects for Mechanical Engineering Fourth Year Class :

1. Technical Dynamics.
2. Power Plant Engineering.
3. Industrial Administration.
4. Mechanical Handling of Materials.
5. Materials of Construction.
6. Machine Tools ; and
7. & 8. Any two of the following six subjects :—
 1. Engineering Geology.
 2. Refrigeration.
 3. Air Conditioning.
 4. Motor Car Engineering.
 5. Hydraulic Machines and Water Power Engineering.
 6. Railway Engineering, Mechanical.

or

the following two :

1. Production Engineering I
(Quantity Production Methods).
2. Production Engineering II
(Production Planning).
9. Advanced Workshop Practice.
10. Mechanical Engineering Laboratory.
11. Machine Design.
12. Abstract.

SYLLABUS

MATHEMATICS

M. 1. Co-ordinate Geometry :

Co-ordinates, Cartesian and Polar. Lengths of straight lines and areas of triangles. Point of division of a straight line. Definition of the Equation to a Locus. Equations of straight lines. Transformation of co-ordinates. Change of axes. Circle, Parabola, Ellipse and Hyperbola—their equations and properties with simple examples. Tangents and normals, Relation between a line and a conic. Tracing some commonly occurring curves whose equations are simple form in Cartesian or Polar co-ordinates. Cartesian co-ordinates in space. Direction-cosines of a line. Length between two points in space. Angle between two lines in space. Point of division of a line in space. Definition of the equation to a locus in space. The plane and the general equation of the first degree in three variables. The straight line in space and its general equations. Projections.

Special Surfaces :—Spheres, cylinders, the ellipsoids, hyperboloids, paraboloids, cones, surfaces of revolution and ruled surfaces.

Tracing of curves will receive considerable attention throughout the whole course.

M. 2A. Differential Calculus :

Constants and variables. Functions. Limits and infinitesimals. Physical meaning of Differentiation. Differentiation from First Principle. Various methods of differentiation. Differentiation of constant, sum, product, and quotient of functions, function of a function, inverse function, logarithmic and trigonometrical function. Differentiation of function of a

1st
Year ; 4 hrs.
a week ;
Lectures.
2 hrs.
a week ;
Tutorial
1st Semester.

1st
Year ; 4 hrs.
a week ;
Lectures.
2 hrs.
a week ;
Tutorial
1st Semester (1 hr.

tutorial for
Ch. E.
1st yr.)

several variables. Partial differentiation. Euler's theorem. Differentials. Successive differentiation. Taylor's and Maclaurin's theorems. Rates. Maxima and minima. Curvature. Radius and centre of curvature. Convexity and concavity and points of inflexion on a curve. Equations of tangents and normals. Subtangents and subnormals. Study of important technical curves as Cycloid Involute. Epi- and Hypo-cycloid. Calculation of small corrections and percentage errors. Applications of differential calculus from the Engineer's point of view.

M. 2B. Integral Calculus :

1st
Year ; 4 hrs.
a week ;
Lectures.
2 hrs.
a week ;
Tutorial
2nd Semes-
ter.

Meaning of Integration. Integration of standard elementary forms. Integration by substitution of a new variable ; Integration by parts. Integration by resolution into partial functions. Lengths and areas of plane curves. Volumes of solids of revolution ; simple cases of definite integrals. Mean values. Root mean square values. Successive and partial integration.

M. 3. Calculus and Differential Equations :

2nd
Year ; 4 hrs.
a week ;
Lectures.
1 hr.
a week ;
Tutorial
1st Semes-
ter.

Fourier's series. Partial Differentiation. De Moivre's Theorem. Hyperbolic Functions. Inverse hyperbolic Functions. Differential equations of the first order and of the first degree. The operator D . Differential equations of the n th order and the first degree. Simple Geometrical and Physical application chiefly from the Engineer's point of view.

M. 4. Engineering Mathematics :

2nd
Year ; 2 hrs.
a week ;
Lectures.
1 hr.
a week ;
Tutorial
2nd Semes-
ter.

Summation of Arithmetic and Trigonometrical Series ; Equations of the n th degree—Real and Imaginary Roots ; Solutions of Equations by Graphical Methods ; Solutions of Cubic Equations ; Cardan's Solution ; Partial Differentiation ; Use of Partial Differentiation to determine Small Errors in

Measurements ; Taylor's Theorem ; Expansion of Simple Functions in Series ; Maxima and Minima of Functions of Two Variables ; Analysis of Plane Curves ; Asymptotes ; Points of Inflexion ; Curvature ; Envelopes ; The Cycloid ; The Epicycloid ; The Cardioid ; The Equiangular Spiral ; Areas and Volumes of Surfaces of Revolution ; Theorems of Pappus ; Moments of Inertia ; Centres of Pressure ; Differential Equations of Newton's Law of Cooling ; Simple Harmonic Motion ; Current in an Electric Circuit ; Deflection of Beams ; Conduction of Heat ; the Whirling of Shafts ; Vibrating Mass ; Motion in Resisting Medium ; Determination of Empirical Laws ; Method of Least Squares ; Interpolation Formulae ; Normal Law of Errors ; Standard Deviation ; Determination of Probable Errors ; Vector Analysis ; Vectors ; Scalars ; Addition, Subtraction and Multiplication of Vectors ; Theory of Dimensions.

PHYSICS

P. 1. Physics :

Heat :—Expansion of gases ; Absolute temperature ; Gas thermometer ; Kinetic theory of gases ; Two specific heats of gases ; Characteristic equations ; Heat as energy ; First Law of thermodynamics ; Gas constant ; continuity of state—Andrew's and Amagat's experiments ; Critical temperature ; Liquefaction of gases ; Relative humidity ; Hygrometers ; Dalton's Law ; Mixture of gases and vapours ; Conduction, Convection and Radiation of heat.

1st
Year ; 4 hrs.
a week ;
Lectures.
1 hr.
a week ;
Tutorial
1st Semes-
ter.

Nature of Light :—Corpuscular Theory, Wave Theory, Quantum Theory ; Explanation of different Basic Phenomena ; Interference ; Diffraction ; Measurement of Wavelength ; Dispersion ; Chromatic and Spherical Aberrations ; Basic Idea about the origin of line spectra ; Spectrum Analysis ; Polari-

sation ; Double Refraction ; Nicol's Prisms ; Polarimeter.

Sound :—Velocity of sound propagation in different mediums ; Doppler's effect ; Ultrasonic velocity and Supersonic waves ; Echo depth sounding ; Composition of Simple Harmonic Motions ; Beat ; Resonance.

P. 2. Physics :

1st
Year ; 4 hrs.
a week ;
Lectures.
1 hr.
a week ;
Tutorial
2nd Semester.

Magnetism :—Laws of attraction and repulsion ; Unit pole ; Magnetic Field ; Intensity ; Potential ; Tan A & Tan B positions of Gauss ; Magneto-meter ; Moment of magnets ; Determination of H ; Permeability and Hysteresis of iron ; Magnetic Maps.

Static Electricity :—Electric field ; Intensity ; Potential ; Gauss's theorem and its implications ; Condenser ; Capacity of condensers ; Unit capacity ; Specific Inductive Capacity ; Condensers in series and parallel ; Energy of a charged condenser ; Residual charge ; Electro-meters.

Dynamic Electricity :—Electric current ; Laplace's Law ; Magnetic field due to current ; C. G. S. unit of current ; Action of currents on magnets ; Action of magnets on currents ; Galvanometers ; Conductors ; Resistance of conductors ; Effect of temperature on resistance ; Resistance of conductors in series and parallel ; Measurement of resistance ; Comparison of E. M. F. ; Wheatstone's bridge ; Potentiometer ; Kirchhoff's Law ; Electromagnetic induction ; Faraday's Law ; Lenz's Law ; Eddy current ; Solenoids and electro-magnets ; Magnetomotive force ; Magnetic flux ; Self induction ; Ruhmkorff's Coil ; Transformer ; Thermal effects of current ; Electrical energy ; Conversion of electrical energy into heat ; Electric power ; Incandescent and arc lamps ; Conversion of heat into electrical energy ; Thermopile ; Thermocouple ; Electrolysis and laws of electrolysis ; Electro-chemical equivalent of elements ; Electro-plating.

Elementary treatment of the following : Conduction through gases ; Electrical discharge ; Kathode rays ; Fundamental Electric Particles ; Atomic Structure ; X-rays ; Cosmic Rays ; Radio-activity ; Electric waves ; Wireless Telegraphy ; Photo electricity and Piezo-electricity.

P. 1A. Physics Laboratory :

1. Determination of specific heat of a solid with radiation correction. 1st
Year ; 4 hrs.
a week ;
Practical.
2. Determination of latent heat of fusion of ice.
3. Determination of latent heat of vaporisation of water with radiation correction.
4. Determination of co-efficient of linear expansion of a solid.
5. Verification of Boyle's Law.
6. Determination of volume co-efficient of air.
7. Determination of pressure co-efficient of air.
8. Determination of Relative humidity of atmospheric air.
9. Measurement of Thermal conductivity of a metal.
10. Measurement of Refractive Index by microscope.
11. Spectrometer, its adjustment and use.
12. Measurement of indices of refraction by spectrometer.
13. Comparison of moments of bar-magnets, by
 - (a) Tan A method of Gauss.
 - (b) Tan B method of Gauss.
14. Determination of 'H' in the laboratory.
15. Determination of Inclination by Dip-circle.
16. Measurement of resistance of a coil by
 - (a) Wheatstone's Bridge.
 - (b) Post Office Box.
17. Determination of resistance of a galvanometer by
 - (a) Thompson's method.
 - (b) Half deflection method.

18. Determination of resistance of a battery by
 - (a) Mance's method.
 - (b) Ammeter and Voltmeter method.
19. Measurement of low resistance.
20. Measurement of Resistance of an electrolyte.
21. Comparison of E. M. F. by potentiometer.
22. Determination of electro-chemical equivalent of a metal.
23. Determination of Mechanical equivalent of heat.
24. Determination of Reduction factor of a galvanometer.
25. Determination of Temperature co-efficient of resistance.
26. Verification of Fleming's rule.
27. Measurement of Commercial efficiency of lamps.

CHEMISTRY AND CHEMICAL ENGINEERING

Ch. 1. Chemistry of Engineering Materials :

Water for steam generation and industrial purposes ; Rules and principles of combustion ; lime and gypsum products, sand, cement ; refractory materials ; furnace types ; metallurgical terms and processes ; extraction of iron and manufacture of various kinds of iron, steel and their alloys ; extraction of common non-ferrous metals as *Al*, *Cu*, *Pb*, *Sn*, *Zn*, and their properties, including those of their principal alloys ; properties of *Ag*, *Au* and *Pt* ; methods of protection of metals, specially iron and steel ; paints and varnishes ; lacquers and enamels ; lubricants ; electrical insulating materials such as glass, porcelain, mica, rubber, plastics, nitro-cellulose products, etc.

Ch. 2. Inorganic Chemistry I :

An introduction to the classification of elements ; Combining weights ; Atomic weights and molecular weights ; Valency ; The periodic system ; The inactive elements ; The halogens ; Oxygen, Sulphur, Selenium and Tellurium ; Air and the nitrogen family of elements, N.P. and As ; Carbon, carbon monoxide ; Carbon dioxide, Coal and coalgas, Combustion and structure of flame ; Silicon, Silica and Silicates ; Boron and Borax ; Hydrogen, Deuterium, Water ; The peroxides and peracids including hydrogen peroxide and ozone ; Introduction to the principles of qualitative analysis and chemical calculations.

Books Recommended :—As in Ch. 4.

Ch. 2A. Qualitative Analysis :

Dry tests for bases and acids. Practice with blow pipe, reduction, borax bead test, flame test and fusion. (This may be omitted here if the student has already acquainted himself fully with the above methods).

Insoluble substances, simple methods of solution for insolubles—double decomposition, fusion, extraction with strong acids, etc., etc.

A few preliminary lectures will be given to enable the students to follow the different operations in a systematic analysis for the separation and identification of groups and radicals. The aim should be to impress on the students the necessity of adhering to the required minimum of reagents and chemicals in the manipulation, and to bring home to them the fact that qualitative analysis leads to quantitative if only a balance is used.

The theory of electrolytic dissociation, Osmotic pressure, law of mass action, balanced reactions, solubility product, colloidal solutions.

Individual tests of metals. Division of metals into groups. Systematic analysis of the metals in each

group. Reactions in the dry way. Wet reactions. Separation of bases into groups. Detection of acids. Systematic analysis of unknown substances, containing not more than 6 of the following radicals: Ag, Pb, Hg, Cu, Bi, Cd, Sn, As, Sb, Fe, Al, Cr, Zn, Mn, Co, Ni, Ca, Sr, Ba, Mg, Li, K, Na, NH_4 , OH, CrO_4 , AsO_4 , AsO_3 , S_2O_3 , PO_4 , BO_3 , C_2O_4 , CO_3 , Cl, Br, I, F, S, $\text{Fe}(\text{Cy})_6$, CHO_2 , SO_4 , SO_3 , NO_3 , NO_2 , ClO_3 , ClO_4 , OCl, $\text{C}_4\text{H}_4\text{O}_6$ and silicates.

Complete analysis of a few naturally occurring ores and substances.

Ch. 3. Organic Chemistry I :

Ch. E. 1st
Year; 6 hrs.
a week;
Lectures.
2nd Semes-
ter.

The growth and the scope of organic chemistry ; Purification of organic compounds—solids and liquids. Analysis of organic compounds—qualitative and quantitative. Determination of molecular weights of organic acids and bases by chemical methods. Classification of organic compounds.

Detailed Study of Aliphatic or Open-chain Compound:—Saturated Hydrocarbons, unsaturated Hydrocarbons—Olefines and Acetylenes. Halogen derivatives of the paraffins and unsaturated hydrocarbons. Alcohols—Monohydric saturated alcohols and Monohydric unsaturated alcohols. Ethers, Aldehydes and Ketones. Mono-basic Fatty Acids—Saturated acids and unsaturated acids. Acid Chlorides, Anhydrides and Amides. Esters—Esters of organic and inorganic acids. Mercaptans, Sulphonic Acids and Sulphonates, Thio-ethers. Amines. Cyanogen compounds—Cyanogen and Hydro-cyanic acid. Halogen compounds of cyanogen—Cyanic and Cyanuric acids—Thiocyanic acid, Thiocyanates—Nitrites—Carbamines.

Alkyl derivatives of Phosphorus, Arsenic, Silicon, etc. Organometallic compounds—Synthetic uses of Zinc Alkyl compounds and Grignard's Reagents. Polyhydric Alcohols, Carbohydrates.

Hydroxy Monobasic Acids and compounds related to them—Monohydroxy fatty acids—Stereoisomerism of Lactic Acids—Amino Acids—Dialdehydes—Diketones—Monobasic Aldehydic and Ketonic Acids—Synthetic uses of Aceto-acetic Ester. Diabasic acids—Carbonic acid derivatives—Saturated and unsaturated Diabasic acids—Monohydroxy and Dihydroxy Diabasic acids—Stereoisomerism of the Tartaric acids and Stereoisomerism of unsaturated acids—Hydroxy poly-basic acids.

Ch. 4. Inorganic Chemistry II :

In continuation of Ch. 2, a detailed study of the metals and their important compounds in the light of the periodic classification of elements, including the alkalimetals, electrolysis and electro-chemical methods ; Cu, Ag, and Au ; the alkaline earth metals, Be, Mg, Zn, Cd, and Hg ; Al, glass and ceramics ; Ti, Zr, Ce, and Th ; Sn, Pb ; Sb, Bi, V ; Cr, Mo, W ; Se, Te ; Mn ; Fe, Co, Ni ; elementary knowledge of the platinum metals, and rare earths elements.

Ch. E. 2nd
Year; 4 hrs.
a week;
Lectures.
1st Semes-
ter.

Detailed descriptions of metallurgical and industrial processes are omitted from this course as they will be more adequately treated in Ch. 11, Ch. 12 and Ch. 15.

Books Recommended:—Text book of Inorganic Chemistry—J. R. Partington ; Inorganic Chemistry—Sherwood Taylor ; Modern Inorganic Chemistry—Mellor.

Ch. 4A. Quantitative Analysis :

Gravimetric Analysis:—Standardisation of a set of Weights ; Determination of water of crystallization in BaCl_2 or CuSO_4 ; Determination of Barium, Sulphur and Chlorine ; Estimation of iron as Fe_2O_3 ; Separation of iron from Manganese and from Zinc. Separation of calcium and magnesium in an unknown

Ch. E. 2nd
Year;
12 hrs.
a week;
(Half year)
Practical.

solution ; Separation of Silica, iron, aluminium, calcium and magnesium in an unknown sample ; Separation of Copper and Nickel electrolytically ; Estimation of nickel by organic reagent Dimethylglyoxime.

Volumetric Analysis :—Standardisation of measuring vessels ; Preparation of standard solutions of acids and alkali ; Estimation of Na_2CO_3 in presence of NaHCO_3 ; Estimation of acetic acid in vinegar ; Standardisation of KMnO_4 solution ; Preparation of standard solution of $\text{K}_2\text{Cr}_2\text{O}_7$; Estimation of Iron in an iron ore ; Estimation of manganese in Pyrolusite ; Preparation of standard thiosulphate solution ; Determination of available Chlorine in bleaching powder ; Estimation of Copper by iodometric methods ; Estimation of Chromium.

Complete Analysis of a few ores and alloys by gravimetric and volumetric methods.

One lecture a week up to December on the methods and principles of quantitative analysis.

Ch. 5. Organic Chemistry II :

Detailed study of the Chemistry—of the Cyclic compounds :—(a) Carbocyclic Compounds—Polymethylenes. Aromatic Hydrocarbons including structure of Benzene, etc. Aromatic halogen derivatives ; Aromatic Nitro-compounds ; Aromatic Amines, Diazo- and Azo-compounds ; Aromatic Sulphonic acids ; Phenols ; Aromatic Alcohols, Aldehydes and Ketones ; Quinones ; Aromatic Acids ; Aromatic compounds containing two or more Benzene nuclei. Naphthalene and its derivatives. Anthracene and its derivatives. Phenanthrene. (b) Hetero-cyclic compounds—An elementary study of the Hetero-cyclic Compounds with special reference to Furfurane, Thiophene, Pyrrole, Pyrazole, Pyrazolone, Indole, Carbazole, Pyridine, Quinoline, Isoquinoline and Acridine.

Ch. E. 2nd
Year ; 6 hrs.
a week ;
Lectures.
2nd Semester.

Elementary References omitting synthesis and constitution of the following :

Synthetic Dyes :—Classification of dyes—Important Dye-stuffs of each class with special reference to Azo-dyes and Triphenylmethane Dye-stuffs.

Ureids :—Parabanic Acid, Barbituric Acid, Allantoin, Veronal, Uric Acid, Theophylline, Caffeine, Theobromine, Purine, Xanthine, Guanine.

Terpenes and Camphors :—Monocyclic Terpenes—Terpineol—Limonene—Menthone—Menthol. Dicyclic Terpenes—Camphor—Pinene—Borneol. Olefinic Terpenes—Isoprene—Citral—Geranial—Linalool.

Alkaloids :—Classification of Alkaloids. An elementary study of the following Alkaloids : Piperine, Conine, Nicotine, Atropine, Cocaine, Quinine, Cinchonine, Morphine, Strychnine and Brucine.

Synthetic Drugs :—Important compounds of Arsenic. Important members of the following classes of drugs—Antiseptic, Hypnotics and Anaesthetics, Antipyretics, Diuretics and Uric Acid Eliminants. Sulpha drugs and anti-malarial drugs.

Ch. 5A. Organic Preparations and Detections :

(1) *Detection of the following elements in organic compounds* :—Carbon, Hydrogen, Nitrogen, Halogens, and Sulphur. (2) *Detection of the following organic compounds* :—Methyl alcohol, Ethyl alcohol, Glycerine, Formic Acid, Acetic Acid, Oxalic Acid, Tartaric Acid, Citric Acid, Lactic Acid, Benzoic Acid, Salicylic Acid, Cane Sugar, Glucose, Starch, Benzene, Aniline, Phenol, Urea, Uric Acid, Formaldehyde, Acetone. (3) *Preparation of the following Organic Compounds* :—Methyl Iodide, Methyl Oxalate, Allyl Alcohol, Nitrobenzene, Aniline, Acetanilide, Para nitraniline, Para red, Naphthol Orange, Malachite Green, Sulphonamide, Malonic ester, D.D.T., Benzoin, Dibenzyl, Phenylhydrazine, Anisole, Picric Acid, Nitro-phthalic acids, Aspirin, Caffeine from tea dust, sodium benzenesulphonate.

Ch. E. 2nd
Year ;
12 hrs.
a week ;
(Half year)
Practical.

Ch. E. 2nd
Year; 3 hrs.
a week;
Lectures.

Ch. 6. Physical Chemistry I :

Units and Dimensions—Gases :—Postulates of the kinetic theory, the average velocities, mean free path, viscosity, ideal and real gases, Van der Waal's equation, specific heats, concept of the distribution of velocity and energy—*Liquid state of matter* ; continuity of states, the corresponding state, the critical state, liquefaction of gases, vapour pressure and vapour density, surface tension and surface energy, and viscous properties—*Thermodynamics* : First and Second laws, concept of maximum work, reversibility, Carnot's cycle, Kelvin scale of temperature, entropy, thermodynamic potentials, free energy, equilibrium, chemical potential, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Duhem-Margule's equation, Clausius-Clapeyron equation, Joule-Thomson effect and the cooling coefficient—*Solutions* : Thermal properties, distillation of binary mixtures, azeotropism, Fractional distillation, Dilute solutions and their colligative properties, Osmotic pressure and Van't Hoff's 'i'.

Ch. 7. Physical Chemistry II :

Ch. E. 3rd
Year; 2 hrs.
a week;
Lectures.

Solid state of matter ; Types of Crystals, isomorphism, Miller index, unit cell, lattice energy and specific heats—*Atomic theory and atomic weights*.

Colloids : Their nature, properties, classification and preparation—*Thermochemistry* : Hess's law and Kirchhoff's equation.

Chemical Equilibrium : Homogeneous systems, law of mass action, the equilibrium constant, free energy of a chemical reaction, effect of temperature, pressure, etc. on the chemical equilibrium, applications to some technical gas reactions—*The Phase Rule* : one component systems, two component systems, binary alloys, three component systems—*Chemical Kinetics* : Reactions of the first and second orders, activation theory, order of a reaction, cataly-

sis, chain reactions, explosions—*Photochemistry* ; Lambert and Beer's laws, Einstein's law of photochemical equivalence, hydrogen-chlorine reaction—*Radio-activity and Subatomic phenomena* ; Discovery of radio-elements, the disintegration theory, the properties of α and β -rays, Fajan's and Soddy's displacement law, the atomic structure, isotopes, the nucleus and the artificial disintegration—*Chemical Thermodynamics* : Affinity and its measurement, the Third law of Thermodynamics, the chemical constant, absolute values of entropy and free energy and their application to actual reactions.

Ch. 8. Electro-chemistry :

A. *Theory* :—Electrical conductance : the Ionic theory, transport number of ions, the ionic conductance, the theory of Debye and Huckel, applications of conductance measurements—*Equilibrium in Electrolytes* : Ostwald's dilution law, activity of ions, hydrolysis, neutralisation, buffer solutions, solubility product,—*Electromotive Force* : Electrical and chemical energies, concentration cells, liquid-liquid potential, redox potential, electrodes used for pH measurements, indicators, applications of e.m.f. measurements—*Electro-kinetic phenomena* : Electrolysis and Polarisation : Decomposition potential, Overvoltage, different types of polarisation,—*Electrolytic oxidation and reduction*.

B. *Applications* :—Primary and secondary cells, the standard cell—*Electroplating*, electro-typing, electro-refining and electro-metallurgy,—*Electrolysis of molten electrolytes* : Sodium and Aluminium—*Electrolysis of aqueous solutions* : hypochlorites, chlorates, alkali-chlorine cells,—*Electro-chemical preparation of permanganates, perchlorates, hydrogen and oxygen and hydrogen peroxide*—*Electric Furnace* : Arc, Resistance and Induction types—*Electro-chemical Industries* : Manufacture of calcium carbide, cyanamides, cyanides, carborundum,

Ch. E. 3rd
Year; 3 hrs.
a week;
Lectures.

graphite, sodium sulphide, carbon bisulphide and phosphorus—Fixation of atmospheric nitrogen.

Ch. 9. Physico-chemical Measurements :

Ch. E. 3rd
Year;
18 hours.
a week;
(Half year)
Practical.

Vapour density determination—Adjustment of thermostats—Determination of density and relative viscosity—Absolute viscosity of a liquid by the flow method—Surface tension by drop method and by capillary rise—Phase diagrams of the phenol-water system and of binary alloys by thermal analysis—Estimations by refractometry and polarimetry—Conductometric experiments on specific conductance, acid-base titrations and solubility of sparingly soluble salts,—Potentiometric measurements of the pH of a buffer solution, titration of a mono-basic strong acid by a strong monacid base and evaluation of the standard potential of a redox system—Colorimetric estimation of pH—Electro-analysis of copper and zinc in a mixture of their salts—Electro-chemical preparation of potassium perchlorate and hydrazo-benzol—Purification and distillation of mercury—Transition temperature by the dilatometric method—Rate of hydrolysis of an ester—Heat of neutralisation of a strong acid by a strong base—Experiments based on the Distribution Law.

(The course is covered by 24 experiments.)

Ch. 10. Chemical Engineering I :

Ch. E. 3rd
year; 3 hrs.
a week;
Lectures.

Definition of Chemical Engineering, Industrial Stoichiometry, Fluid films concept, Flow of fluids—compressible and non-compressible fluids. Material and energy balances for flow of fluids through pipe lines, fluid heads; Measurements of fluid flow by Pitot tubes, Venturimeters, Orifice meters, nozzles, weirs, etc., streamline and turbulent flow, critical velocity, Reynold's number, friction loss in pipe lines and fittings, flow of fluids through non-circular conduits. Power or Head re-

quirements of pumps for maintenance of flow; flow of Heat—Mechanism of heat transfer by conduction, convection and radiation; Heat loss by steady conduction through furnace walls, Heat transfer by convection and heat transfer coefficients, Heat transfer and fluid friction, condensation of vapours, effect of non-condensable gases; Design of heat exchangers, codensers, tube banks and coils, recuperators, etc., Heat transfer by Radiation from surfaces, Radition errors in Pyrometry.

Books Recommended :

Principles of Chemical Engineering by Walker Lewis, McAdams Gilliland; Elements of Chemical Engineering by Radger and McCabe; Unit Operations by Brown; Chemical Engineers' Handbook by Perry; Heat transmission by McAdams; Industrial Chemical Calculations by Hougen & Watson.

Ch. 10A. Chemical Engineering II :

Combustion; Furnaces and kilns; Gas producers, Ch. E. 3rd
Size reduction—Crushing, grinding and Disintegrating year; 2 hrs.
types of machines, relation between power require- a week;
ments and size reduction. Emulsification. Open and Lectures.
closed-circuit grindings; dry and wet grindings. Size separation and grinding—Screening, hydraulic classification and separation; flotation; electro-static and electro-magnetic separation, centrifugal separation, sedimentation.

Filtration—Batch and continuous filtration equipments, filter media, filter aids, theories of filtration and washing; centrifuges.

Books Recommended :

Same as under Ch. 10. Also "Industrial Filtration"—Wright; Industrial Furnaces 2 vols.—Trinks; Chemical Plant Design—Vilbrandt.

Ch. E. 3rd
year; 2 hrs.
a week;
Lectures.

Ch. 11. Industrial Chemistry I :

Water for Industry ; Acid Industries : Sulphuric, Hydrochloric and Citric acids ; Alkali industries : Caustic Soda and sodium carbonate ; Chlorine and Bleaching powder ; High pressure process : Ammonia ; Fertilizers ; Glass and Ceramics ; Lime, Cement and Plaster ; Planning of a Chemical Industry.

Ch. 11A. Technical Analysis :

In the Chemical Engineering Second Year Class in the Quantitative Analysis Laboratory from July to end of February—12 periods per week.

1. *Analysis of Iron Steel*: (a) S., (b) Si, (c) P., (d) Mn, (e) Carbon.
2. *Analysis of Water*: (a) Ca., (b) Mg., (c) Fe., (d) Cl, (e) SO₄, (f) hardness of different types.
3. *Proximate Analysis of Coal*: (a) Moisture, (b) Volatile Matter, (c) Ash content acid, (d) Sulphur.
4. *Analysis of Cement*: (a) Si., (b) Al₂O₃, (c) Fe₂O₃, (d) CaO and (e) MgO.
5. *Analysis of Paints*: (with special reference to the analysis of pigments only)
(a) White pigment, (b) Green, (c) Yellow, (d) Filler.

In the Organic Chemistry Laboratory

In the Chemical Engineering Second Year Class—
from March 12 periods per week.

In the Chemical Engineering Third Year Class—
July to end of November.

6. *Analysis of Paints* (contd.)—(with special reference to the Vehicles): (a) Percentage amount, (b) Saponification value, (c) Iodine value.
7. *Analysis of Fertilisers*: (a) Phosphorus, (b) Potassium and (c) Nitrogen.
8. *Analysis of Milk*: (a) Total solid, (b) Proteins, (c) Fat and (d) Ash.

9. *Analysis of Oil*: (a) Acid value, (b) Saponification value, (c) Iodine value, (d) Helmer value and (e) Unsaponifiable matter.
10. *Analysis of Soap*: (a) Moisture, (b) total fatty acid (c) free alkali and (d) Degree of saponification.

In the Physical Chemistry Laboratory.

Chemical Engineering Third Year Class—
December to end of March—18 periods per week.

11. *Gas Analysis*: By Orsat apparatus.
12. *Thermal Analysis of Alloys*: Simple eutectic systems.
13. *Determination of Viscosity*: with special reference to highly viscous liquids at different temperatures.
14. *Refractometry*: with special reference to estimation of alcohols in spiritous liquids and oils.
15. *Determination of Flash points of mineral oils*.
16. *Determination of calorific value*: (a) Solid fuels and (b) gaseous fuels.
17. *Saccharimetry*: Estimation of cane sugar in commercial samples.

Ch. 12. Metallurgy and Engineering Materials :

Metallurgical terms and processes ; Occurrence of metals and their common ores ; concentration of the ores, different methods of concentration, winning of metals from their ores—pyrometallurgical, electro-thermal, hydrometallurgical and electrolytic methods ; metallurgical fuels and furnaces. Classification of the metals—metallurgy of the ferrous metals, production of iron and its modifications ; the iron carbon system, thermal and mechanical treatment of iron and its alloys ; alloy steel, corrosion of the ferrous metals and its prevention.

Ch. E. 3rd
Year; 2 hrs.
a week;
Lectures.

Metallurgy of the non-ferrous metals:—copper, lead, tin, zinc, aluminium, magnesium, gold, metallurgy of the less common alloying metals; the non-ferrous alloys. Wood, its properties, preservation and uses; Protective coating of metallic and non-metallic materials of construction; Refractories:—Chemical composition, properties, and uses. Materials of construction for various chemical reactions—inner and outer coatings, gaskets; Glass, ceramics, rubber, and newer synthetic materials; Building materials: Bricks, stones and lime mortars, cements etc.

Books recommended:

- (1) The metallurgy of Iron and Steel by Bradley & Strughton
- (2) Metallurgy by Rhead
- (3) Metallurgy of the Common Metals by Austin
- (4) Hand book of Non-ferrous Metallurgy by Liedall
- (5) Engineering Materials by G. C. Banerjee

Ch. 13. Fuels and their Combustion :

Ch. E. 3rd
Year; 2 hrs.
a week;
Lectures.

Industrial fuels, origin, composition, classification and storage of coal; prepared solid fuels; coke-ovens and coke; chemistry of combustion reaction; combustion calculations; combustion of coal on Grates; operation of hand-fired furnaces, Mechanical stokers and furnaces. Powdered coal as fuel. Liquid fuels and their combustion; liquid fuels from solid fuels. Gaseous fuels, their production, properties and combustion.

Synthetic fuels. Furnace efficiency and distribution of heat losses. Different types of furnaces, their design and construction.

Books recommended:

- (1) Fuels and their combustion—Haslam & Russel
- (2) Fuel—Brame & King
- (3) Industrial furnaces, 2 volumes—Trinks

- (4) Fuels, combustion and furnaces—Griswold
- (5) Chemistry of coal utilization, 2 volumes—Lowry
- (6) Efficient use of fuel—His Majesty's stationery Office, London.

Ch. 14. Chemical Engineering III :

Evaporation—Principles of single and multiple effect systems, entrainment and its prevention; different types of evaporators and their accessories; Rate of evaporation and energy consumption; thermo-compression evaporators.

Ch. E. 4th
Year; 4 hrs.
a week;
Lectures.

Humidification and dehumidification—Humidity, dry and wet bulb thermometry, Air conditioning—Principles and equipments. Drying—batch and continuous equipments and auxiliaries for drying solids and liquids; theory of drying of solids. Refrigeration—Principles of Refrigeration and different systems used for refrigeration; equipments needed for refrigeration, 'ton of refrigeration' and 'performance coefficient'.

Pyrometry—Different types of Pyrometers used in industries, their principles of operation.

Crystallization—Crystal growth, supersaturation and nucleus formation, batch, continuous, and vacuum crystallizers.

Materials of construction—Characteristic of different types of materials, used in chemical plant construction, such as metals and their alloys, synthetic plastics, stonewares, karbate, rubber, etc. Mixing and agitation—Characteristics of equipment, power consumption, efficiency.

Transportation of solids, liquids and gases—Different types of pumps, fans and blowers, their principles of operation and characteristics; acid eggs and air lift pumps, mechanical and pneumatic conveyors for transportation of solids and slurries. Chemical Engineering Economics, cost calculation and preparation of balance-sheets.

Books recommended:

Same as under Ch. 10; Also "Chemical Plant Design"—Vilbrandt; Chemical Engineering Economics—Tyler.

Ch. 14A. Chemical Engineering IV :

Ch. E. 4th
Year; 4 hrs.
a week;
Lectures.

General Principles of diffusional processes, factors controlling the operation of diffusional processes in absorption and extraction, adsorption etc., analogy of mass transfer and heat transfer.

Absorption and Extraction—different types of equipments employed, theory of design of packed and plate towers, for two component systems, H.E.T.P., and H.T.U., operation of adsorption equipments, liquid-liquid extraction.

Distillation—Batch and equilibrium distillation, vapour—liquid equilibria, volatility, theory of operation of fractionating columns for binary systems—designs of such towers, distillation of complex mixtures, steam distillation, methods of calculations for batch and equilibrium distillation, azeotropic distillation, extractive distillation. Chemical Engineering Thermodynamics—Quantitative development of the fundamental laws, thermodynamic properties, reversibility and entropy for various processes, applications of the First Law—batch and continuous or flow process, steady and unsteady fluid flow, J-T effect, nozzles, etc., Application of the Second law—Heat transfer limitations in the design of heat exchangers, thermodynamic equations, C_p — C_v , effect of pressure on specific heat and heat of reaction, thermo-chemistry, Real gases— p, v, T . properties, application of compressibility chart, etc.; Compression and expansion work, theory of reciprocating compressors—single and multi-stages, minimum work, availability and free energy, minimum work of separation, power cycles—engines, turbines, etc., Refrigeration cycles.

Books recommended:

Same as under Ch. 10. Also "Absorption" by Sherwood; "Elements of Fractional Distillation" by Robinson & Gilliland; "Distillation" by Kirschbaum; "Chemical Engineering Thermodynamics" by Dodge; "Chemical Process Principles Vols. I & II", by Hougen & Watson; "Thermodynamics for Chemical Engineers" by Weber; "Thermodynamics" by Keenan; "Steam tables" by Keenan & Keys.

Ch. 15. Industrial Chemistry II :

Chemicals from coal and coal tar; Wood distillation products; Cellulose industries: Cellulose esters and ethers, Pulp and Paper, Artificial Silk; Starch and Starch products; Sugar; Nitrogenous Organic Products: Leather, Glue, Gelatine and Casein; Rubber—natural and synthetic; Plastics; Petroleum; Introduction to Fermentation technology: Alcohol; Industrial solvents.

Ch. E. 4th
Year; 3 hrs.
a week;
Lectures.

Books Recommended:

Industrial Chemistry by Rogers and Aubert; Industrial Chemistry by Martin; Industrial Chemistry by Thorp; Principles of Applied Electro-chemistry by Allmend; Industrial Chemistry by Riegel; Synthetic Resins by Ellis; Vegetable Casein.

Ch. 16. Chemical Engineering Laboratory and Plant Operations :

1. Measurement of flow of fluids through orifice-meters, Venturimeters, Rotameters, Weirs etc. and calibration of different flowmeters.
2. Flow of fluids through bends, loops etc. and estimation of friction losses; efficiency of pump.
3. Measurement of approximate critical velocity of a liquid.
4. Gage testing with deadweight testers and calibration.

Ch. E. 4th
Year;
14 hrs.
a week;
Practical.

5. Determination of efficiency of a gas-fired boiler furnace.
6. Rate of filtration under different pressures in a monel metal plate & frame type filter press and a leaf press, and estimation of compressibility, coefficient of plugging etc.
7. Running of continuous rotary filter, basket centrifuge and super centrifuge.
8. Drying rate under constant drying conditions and atmospheric pressure.
9. Drying rate under constant drying conditions in vacuum.
10. Running of a vacuum double drum drier.
11. Concentration of minerals by froth flotation and taking test data.
12. Mechanical separation by Wilfley table.
13. Running of a Dorr thickener.
14. Dry classification by pneumatic classifier.
15. Wet classification by Hydraulic and Dorr bowl classifier.
16. Running of a continuous countercurrent decantation plant and taking test data.
17. Crushing and grinding of substances of different hardness by Jaw Crusher ; Disc crusher ; Rotary crusher ; Crushing rolls ; Hammer mill ; Pot mill and Ball mill and relation of energy consumption and Screen analysis of different products ; estimation of Rittinger's and Kick's constants, and comparison of grindability.
18. Dry and wet grinding in continuous ball mill, estimation of critical R.P.M. and effect of speed on product, size and capacity.
19. Electro-plating.
20. Complete run of the following plants and taking test data :—
 - (a) Oil extraction plant ;
 - (b) Water distillation plant.

Also the following experiments in the Mechanical Engineering Laboratory :—

1. Testing for tensile strength ;
2. Use of Junker's calorimeter ;
3. Use of Planimeter ;
4. Running & Maintenance of Diesel engine ;
5. Running & Maintenance of steam engine ;
6. Running & Maintenance of Cetrifugal pump ;
7. Running & Maintenance of Loco-boilers ;
8. Running & Maintenance of steam turbine ;
9. Use of Brinell hardness testing machine ;
10. Calibration of pressure gage ;
11. Calibration of Vacuum gage.

Books recommended for Chemical Engineering Laboratory Works : (i) Chemical Engineering Laboratory equipment—Zimmerman & Levine ; (ii) Applications of Chemical Engineering—Harry McCormack.

Ch. 17. Chemical Technology of Oils and Fats :

Chemical Nature of Fats and Oils—structure, composition, properties and Reactions of Fats and Fatty Acids. Classification of Oils and Fats. Raw materials for Oil and Fat products—sources, classification production, consumption and storage of Oil and Fat bearing materials.

Unit process in Oil and Fat Technology—Extraction of Fats and Oils ; Refining and Bleaching ; Deodorization ; Hydrogenation ; Fat Splitting ; Saponification ; Fractionation of Fat and Fatty Acids ; Esterification and Interesterification ; Emulsification and Homogenization.

Utilization of Fats and Oils—Edible products such as cooking and salad oils, Margarine and Butter ; Vegetable Ghee. Bakery products and confections etc. and the problem of rancidity in edible fats ; Non-edible products such as Plastic shortening Agents, Paints and Varnishes, Printing Ink, Oil Cloth, Insulating Fabrics, Water-proofing Linoleum, Soap—Toilet, Washing and Industrial.

Ch. E. 4th
Year ; 3 hrs.
a week ;
Lectures ;
(Elective).

Essential Oils—their production and evaluation;
Synthetic perfumes—Relation between odour and
chemical constitution; principles of perfume
blending.

Ch. 17A. Practical :

Ch. E. 4th
Year; 6 hrs.
a week;
Practical;
(Elective).

Physical properties of Fats: Setting and melting
points; density; viscosity; refractive index.

Chemical Analysis: Maumene test; Acid Value;
Saponification Value; Iodine Value; thiocyanogen
value, unsaponifiable matter; R.M., R.P., and Kirsch-
ner values; acetyl value; Kreis test for rancidity.

Unit processes in oil technology: expression of
oil by hydraulic press; solvent extraction of oil cakes;
rendering of tallow and fish oils; refining and
bleaching of oils, hydrogenation; preparation of soap
by cold, semiboiling and boiling processes; prepara-
tion of transparent and liquid soaps; hydrolysis by
Twitchell and Lipase process; separation of fatty
acids by the lead salt method; preparation of boiled
oil and paints.

Color reactions for individual oils and fats and
detection of adulterants in common oils and fats.

Preparation and evaluation of a few essential oils.

Preparation of some common cosmetics e.g.
cream, snow, hair oil; fundamentals of perfume
blending.

An assigned problem in oil technology.

Ch. 18. Glass and Ceramic Technology :

Ch. E. 4th
Year; 3 hrs.
a week;
Lectures;
(Elective).

General study of different types of refractory
materials and their classification and properties with
special reference to Indian fireclays. Treatment and
testing of fireclays.

Manufacture, properties and uses of:—

(a) Fire bricks and fireclay products such as
crucibles, glass house pots, furnace
blocks and muffles.

(b) Silica and silimanite refractories.

(c) Bauxite bricks.

(d) Insulation bricks.

(e) Refractory mortars and cements.

Specifications and tests for refractories with
special regard to suitability for the glass industry.

Brief history of the glass industry.

Definition of glass and characteristics of the
vitreous state.

Common glass forming oxides and raw materials.

General formulae for glass^o compositions and
simple batches—

Calculation of glass composition from batches
and vice versa.

Processes of melting and refining.

Outlines of glass manufacturing processes: hand
methods of production.

A general treatment of glass melting furnaces,
annealing kilns and lehrs, pot arches and glory holes.

Important properties of glasses as related to
chemical composition.

(a) Mechanical properties: Sp. gravity, elasti-
city and strength.

(b) Thermal properties: Expansion, sp. heat
and conductivity.

(c) Viscosity: Adaptability of chemical com-
position to manufacturing processes.

(d) Thermal Endurance.

(e) Chemical durability.

(f) Optical properties: refractive index, dis-
persion and absorption.

Decolorising of glass.

Annealing of glass.

Batches and compositions for various types of
glasses, such as bottles, tableware, sheet glass, chemi-
cal ware etc.

Classification of glassware.

Outlines of important manufacturing processes:
Mechanical and automatic methods for bottles,
pressed ware, sheet and plate, tubing etc.

Decorative processes : enamelling, etching, frosting etc.

Devitrification and common defects in glassware.

Books recommended :

1. Textbook of glass technology—Hodkin & Cousen.
2. Modern Glass Practice—S. R. Scholes.
3. Defects in glass—C. J. Peddle.
4. Glass : The Miracle Maker—C. J. Phillips.
5. Properties of Glass—G. W. Morey.
6. Manufacture, Properties and Uses of Refractory Materials—A. B. Searle.
7. Refractories—Norton.

Ch. 19. Food Technology :

Nutrition :—

Ch. E. 4th
Year ; 3 hrs.
a week ;
Lecture ;
(Elective).

A study of factors necessary for proper nutrition including carbohydrates, fats, proteins, vitamins, inorganic substances, water etc., Enzymes, the Chemistry and the mechanism of the action of enzymes and the importance and their action in living tissues with special reference to the problems in food industries.

Introduction to Bacteriology :—Classification and morphology of bacteria ; physiological activities of bacteria ; growth oxidation carbohydrate disimilation, protein and amino acid requirements and variations study of the activators and inhibitors of the growth processes of micro organisms.

General principles of canning, refrigeration dehydration and other methods of food preservation, Technology of fish and fish products, milk and milk products, meat and poultry, fruit and fruit products, vegetables, cereals, beans, nuts and candies, soft drinks.

Packing and transport of food ;

Food plant sanitation ;

Food engineering :—design and construction of equipments used in the preparation and handling of

food stuffs, including canning machinery, packaging machines, bottling equipment, conveying systems, bakery installation etc.

Industrial microbiology :—Study of industrial production of ethyl alcohol, acetic acid, citric acid, lactic acid, etc. by microbiological methods. Manufacture of pickles and cheese.

Ch. 19A. Food Technology Laboratory :

Bacteriology : preparation of culture media ; Ch. E. 4th
isolation and identification of organisms ; staining ; Year ; 6 hrs.
counting of micro-organisms, determination of thermal death point of bacteria, determination of phenol-coefficient for different disinfectants, examination of water, milk and other food stuffs. a week ;
Practical ;
(Elective).

Enzymology : preparation of enzymes and study of their activities, qualitative and quantitative estimation of phosphatase, peroxidase, catalase in food products.

Food and nutrition chemistry : assay of protein, fat carbo-hydrate and vitamins and different minerals in food stuffs.

Food processing : Experiments to illustrate the problems in canning, dehydration and freezing of food and the control techniques ; pasteurization of milk and fruit juices ; preparation of fruit jelly, malt, etc.

Soap Technology :

A special course of 15 to 20 lectures is arranged every year.

Special Note for Laboratory Course.

For the laboratory courses Ch. 2A, Ch. 4A, Ch. 5A and Ch. 9. 30 per cent of the total marks will be allotted to a written examination to be held immediately at the end of the laboratory course by the teachers in charge of the course.

ELECTRICAL ENGINEERING

E. E. 1. Principles of Electrical Engineering I :

E. E. &
M. E. 2nd
Year; 2 hrs.
a week;
Lecture.
1 hr.
a week;
Tutorial.

A detailed study of the Units and laws of Electric and Magnetic Circuits; Chemical effect of Current; Principles of Storage Batteries; D.C. Circuits and Networks; Vector Algebra; the Elementary Alternator; Effective Current and Voltage; Complex Quantities used in Electrical Engineering; Circuits containing Resistance Inductance and Capacity; Series, Parallel and Series-parallel Circuits; Power-factor.

E. E. 1A. Electrical Measuring Instruments :

E. E. &
M. E. 2nd
Year; 2 hrs.
a week;
Lecture.
2nd
Semester.

Electrical Measuring Instruments—their classification. Principles underlying the operation of electrical measuring instruments. Study of methods of control, damping and balancing. Study of various constructional details. Construction and theory of moving coil, moving iron and electro-dynamometer instruments. Measurements of resistance.

E. E. 2. Electric Wiring and Installations :

E. E. &
M. E. 2nd
Year; 2 hrs.
a week;
Lecture.
1st Semester

Conductors; Insulators; Installation Materials; Industrial Lighting and Domestic Wiring installations; Lighting and Illumination; Domestic Loads; Determination of size of Conductor; Voltage Drop; Heating; Switching and fusing; I.E.E. and Indian Electricity Rules; Design and Estimating of a Domestic Installation.

E. E. 3. Direct Current Machines :

E. E. &
M. E. 2nd
Year; 4 hrs.
a week;
Lecture.
1 hr.
a week;
Tutorial.
1st Semester

Principles of Generation of Direct Current. E.M.F.; Armature Windings; Magnetisation Curve; Armature Reaction; Operating Characteristics of D.C. Generators; Compensation of Armature Reaction; Commutation; D.C. Motors; Efficiency; Rating and Heating; Generators for special purposes; Parallel Operation of generators.

E. E. 4. Principles of Electrical Engineering II :

Balanced and Unbalanced Polyphase Circuits; Measurement of Power in Polyphase Circuits; Mutual Induction; Non-Sinusoidal Waves; Harmonic Analysis; Growth and Decay of Current in D.C. and A.C. Circuits; Magnetic Circuit and Inductance of Cables and Overhead Lines; Dielectric Circuit and Capacitance of Cables and Overhead Lines; Symmetrical Components.

E. E. 3rd
Year; 3 hrs.
a week;
Lecture.

E. E. 4A. Electron Tubes and Circuits :

A condensed presentation of courses E.E. 15'05 and E.E. 15'1 combined.

E. E. 3rd
Year; Power
Option;
2 hours
a week;
Lecture.

E. E. 5. Differential Equations and Electrical Networks :

Linear Differential Equations with constant coefficients; The operators D , $x D$; Differential Equations of the Second Order; Simultaneous Differential Equations; Partial Differential Equations; Laplace's Transform and Heaviside's operator; Electric Circuit Problems; Analysis of General Series Circuit; Discharge and Charge of a Condenser; Circuits with mutual inductance; Circuits coupled by a condenser; The effect of finite potential pulses; Analysis of the general network; Problems of a sudden short-circuit; A sudden discharge of a line; Lightning Surges; Transients; Sub-marine Cables.

E. E. 3rd
Year; 2 hrs.
a week;
Lecture.

E. E. 6. Alternating Current Machines I :

Alternators; Transformers; Induction Motors; Synchronous Motors; Parallel Operation of Alternators.

E. E. 3rd
Year; 4 hrs.
a week;
Lectures.

E. E. 7. Alternating Current Machines II :

Single-phase Induction, Series and Repulsion Motors; Rotary Convertors; Motor Convertors; Frequency Convertors; Phase Advancers; Mercury Arc Rectifiers.

E. E. 4th
Year; 2 hrs.
a week;
Lecture.

E. E. 8. Electrical Measuring Instruments and Measurements :

E. E. 3rd Year ; 2 hrs. a week ; Lecture. Galvanometers ; Flux meter ; Measuring Instruments : General considerations ; theory and construction of moving coil, moving iron, dynamometer, induction, thermal and electrostatic types of indicating instruments ; Rectifier Instruments ; Frequency and Power Factor meters ; Synchroscopes ; Energy meters ; Instrument Transformers ; Oscillographs.

Errors in Measurements ; Measurement of Resistance, Inductance and Capacity ; Potentiometers ; Photometric Measurements ; Magnetic Measurements ; Principles of High-voltage testing and measurements ; Meter testing technique.

E. E. 9. Electric Power Distribution :

E. E. 4th Year ; (Power option) 2 hours a week ; Lecture. D.C. Distribution Systems ; Boosters and Balancers ; Low-Tension and Medium-Tension A.C. Distribution Systems ; Line Insulators ; Poles and Masts ; Approximate Sag-tension Calculations ; A.C. Distribution Voltage Regulators ; High Voltage A.C. Distribution over short Transmission Lines ; Approximate Method of Solution ; Distribution System Design Economics ; Indian Electricity Rules and other Regulations. Sub-Stations.

E. E. 10. Electric Power Transmission :

E. E. 4th Year ; 2 hrs. a week ; Lecture. Hyperbolic Functions ; Long Transmission Line with uniformly distributed Resistance, Inductance and Capacitance ; Transmission Line Conductors ; High Voltage Line Insulators ; Extra High Voltage Cables ; Mechanical Design of Transmission Lines ; Economics of Span Design ; Corona Effect ; Inductive Interference ; Line Performance diagrams ; Power Limits and Stability ; Travelling Waves ; Transmission Line Protection.

E. E. 11. Electric Power Generation :

General layout of Dissel, Steam and Hydraulic Power Plants. Location of Generating Units and Auxiliaries, Switchgear, Transformers and Control. Principles of paralleling Alternators, Generating Stations and Sub-Stations. Voltage and Frequency Control of Alternators, Stations and Sub-Stations. Base-load and peak-load units. Scheduling and transferring loads amongst alternators in a station, amongst generating stations in a grid system.

Calculation of short-circuit currents. Methods of limiting short-circuit currents by reactors. Determination of Circuit-breaker capacity. Choice of circuit-breakers and relays for protection of generators and transformers. Layout of bus-bars and switchgear.

Generating Station Logs ; Load Curves—Chronological load curve, load duration curve and energy load curve ; Load Topographs. Station Factors—Load Factor, Capacity Factor, Utilization Factor, Demand Factor, Peak Diversity Factor. Cost of power generated.

Principles of Rate-making for different kinds of consumers.

Principal Tariffs—Flat Rate Tariff (Two-rate, Multi-rate), Block Rate (Sliding Scale) Tariff, Maximum Demand Tariff, All-in-Tariff etc. Rate Adjustments.

E. E. 12. Power Utilization and Traction :

Running and Starting Characteristics of Motors ; Speed Control ; Control Gears ; Electric Breaking ; Suitability of Different Kinds of Motors for Different Services ; Principal Limitations of Motor Rating ; Power Frequency Induction Heating ; Arc Furnaces.

Electric Railways, Tramways and Trolley Buses ; Systems of Power Supply ; Speed-Time Curves ; Mechanics of Train Movement ; Energy Consumption ; Tramway Motors and Control ; Braking.

E. E. 13.1. Advanced Electrical Measuring Instruments and Measurements :

E. E. 4th Year; Power Option; 2 hours a week; Lecture and 3 hours a week; Computation and Design (Elective).
Electrical Standards and their absolute determination; Standardising Laboratory Technique; Advanced Treatment of A.C. Bridges; High-voltage measurements; Modern Magnetic Materials and advanced magnetic measurements; Load totalising and telemetering; Electrical method of temperature measurement; Design of Electrical Instruments; Valve Voltmeter and Wattmeter; Thermal Wattmeter; Electrostatic Voltmeter and Wattmeter.

E. E. 13.2. Switch Gear and Protective Devices :

E. E. 4th Year; Power Option; 2 hours a week; Lecture and 3 hours a week; Computation and Design (Elective).
D.C. Circuit Breakers and Switches; A.C. Circuit Breakers for Low Voltage, Medium Voltage, High Voltage and Extra High Voltage.
Circuits; Oilless A.C. Circuit Breakers; Arc Control Devices; Kinematics of Switchgear; D.C. and A.C. Switch Board Layouts; Fuse Protection; Fire Prevention and Protection.
Relay Protective Systems for Generators, Transformers, Transmission Lines, Distribution Systems and Motors.

E. E. 13.3. Industrial Electronics ;

E. E. 4th Year; Power Option; 2 hours a week; Lecture and 3 hours a week; Computation and Design (Elective).
Diode and Triode Rectifiers; Amplifiers; Oscillators; Modulation; Demodulation; High Frequency Heating; Current and Voltage Controllers; Tuners; Welding Controls; Motor Controls; Photoelectric Relays; Static and Astatic Regulators; Antihunting circuits; Safety Devices; Miscellaneous Applications; Elements of Servosystems; Industrial and Medical use of X-rays.

E. E. 13.4. Design of Electrical Machines :

E. E. 4th Year; Power Option; 2 hours a week; Lecture and 3 hours a week; Computation and Design (Elective).
Computation of Main Dimensions and Parameters of D.C. Machines, Alternators, Transformer and Induction Motor; Cooling of Machines; Mechanical Design Features of Machines.

E. E. 15.05. Advanced Physics :

Structure of Matter; The fundamental Particles; Energy Levels; Radiation and Absorption; Photo-emission; Emission and Emitters; Ions and Ionisation; Conduction through Gases and Vacua.
Elements of Physical Optics.

E. E. 3rd Year; Communication Option; 2 hours a week; Lecture.

E. E. 15.1. Theory and Application of Electron Tubes I :

Diodes; Rectification Phototubes; Cathode Ray tubes; Triodes, Tetrodes and Pentodes; Beam Tubes; Tube Parameters and Equivalent circuits; Multigrid Tubes; Amplifiers; Oscillators; Modulation; Detection.

E. E. 3rd Year; Communication Option; 2 hours a week; Lecture.

E. E. 15.2. Electronics Laboratory I :-

Experiments to illustrate E. E. 15.05 and E. E. 15.1.

E. E. 3rd Year; Communication Option; 3 hours a week; Laboratory.

E. E. 15.3. Computation :

Illustrative Examples supplementing E. E. 15.05 and E. E. 15.1.

E. E. 3rd Year; Communication Option; 3 hours a week; Computation.

E. E. 15.4. Communication Networks :

Linear Networks; Two Terminal Networks; Reciprocal Networks; Coupled and Tuned Circuits; Four Terminal Networks; Filters; Equalizers; Attenuators; General Equivalence Theorems; Lumped Networks and Smooth Lines; Line Segments as Network Elements; Matching; Introduction to Active and Nonlinear Network Analysis.

E. E. 4th Year; Communication Option; 4 hours a week; Lecture. 1st semester

E. E. 15.5. Electro Acoustics :

Vibrating Bodies; Sound Waves; Generation, Transmission and Reception of Sound; Human Speech Organ and Ear; Electromechanical Transducers; Horns, Cavities and Other Acoustic Circuit Elements; Dynamical Analogies; Architectural Acoustics.

E. E. 4th Year; Communication Option; 3 hours a week; Lecture. 1st semester

E. E. 15.6. Electromagnetic Waves :

E. E. 4th Year; Communication Option; 3 hours a week; Lecture. 1st semester
 Vector Analysis ; Electric and Magnetic Fields ; Conduction and Displacement Currents ; Maxwell's Hypotheses and Equation ; Plane Waves ; Radiation ; Antenna and Arrays ; Wave Guides ; Group and Phase Velocity ; Ionosphere ; Propagation under Different Conditions.

E. E. 15.7. Theory and Application of Electron Tubes II :

E. E. 4th Year; Communication Option; 4 hours a week; Lecture. 1st semester
 Video and Feedback Amplifiers ; Special Circuits; Integration of Elements into Transmitters, Receivers etc. ; Facsimile ; Television ; Special Applications.

E. E. 15.8. Electronics Laboratory II :

E. E. 4th Year; Communication Option; 6 hours a week; Laboratory. 1st semester
 Experiments to illustrate E.E. 15'1, E.E. 15'5 and E.E. 15'7.

E. E. 15.9. Electronic Equipment Shop I :

E. E. 4th Year; Communication Option; 3 hours a week; Workshop. 1st semester
 Construction and Testing of Various Electronic Circuits and Equipment.

E. E. 15.10. Electronic Design I :

E. E. 4th Year; Communication Option; 6 hours a week; Design & Computation, 1st semester
 Design of Tuning and Smoothing Inductances and Circuits ; Air and Iron Core Transformers ; Filters ; Equalizers ; Attenuators ; Amplifiers etc.

E. E. 15.11. Communication Laboratory I :

E. E. 4th Year; Communication Option; 3 hours a week; Laboratory. 1st semester
 Experiments to illustrate E.E. 15'4 and E.E. 15'6.

E. E. 15.12. Telephone and Telegraph Systems :

Single and Double Current Working ; Duplex and Quadruplex ; Central Battery Working ; Concentrators ; Automatic Sending and Receiving ; Teleprinters ; Telephone Circuits ; PBX ; Simple and Multiple Common Battery Exchanges ; Magneto Systems ; Automatic Exchanges ; Trunking and Grading ; Traffic Studies and Provision of Equipment ; Quality of Service ; Choice of System ; Transmission of Communication Signals ; Distortion and Compensation ; Limit of Speed ; Long Distance Communication ; Repeaters ; Elements of Carrier Communication ; Power Plants for Telephone and Telegraph Systems.

E. E. 4th Year; Communication Option; 6 hours a week; Lecture, 2nd semester.

E. E. 15.13. Microwave Technique :

Pulse Shaping Circuits ; Triggers ; Multivibrators ; Counters ; CRT Circuits ; UHF Generation and Reception ; Special Considerations in Propagation and Transmission ; Termination ; UHF Antenna ; Application of UHF.

E. E. 4th Year; Communication Option; 4 hours a week; Lecture 2nd semester.

E. E. 15.14. Measurements in Communication :

Circuit Constants at R.F. ; R.F. Standards ; R.F. Bridge ; Vacuum Tube Voltmeters ; Cathode Ray Oscilloscope ; Harmonic Analysis ; Distortion Measurement ; Frequency Comparison and Measurement ; Vacuum Tube Characteristics ; Measurements on Amplifiers, Detectors and Modulators ; Sensitivity, Selectivity and Fidelity of Receivers ; Field Strength and Radiation ; Noise Measurement ; Distortion of Telegraph Signals ; Cross Modulation ; Special Considerations at UHF ; Acoustic Measurements.

E. E. 4th Year; Communication Option; 4 hours a week; Lecture 2nd semester.

E. E. 15.15. Communication Laboratory II :

Experiments to illustrate E.E. 15'4, E.E. 15'12 and E.E. 15'13.

E. E. 4th Year; Communication Option; 6 hours a week; Laboratory, 2nd semester.

E. E. 4th
Year; Com-
munication
Option;
6 hours
a week;
Design &
Computa-
tion, 2nd
semester.

E. E. 15-16. Electronic Design II :

Design of Various Electronic and Communication
Circuits ; Design of Transmitters and Receivers.

E. E. 4th
Year; Com-
munication
Option;
3 hours
a week;
Workshop,
2nd
semester.

E. E. 15.17. Electronic Equipment Shop II :

Continuation of E.E. 15.9.

E. E. 4th
Year; Com-
munication
Option;
3 hours
a week;
Laboratory,
2nd
semester.

E. E. 15.18. Measurements Laboratory :

Experiments to illustrate E.E. 15.14.

E. E. 4th
Year; Com-
munication
Option;
1 hour
a week;
Discussion,
2nd
semester.

E. E. 15.19. Seminar :

Preparation of a Bibliography and Term Paper on
an Assigned Topic and Presenting the Subject Ver-
bally to the Class.

M. E. 3rd
Year; 3 hrs.
a week;
Lecture.

E. E. 16. A. C. Machines and Power Distribution :

Elementary Principles of Alternating Current ;
Polyphase Circuits ; Construction, Operation and
Simple Characteristics of Alternators ; Transformer,
Induction Motors, Synchronous Motors, Rotary Con-
verters and other important machines ; A.C. Instru-
ments ; Elements of Electric Power Distribution
including use of Switch Gears, Insulators and Pro-
tective Devices.

Ch. E. 2nd
Year; 3 hrs.
a week;
Lectures.

E. E. 17. Electrical Engineering :

General Laws and Definitions ; Principles of
Direct Current and Circuit ; Calculations. Induction

of Currents; Flemings Rule; Lenz's Laws; Practical
application of Induction ; Self and Mutual Induction.
Magnetic Properties of Materials ; General Laws and
Terminology ; Magnetic Circuit ; Calculations. Elec-
trical Measurements and Measuring Instruments.

Dynamos and Motors ; Principles involved ;
Different Types and their functions ; Management ;
Power and Efficiency Calculations. Accumulators ;
Principles involved ; Construction and maintenance.

Principles of Alternating Currents ; Circuit Cal-
culations ; Single-phase, two-phase and three-phase
current ; Vector diagrams ; Simple Alternator ;
Induction and Synchronous Motor ; Elementary
Theory of Transformers and their uses ; Rotary
Converter and Rectifiers.

Power Transmission ; Switchboard Diagrams ;
Advantages of high tension Alternating Current
Transmission. Electro-deposition of Metals ; Utility
of A.C. and D.C. compared with respect to the
adaptability to Chemical Industry. Cost of genera-
tion and upkeep.

E. E. 17A. Electrical Engineering Laboratory :

1. Measurement of Resistance ; 2. Measurement of Internal Resistance of Storage Battery ; 3. Calibration of Ammeter and Volt-meter ; 4. Study of Energy-meters ; 5. Study of D.C. Generators (Shunt, Series and Compound) ; 6. Characteristics of an A.C. Series Circuit ; 7. Study of Alternators (Single and Poly-phase) ; 8. Measurement of three-phase Power by two Wattmeters ; 9. Synchronising and Parallel operation of two Alternators ; 10. Study of a Poly-phase Induction Motor ; 11. Study of a Transformer ; 12. Study of a Rotary Converter ; 13. Study of an Induction Regulator.

E. E. 18. Electrical Drawing :

Standard Symbols, Armature Winding Diagrams;
Outline Drawings of Generators, Motors, Switches
etc. ; Sectional Drawing of D.C. Generator or Motor

E. E. 4th
Year; Power
option;
3 hours
a week;
Practical.

Ch. E. 2nd
Year; 3 hrs.
a week;
Practical.
2nd
semester.

and D.C. Circuits Breaker ; Standard Circuits ; Curve Tracing ; Nomography ; Problems in D.C. Machines and Circuits.

E.. E. 19. Electrical Design and Drawing :

E. E. 3rd
Year ; Power
option ;
3 hours
a week ;
Practical.

Design and estimating of a Factory Lighting and Power Wiring System ; Sectional Drawing of Different Types of Conductors and Cables ; Design of Electromagnets, Regulators and Heaters.

E. E. 20. Electrical Project and Design :

E. E. 4th
Year ; Power
option ;
6 hours
a week ;
Practical.

Design of an Electrical Project ; Design of D.C. Machine ; Alternator, Transformer, Induction Motor and Converter.

E. E. 21. Electrical Engineering Calculations :

E. E. 3rd
Year ; 2 hrs.
a week ;
Computation.

Calculations covering subjects E.E. 4, E.E. 6 and E.E. 8.

E. E. 22. Electrical Engineering Laboratory I :

E. E. &
M. E. 2nd
Year ; 3 hrs.
a week ;
Practical.

1. To measure resistance by ammeter and voltmeter method.
2. Calibration of voltmeter and ammeter by comparison.
3. Study of a Direct Current Generator.
4. Calibration of a D.C. Ampere-hour meter.
5. Measurement of Permeability.
6. Magnetization Curve of a D.C. Generator.
7. Characteristic Curves of Shunt and Compound Generators.
8. Characteristic Curves of Series Generator.
9. Determination of Losses and Efficiency of D.C. Generator.
10. Performance Curves of Series Motor.
11. Performance Curves of Shunt and Compound Motors.

12. Parallel Operation of Generators.
13. Characteristics of A.C. Series Circuit.
14. Characteristics of A.C. Parallel Circuit.
15. Operation tests in Storage Battery.
16. Localisation of Faults in Electric Mains by Murray's Loop Method.

E. E. 23. Electrical Engineering Laboratory II :

1. Separation of losses in a D.C. Generator.
2. Efficiency Test on a Shunt Motor by Hopkinson Method.
3. Study of Rosenberg type of Train Lighting Generator and System.
4. Magnetization Curve of an Alternator and Determination of its Regulation by Synchronous-impedance Method.
5. Measurement of Power and Power-factor of a 3-phase system by two watt-meters.
6. Measurement of Slip of an Induction Motor by Sector-disk Method.
7. Regulation and Efficiency of a Transformer from losses.
8. Performance Curve of an Alternator.
9. Effect of variation of Excitation of a Synchronous motor at constant load.
10. Performance Curves of Induction Motors.
11. Characteristic Curves of a Synchronous Converter and Inverted Rotary.
12. Performance and Vector Diagram of an Induction Regulator.
13. Heat Run on a Transformer.
14. Balancer on a 3-wire System with two Shunt Machines.
15. Separation of Iron Losses of a Transformer.
16. Synchronising of Alternators.

E. E. 3rd
Year ; 3 hrs.
a week ;
Practical.
M. E. 3rd
Year ; 3 hrs.
a week ;
Practical
(Half-year)
Expt. No.
1, 4, 5, 6,
7, 11, & 16.

E. E. 24. Electrical Engineering Laboratory III :

E. E. 4th
Year ; Power
option ;
6 hours.
a week ;
Practical.

1. Transformer Connections and Determination of Ratio of Transformation.
2. Dielectric Strength of Insulating Oil.
3. Circle Diagram of Induction Motor.
4. Calibration of A.C. three-phase watt-hour meter.
5. Commercial Test on three-phase Alternator.
6. Efficiency and other Tests on Storage Battery.
7. Photometric Test on Incandescent Lamps.
8. Performance Test on Induction Generator and Motor.
9. Test on three-phase Pole-changing Induction Motor.
10. Standardisation of Ammeters and Voltmeters.
11. Test on Repulsion Motor.
12. Test on Rosenberg Generator.
13. Testing of Rectifier Valve with Oscillographic Record of Current.
14. Characteristics of Thermionic Valves and Determination of its Constants.
15. Measurement of Capacity and Inductance.
16. Setting up of High Frequency Oscillator.
17. Setting up of a Receiving Circuit.
18. Experimental study of characteristic of detectors and vacuum tube Voltmeter.
19. Determination of value of constants by dynamic method.
20. Study of Magneto and Common Battery Telephone system.
21. Measurement of High Voltage by Sphere-gap.
22. High-voltage Tests on Line Insulators.
23. Testing of Insulation by High-voltage Direct Current.
24. Tests on Mercury Arc Rectifier.

E. E. 25. Computation and Design for the Elective Courses :

E.E. 13.1, E.E. 13.2, E.E. 13.3 and E.E. 13.4.

E. E. 4th
Year ; Power
option ;
6 hours
a week ;
Practical
(Elective).

E. E. 26. Abstract :

In this course each student will be required to write an article of about 2000 words on a current engineering topic assigned by the teacher and to give a concise talk on the subject for 10 minutes in the class, by rotation. The result of these assignments will be considered as that of practical work. There will be no written examination for this course.

DRAWING**D. 1. Drawing :**

Construction of Scales ; Construction of Curves ; Orthographic and Isometric Projections ; Sections in Orthographic projections ; Conventions in Mechanical Drawing ; Dimensioning ; Working ; Drawing of simple machine parts such as bolts, nuts studs, rivetted joints, keys, fly-wheel, pulleys, coupling brackets ; Tracing and Blue-printing.

D. 2. Descriptive Geometry :

Four angles of Projection in Orthographic projection ; Problems on Points, Lines, Planes, and Solids ; Sections and Developments ; Tangent lines and planes, Warped surfaces ; Interpenetration.

E. E. &
M. E. 1st
Year ; 3 hrs.
a week ;
Practical.

ENGINEERING MECHANICS**E. M. 1. Engineering Mechanics I :**

Displacement ; Velocity ; Acceleration ; Graphical representation of displacement, velocity and acceleration ; Vector Quantities ; Velocities, Acceleration etc. considered as Vectors ; Composition and Resolution of Velocities ; Relative velocity ; Com-

1st Year ;
4 hrs.
a week ;
Lecture.
2 hrs.
a week ;
Tutorial.

position and Resolution of acceleration ; Angular velocity and acceleration.

Motion under gravity ; Motion on inclined planes ; Projectiles ; Inertia, Laws of Motion ; Weight, Momentum, Units of force ; Motion of connected bodies, Attwood's Machine.

Work, graphical representation of Work ; Power, Energy, Principle of Work ; Conservation of energy.

Circular motion, Centrifugal and Centripetal force, Motion in a curved track, Conical pendulum, Simple harmonic motion, Forces in simple harmonic motion, Alternating Vectors, Simple pendulum.

Concurrent forces, Composition and resolution of forces ; Triangle of forces ; Polygon of forces ; Analytical and graphical methods ; Physical independence of forces ; Moment of a force ; Work done by torque ; Sliding friction ; Angle of friction ; Action of Brakes ; Friction and Efficiency of screw.

Statics of rigid bodies ; Parallel forces ; Moments ; Principle of moments ; Couples ; Conditions of equilibrium ; Analytical methods ; Methods of sections.

E. M. 2. Engineering Mechanics II :

Centre of parallel forces ; Centre of mass ; Centre of gravity ; Different states of equilibrium ; Theorem of Guldinus or Pappus ; Moment of Inertia ; Radius of Gyration ; Changes of energy and speed ; Laws of rotation of a rigid body ; Kinetic energy of rotation ; Compound pendulum ; Torsional and compound harmonic motion ; Kinetic energy of rolling bodies.

Graphical statics ; Bow's notation ; Funicular polygon ; Bending Moment and Shearing Force Diagrams ; jointed structures ; Stress Diagrams ; Roof Frame and Girder ; Loaded strings and chains.

Machines, Effort and Resistance, Mechanical advantage, Velocity ratio and efficiency of machine, Rolling friction ; Journal friction ; Friction of Flat and V-band on pulleys ; Brakes.

E. E. &
M. E. 2nd
Year ; 3 hrs.
a week ;
Lecture.
1 hr.
a week ;
Tutorial.

E. M. 3. Engineering Mechanics :

Centre of parallel forces ; Centre of mass ; Centre of gravity ; Different states of equilibrium ; Theorem of Guldinus or Pappus ; Moment of Inertia ; Radius of Gyration ; Laws of rotation of rigid body ; Kinetic energy of rotation ; Kinetic energy of a rolling body.

Ch. E. 2nd
Year ; 6 hrs.
a week ;
Lecture.
1 hr.
a week ;
Tutorial.
2nd
semester.

Graphical statics ; Bow's rotation ; funicular polygon ; Bending moment and Shearing force diagrams ; jointed structures ; Stress Diagrams ; Roof frame and Girder ; Loaded strings and chains.

Law of machines ; Velocity ratio ; Mechanical advantage and efficiency of simple machines as Jack screw, Pulley blocks, wheel and axle, worm and wheel.

Friction in Bearing ; Belt friction ; Transmission of Motion by Belts, Ropes and Chains, Friction gearing, spur gearing, wheel train Rack and Pinion ; Crank and connecting rod mechanism, quick return motion, cams, ratchets.

E. M. 4. Strength of Materials and Theory of Structures :

Strength and resistance of Materials—Strain and stress, Elasticity, Rigidity, Stress Strain diagram, Resilience and Shock, Thin Cylindrical Shell subjected to internal pressure, Torsion, Angle of twist of a shaft, Moment and resistance of a shaft to torsion, Helical springs, Bending moment and Shearing force diagrams, Bending of beams under various loads, Bending and shearing due to travelling loads, Bending and shearing forces in different planes, Stress introduced due to bending and shearing, Moment of resistance to bending, Bending beyond elastic limit and rupture. Deflection of beams, Deflections from bending moment diagrams, Deflection of beams having fixed ends, Propped up beams, Continuous beams and theorems of three moments, Resilience of Beams, Compound strain and stresses,

M. E. 3rd
Year ; 4 hrs.
a week ;
Lecture.

Principal stresses due to combined bending and twisting, equivalent bending and twisting, Ellipse of stress, eccentric loading, bending combined with torsion and compression. Strength of a Ring, Poisson's ratio, Thick hollow cylinder subject to internal pressure, Column and struts, Euler's Theory of long columns, Rankine-Gordon Formulae for struts, Stress diagram for wind pressure, Roof-trusses, Beams and Girders.

Masonry structures, Retaining walls and Gravity Dams ; Reinforced Beams, Framed structures and foundation for Buildings.

E. M. 5. Strength of Materials :

E. E. &
Ch. E. 3rd
Year ; 3 hrs.
a week ;
Lecture.

Materials of Construction ; Physical and Mechanical properties, Characteristics and uses of Cast Iron, Steel, Non-ferrous Metals and alloys, such as, bearing metals, stellite, etc. ; Concrete, Wood, Fire-clay, Fire Brick Cement, etc.

Preservation of materials from natural decay—corrosion of metals and its prevention.

Simple stress and strain ; Elasticity, Rigidity, Hook's Law, Stress-strain diagrams ; Resilience and Shock.

Ultimate strength of materials, Working stress, Factor of safety, Thin cylindrical shell subjected to internal pressure, Rivetted joints.

Bending moment and Shearing Force diagram by analytical method for (a) Cantilevers and beams with single and multiple concentrated loads, and (b) Cantilevers and beams, with uniformly distributed loads.

Torsional stress and Moment of Resistance of shaft to torsion.

Stress induced by Bending ; Moment of Resistance to Bending ; Neutral axis ; Section Modulus ; Deflection of beams in simple cases.

Compound stress and strain ; Principal stresses due to combined Bending and Twisting ; Bending with Tension and Compression ; Eccentric Loading.

Poisson's Ratio ; Thick Cylinder subjected to pressure ; Euler's Theory of columns and struts ; Rankine Gordon formula for struts.

Application of the foregoing in the design of simple machine elements such as cylindrical vessels subjected to internal and external pressure, Rivetted joints, Bolts and nuts, screws, cotters, keys, couplings, Belts, Pulleys, Spur wheels, Shafts, Journals and Bearings, Worm and Wheel.

E. M. 6. Technical Dynamics :

Dynamics of Machinery, Effort, Acceleration and velocity diagram, Angular velocity diagrams, Piston or Slider and connecting rod velocity diagram, Piston Effort diagram, Crank Effort diagram, Forces in the Reciprocating parts, Fluctuation of Energy in Steam and Internal Combustion Engines, Fly-Wheel, Governor, Loaded Governors, Effect of Friction on Governors, Power, Effort and Sensitiveness of Governor and Balancing of Engine ; Vibration problems, Damped vibration ; Torsional vibration.

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

E. M. 7. Mechanism Drawing :

In this course students are required to solve by drawing problems on revolving and oscillating bodies, such as cranks, levers and four bar linkages etc. Transmission of motion by belts, Ropes etc. ; Gears and Gear wheels ; Cams ; Aggregate combination etc.

E. E. &
M. E. 2nd
Year ; 4 hrs.
a week ;
Practical.
2nd
Semester.

E. M. 8. Engineering Materials and Processes :

Outline of manufacture of cast iron, wrought-iron and steel ; their physical and mechanical properties. Types of furnace ; Furnace linings ; Refractory materials. Products of iron and steel industry ; Production of parts by rolling, rolled, sections, sheets, strips etc. ; Wide drawing ; Manufacture of tubes.

E. E. &
M. E. 2nd
Year ; 4 hrs.
a week ;
Lecture.
2nd
Semester

Iron castings ; Cupolas, Blowers ; Air furnaces, Moulds ; Patterns and pattern making, Pattern re-

quirements ; Moulding and core sand, properties of sand, preparation of sand ; Moulding machines ; Steel castings ; Electric furnaces ; Malleable castings ; Investment castings etc.

Methods of forging, Hammer forging, Drop forging and stamping, Power hammers and presses.

Oxyacetylene, Electric arc and Resistance welding Thermit welding ; Spot, Seam and Butt welding ; Welding machines.

Alloy steels, their properties and uses. High speed steels. Physical properties and non-ferrous metals such as copper, lead, tin, aluminium, magnesium, and their alloys such as brass, bronze, gun-metal, duralumin etc.

Soldering and brazing ; Autogenous welding of non-ferrous metals ; Metal castings, Die casting ; Entrusion of metals.

Timber ; growth and felling of timber, seasoning, preservation, principal uses, important varieties in use in India, veneers and plywood.

Bricks ; Stones ; Cement ; Concrete ; Lime and Mortars.

E. M. 9. Engineering Computation :

M. E. &
E. E. 2nd
Year ; 4 hrs.
a week ;
Practical. 1st
Semester.

Sketching of curves of different types, including Parabola, Hyperbola, Curves representing Exponential Functions, Catenary, Sine Curves and Simple Harmonic Motion, Compound Periodic Curves, Summation, Subtraction, Multiplication and Division of Curves. Graphical Solution of Simple Equations. Determination of Laws for Curves.

Practical ideas of differentiation. Graphical differentiation. Meaning of Integration ; Graphical Integration. Planimeter and its theory. Applications of Integration. Determination of First and Second Moment of Section by means of Graphical Construction. Nomography.

MECHANICAL ENGINEERING

M. E. 1. Engineering Thermodynamics :

This course embraces the Study of the Principles of Thermodynamics governing the various forms of Heat Engines and Heat Producers such as :—Steam Engine, Steam Turbine, Oil and Gas Engines, Boiler, Compressors, etc., etc.

E. E. &
M. E. 2nd
Year ; 3 hrs.
a week ;
Lecture.

Heat units, Measuring Instruments, Laws of Thermodynamics, Mechanical Equivalent of Heat, Laws of Perfect Gases and their Characteristic Equation, Gas Constants and their Physical Significance, Specific Heats, two Specific Heats of Gases, Specific Heat of a mixture of gases, Relation between two specific heats of a gas and its constant, Internal Energy, Adiabatic, Isothermal and Polytropic expansion in general, Work done during Isothermal and Adiabatic expansion and compression of gases, Relation between Pressure, Volume and Temperature in Adiabatic and Isothermal changes, Carnot's and other Cycles, Reversible Engine, Condition of maximum efficiency and reversibility, Single and Multistage air-compressor, work required in a compressor, Air-Motors, Internal Combustion Engine Cycles. Fuels, higher and lower calorific values, other properties of fuels, combustion, coefficient of excess air, regulation of combustion from flue gas analysis, Formation of Steam, Properties of saturated and superheated steam. Internal energy, Total heat of Saturated and Superheated steam, Quality of Steam, High pressure Steam, Critical pressure, Use of Steam Tables, Entropy chart for Water and Steam, Study of Mollier chart and its application in Steam Engines. Wire-drawing and throttling of Steam, Dryness fraction and its determination by Steam Calorimeters.

Steam Engine Cycles, Representation of P-V Diagrams and Entropy Diagrams, Flow of Steam through Nozzles and Orifices, Conversion of Pressure Energy into Kinetic Energy and *vice versa*, Pressure, Volume and Entropy diagram for expansion through Nozzles.

Other important vapours as used in Refrigerating Machine such as : SO_2 , CO_2 , NH_3 , etc., etc., their Characteristics.

M. E. 2. Mechanism :

E. E. &
M. E. 2nd
Year ; 4 hrs.
a week ;
Lecture.
1 hr.
a week ;
Tutorial.
2nd
Semester.

In this course instructions are given in the forms and motions of various mechanism independent of their strength. It is the purpose of this course to familiarise the students with the principles on which various mechanisms are designed.

Instructions in this course covers the following and are supplemented by drawing office exercises.

Revolving and Oscillating Bodies such as Cranks and Levers ; Transmission of Motion Belts, Ropes and Chains ; Transmission of Motion Bodies in pure Rolling contact ; Gears and Gear Teeth ; Gear Wheel in Trains ; Epicyclic Gear Trains ; Inclined Plane Wedge, Screw, Worm and Wheel ; Cams ; Four Bar Linkage ; Relative Velocities of Rigidly connected Points ; Link work ; Straight Line Mechanism and Parallel Motion ; Aggregate Combination ; Pulley blocks ; Intermittent Motion, etc., etc.

Application of above in actual machines.

M. E. 3. Heat Engines :

Ch. E. 2nd
Year ; 4 hrs.
a week ;
Lecture.
1 hr.
a week ;
Tutorial.
1st
Semester.

Heat, Absolute Temperature, Unit of Heat and Work, Horse-Power, Mechanical Equivalent of Heat, Transfer of Heat, two Specific Heats, Characteristic Equation of a Gas, Generation and Properties of Steam, Saturated and Superheated Steam, work done by Steam in Expansion, Back Pressure, Mean Effective Pressure, indicated and Brake Horse power, Efficiency, Limit of Expansion, Cylinder Condensation, Clearance, Compounding, Effect of super-heating.

Types of Engines—Simple and Compound, Valve Gears, Lap, Lead and Angle of advance, Eccentrics, Valve-setting, Reversing Gear, Link Motion, Engine Details and Driving Mechanism, Flywheel and Governor.

Boilers and their Types, Boiler Mountings and Accessories, Economiser, Feed-water Heater, Feed pumps, etc., Chimneys, Natural, Induced and Forced Draught. Condensers and Air Pumps.

Impulse and Reaction Turbines, Single-Stage and Multi-Stage.

Gas and Oil Engines, Working Cycles, Indicated and Brake Horse Power, Mechanical and Thermal Efficiency. Care and Management of Engines and Boilers.

M. E. 4. Steam Engine and Boiler :

A brief survey of principles of Thermodynamics as applied to Steam Engines, Properties of Steam, Behaviour of Steam in the Steam Cylinder, Wire drawing, Clearance, Composition, Cushioning, Cylinder feed, Initial Condensation, Action of Steam Jacket, Advantage of high speed, super-heating. Jacketting and Compound Expansion. Theoretical Indicator Diagram, Mean Effective Pressure, Indicated Horse Power, Steam Consumption from Indicator Diagram, Effect of Clearance, Expansion and Compression on economy, Relation between Steam Consumption and power, Willians Line, Study of Indicator and Indicator Diagrams.

Reciprocating Steam Engine Mechanism, Types of Reciprocating Steam Engines, Simple and Compound, Condensing and Non-condensing, Uniflow Engines, Reciprocating Steam Engine details.

Performance of Reciprocating Engines, Heat balance. Brake Horse Power, Mechanical Efficiency, Available heat, Steam Consumption and Equivalent Heat, Thermal Efficiency, Efficiency Ratio, Economy due to Superheating. Binary Vapour Engines.

Valve and valve Gears, Bilgram Diagrams, Zeuner Diagrams, Slide Valves, Piston Valves. Consequences of Early and Late Cut off, Meyer Expansion Valve, Movable Eccentric Stephenson Link Motion. Gooch and Allen Link Motion, Equivalent Eccentric, Corliss Valve, Drop Valves.

Dynamics of Reciprocating parts Piston or Slider Velocity Diagrams, Piston or Slider Acceleration Diagrams. Piston Velocity and Acceleration, Piston Effort and Piston Effort Diagrams, Crank Effort and Crank Effort Diagrams, Forces due to Inertia of Reciprocating parts, Fluctuation of Energy, Fly-wheel.

Function of a Governor, Simple Conical Pendulum Governor, Loaded Governor, Effect of friction of Governors, Isochronism and Hunting, Sensitiveness of Governor, Effort and Power of Governor, Shaft Governors.

Performance of a Steam Boiler, Generation of Steam, Equivalent Evaporation, Heating Surface and Grate Area ; Boiler Horse Power, Operation and Efficiency of a Boiler, Heat losses in Boiler, Boiler lagging, Chimney Draught and Chimney Height, Artificial Draught, Forced Draught, Steam-jet Draught.

Types and Classification of Boilers, Lancashire and Cornish Boilers, Locomotive Boilers, Water Tube Boilers, Boilers details, Boiler Mountings, Water Level Indicator, Pressure Gauges, Safety Valves, High and Low Water Safety Valves, Feed Check Valve, Boiler Accessories, Feed Pump, Injector, Feed Water Heater, Gain due to Feed Water Heating, Economiser, Super-heaters, Chain Grate and Mechanical Stoking.

M. E. 5. Steam Turbine :

M. E. 3rd
Year ; 2 hrs.
a week ;
Lecture.

Principles of Thermodynamics as applied to Steam turbines, flow of steam through orifices and nozzles, Adiabatic flow, Polytropic flow, Critical pressure ratio and velocity; Design of Nozzles, Use of Entropy chart in connection with Problems relating to Nozzles, Diffuser effect of Nozzles, Velocity Coefficient and Coefficient of Discharge and Efficiency of a Nozzle and the different methods of determining them, Velocity diagram and design of turbine blades. Thermodynamical Efficiency, Mechanical and thermal efficiency of a steam turbine, Types of turbines,

Impulse, Reaction and combined Impulse and Reaction turbines, Simple stage and Multistage turbines, Pressure and Velocity compounding, Mechanical and Hydraulic losses in turbines. Testing of steam turbines, Commercial types of turbines such as De Laval, Terry, Curtis, Zoelly, Westinghouse, Parson, Thyssen-Röder, Allis-Chalmers, Kerr, Ljungström, etc., etc., Marine turbines, Principle of Governing and types of Governors, Exhaust turbines, Bleeder turbines, Back-pressure turbines. Turbine Details, Leakage in Turbines, Labyrinth Packing.

M. E. 6. Internal Combustion Engine :

Principles of Thermodynamics as applied to Internal Combustion Engines ; Otto, Diesel and other Cycles, Two Stroke and Four Stroke Cycle Engines, their different efficiencies, Comparative study of these Cycles, Scavenging, super-charging.

M. E. 3rd
Year ; 2 hrs.
a week ;
Lecture.

Fuels in Internal Combustion Engines, Producer Gas Plant and Gas Generation.

Valves and Valve Mechanism, Ignition Devices, Injection systems, Reciprocating Parts, Bush, Bearings, Cylinder liner, frame, crankshaft, cylinder-head, base, etc., etc. Timing, Methods of Governing, Balancing, Cooling, Lubrication, Arrangements for Starting and Stopping, Types of Engines, Performance and Testing. Gas Turbines Theory and Performance, Theory of Jet Propulsion, Rockets.

M. E. 7. Prime Movers :

Types of steam engine, engine parts and mechanism.

E. E. 3rd
Year ; 3 hrs.
a week ;
Lecture.

Thermodynamics of steam engine, Indicator diagram, clearance and compression, Mean effective pressure, I.H.P., Steam consumption, Willans Line.

Flywheel, Governors, Valves and valve gear, Reversing mechanism, Link motion.

Performance of steam engine, Indicator, I.H.P., Dynamometers, B.H.P., Mechanical efficiency, F.H.P., Thermal efficiency.

Thermodynamics of Gas, Oil and Diesel engines, Working Cycles, Valves and Valve-setting diagrams. Indicated and Brake Horse Power, Mechanical and Thermal efficiencies.

Flow of steam through nozzles, Theory and performance of Impulse and Reaction Steam Turbines.

M. E. 8. Hydraulics ;

E. E. &
M. E. 3rd
Year ; 2 hrs.
a week ;
Lecture.

Properties of Fluids ; Hydraulic Press; Static Pressure of Fluids ; Pressure Heads ; Centre of Pressure ; Fluids in Motion ; Total Energy Bernoulli's Theorem, Radiating Current, Free Circular and Spiral Vortex, Whirling Liquids, Torricelli's Theorem, Flow of water through orifices, Flow of water over Notches and Weirs, Loss of Head due to sudden enlargement, contraction or obstruction in pipes, Flow through mouthpieces, Fluid Friction, Flow of water through open channels and pipes, Usual and Critical Velocities, Friction and other losses in pipe line, Hydraulic Gradient, Flow of water through Nozzles, Power transmitted in a pipe.

Venturimeter, Pitot tube. Impact of a jet on fixed and moving Cups and Vanes, Reaction of a jet, Action of a jet on revolving Vanes.

Working and governing of Pelton-wheels, water-turbines, Single and Multistage Centrifugal pumps ; Piston, Bucket and Plunger pumps, etc.

M. E. 9. Theory of Machine Design :

M. E. 3rd
Year ; 2 hrs.
a week ;
Lecture.

This Course covers Physical Properties of Metals ; Strength of Materials ; Study of the Statical and Dynamical Forces acting in various parts of Machines ; Theory of Design of Machine Parts such as Rivetted Joints, Cotters, Keys, Bolts, Nuts, Screws, Couplings, Belts, Ropes, Chains, Pulleys, Axles and Shafts, Journals, Bearings, Gearing, etc. and Engine Parts such as Eccentric, Crank, Connecting Rod, Connecting Rod Ends, Cross-Head, Piston, Stuffing Box, etc., etc. Helical and other Springs,

Thick Cylindrical Shell, Thin Cylindrical Shell subjected to Internal and External pressure, etc., etc.

M. E. 9A. Machine Drawing and Design (Elementary Course) :

In this Course the students are acquainted with the applications of Theory and Machine Design studied in Course M. E. 9, by means of suitable Problems on Design of Machine Parts such as Keys, Cotters, Bolts, Nuts, Screws, Helical and other Springs, Belts, Pulleys, Gears, Couplings Axles and Shafts, Bearings, Journals, Hangers, Eccentrics, Stuffing Boxes, Connecting Rods, two ends of the Connecting Rod, Overhead Crank, Forged Crank, Rivetted Joints, Pressure Vessels, etc.

M. E. 3rd
Year ; 8 hrs.
a week ;
Practical.

The second part of the Course is devoted in Structural Design and each student is required to design at least one Roof-truss or one Bridge Girder, and one complete Hoisting Machine such as Travelling Cranes, Derricks, etc., etc.

M. E. 9B. Machine Drawing and Design :

This is an abridged course of M. E. 9A.

E. E. 3rd
Year ; 5 hrs.
a week ;
Practical.

M. E. 9C. Machine Drawing and Design :

Design of Machine parts such as keys, Cotters, Bolts, Nuts, Screws, Helical and other Springs, Belts, Pulleys, Gears, Couplings, Shafts, Stuffing boxes, Rivetted joints, Pressure Vessels, Roof trusses, etc.

Ch. E. 3rd
Year ; 3 hrs.
a week ;
Practical.

M. E. 10. Hydraulic Machine and Water Power :

In this course theory and design of water turbines, Centrifugal pumps and utilisation of water power will be taken up. It will also embrace study of other water motors and hydraulic pressure machines used for commercial purposes.

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.
(Elective).

Theory and principle of Impulse and reaction turbines, Types of turbines, Peltonwheel, Francis turbine, Propellor turbines with special reference to Kaplan turbine, Specific speed, Classification of turbine according to the direction of flow, General comparison of impulse and reaction turbines, General theory of turbine design, General case of radial, axial and mixed-flow turbine, Velocity diagram, Vane thickness and curvature of vanes, Losses, Efficiency and variation of efficiency with specific speed, Measurement of Head in turbine test, Characteristic curves for turbines, Model test, Governing, Surge tanks and the effect of governor action on surge.

Centrifugal pumps, Types and construction, General theory of centrifugal pumps, General equation and characteristic, axial thrust balancing of axial thrust on impeller shaft.

Other hydraulic motors such as overshot and undershot wheels etc., etc.

Piston, Bucket and Plunger pumps, Design of valves, theory of air vessels, Efficiency. Rotary pumps and other liquid-raising appliances.

Other hydraulic machines used for commercial purposes such as hydraulic Rams, Presses, Accumulators, Intensifiers, Elevators, Riveters, etc., etc.

M. E. 11. Power Plant Engineering :

This course deals with Design, Operation and Economics of Power Plants, Cost of production and distribution of Power and determination of Rates.

Location of plants ; Study of Power Plants and Buildings, General Lay-out, Erection, Initial cost, Operating Expenses and maintenance. Study of performance of Power Plants by recording Apparatus and Gauges.

Theory of Heat transmission and its application to the design of heating surface or cooling surface in Boilers, Evaporators, Condensers, Furnaces, Coolers, etc.

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

Steam Power Plant :—Supply, handling & storing of fuels, preparation of fuels, mechanical stoker, natural and artificial draft, Chimneys, influence of draft on evaporation, Boiler specification, heating surface, grate area, Boiler mountings, Boiler accessories, Flue chamber, Damper, Steam pipes, Water pipes, Pipe fitting, lagging, feed water heater, Economiser, Water softening, Superheater, Boiler losses, Boiler performance, Boiler regulation.

Selection of Prime movers, their performance, composition of prime movers.

Condensers and Air Pumps :—Types of Condensers, Parallel Flow and Counter Current Jet Condensers, Surface Condensers, Amount of Water for Condensation of Steam, Condenser Efficiency, Sources of Air in condenser, Function and Types of Air Pumps, Combined Wet and Dry Air Pump, Vacuum Augmenter, Air Pump Capacity, Rotary Air Pump, Steam Air Injector, Cooling Towers.

Cooling arrangements for generators.

Diesel Power Plant :—Equipment of Diesel Plants, Suitability of Diesel Equipment of Diesel plants, cost of operation, cooling systems, re-cooling arrangements, starting device, performance of Diesel Engine, care of Diesel plants.

Hydro-electric Plant :—Selection of suitable site advantages and disadvantages and capacity of Hydro-station ; factors on which the capacity depends, Prime movers, their characteristics and performances, hydro-electric survey, flow, fall, catchment, reservoir, rainfall, run-off, etc.

M. E. 12. Motor Car Engineering :

Gasoline Engines and Cycles, Types of Auto-engines, Engine parts, Shapes of combustion chamber, Valves and valve operating mechanism.

Fuels, mixture strength, compression ratio, detonation, Knock rating, Octane number, Super-charging.

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture
(Elective).

Balancing, Crank distribution, Firing order, Power balance chart.

Carburation, Types of carburetors, Intake and exhaust manifold, Muffler, Air cleaner.

Fuel feed systems, Filter, Electric fuel gauge.

Lubrication systems, Oil pump, Crank case ventilation.

Cooling systems, fan, radiators, precaution for cold weather.

Electric system, Storage battery, Generator, Ignition systems, Circuit breaker, Distributor, Spark plug, Self starter, Bendix drive, Lighting system, Head lamps and reflectors.

Transmission, Clutches, Gear box, Synchro-mesh, Over drive, Over-running clutch, Fluid drive, Universal Joints, Differential, Rear axles.

Running gear, Chasis, Springs and spring suspension, Front axle, Steering mechanism. Brakes, Wheels, Rims, Tyres.

Computation of horse power, wind and track resistance.

Gasoline substitutes, Producer gas engine.

M. E. 13. Machine Tools :

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

The importance and development of Machine Tools, Examination of the finished article, Measuring system of Machine shop, Setting up of Machine Tools, Method of work, Feed, Cutting speed, Power required, the Driving System, Changing of Speed, Principles and Design of Rotary Machine Tools such as :—Simple and Screw-cutting Lathes, Turret Lathes, Semi-Automatic and full Automatic Lathes, Drilling Machines Single Multispindle, Horizontal Boring Mills, Vertical Boring and Turning Mills, Cylinder Boring Machine, Milling Machine, Plane and Universal, Vertical Milling Machines, Different types of Gear Cutting Machines, Grinding Machines and methods, Special Screw Cutting Machines, etc., etc.

Reciprocating Machine Tools such as :—Shaping Machines, Planing Machines, Slotting Machines, Bevel Gear and Spur Gear Shaping Machines, Key-seating Machines, Plating edge Shaping Machines, etc., etc.

Machine Saws such as :—Circular Saws, Band Saws, etc., etc., Shearing Machines, Punching Machines and Presses.

Testing of Machine Tools. Economical Utilisation of Machine Tools.

M. E. 14. Metallography and Materials of Construction :

Measurement of mechanical properties and strength of materials and their inter-relations, *viz.*, tenacity, hardness, ductility, impact resistance, fatigue resistance, creep, etc. M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

Testing equipments.

Structure of ferrous metals. Effect of grain size on strength ; Metallography of ferrous metals.

Effects of various ingredients on steel and cast iron ; Physical constitution of steel ; Iron carbon diagram and solid solutions ; Effect of temperature and mechanical working upon grain size and strength of steel. Heat-treatment of steel and its effect ; Hardening, tempering, normalising, annealing, case hardening, etc. and their effects on structure.

Heat treating furnaces and equipments ; Equipments for measuring high temperatures.

Bearing metals, babbit metal, bronze, silver base alloys and other alloys for bearings. Hard metals for cutting tools such as Stellites, Tungsten Carbides, etc. Important metals used for thermocouples.

Powder metallurgy, industrial use of powder metallurgy ; Abrasives ; Grinding wheels ; Coated papers and cloths.

Corrosion and its prevention, Nonmetallic castings, Spray paintings, Dipping, Metal spraying, etc.

Lubricating materials and lubricants, their suitability and use, properties and methods of testing.

Insulating materials for building, refrigerators, cold storage, steam pipes, etc.

Study of materials used in belt, rope and cord manufacture, packing materials, asbestos fibres, asbestos cords, leather, rubber, guttaperchas, etc.

Plastic and their industrial applications.

M.E. 15. Mechanical Handling of Materials :

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

Different types of Elevators and Lowerers for handling materials in bulk and for large objects. Bucket Elevators, shapes of buckets ; their speed, tightening gears and appliances for clean delivery of sluggish materials. Rigid Arm, Swing Tray, Finger Tray Elevators and Lowerers.

Worm, Push Plate, Push Trough and Band Conveyors, Picking Belts, Steel Plate and Slat Conveyors, Vibrating Trough Conveyor.

Automatic feeding devices for elevators and conveyors.

Gravity shoots, Roller Runways, Live Rollers, Humper, Stacker and Gadget.

Pneumatic Handling of Materials, Conveying by hydraulic means.

Endless Rope and Chain Haulage, Aerial Rope-ways, Cable Cranes, Coaling vessels at sea.

Mono-rails and Telfers, Blast Furnace Hoists.

Unloading of Railway Wagons and Motor Trucks.

Crab winches, Pulley Blocks, Skips, Grabes, Lifting Magnets, Hand and Electric Cranes, Steam Cranes, Wharf Cranes and Transportor.

M. E. 16. Industrial Administration :

M. E. &
E. E. 4th
Year ; 2 hrs.
a week ;
Lecture.

Introduction, Growth of industry and commerce, Domestic production, Factory production, Use of power, mass production, Capital, Industrial finance, Rise of trade unions, Joint stock system, Limited liability concern, Development of modern industrial organisation, Scientific management.

The structure of organisation, Staff and departmental organisation, Significance of utility, Functions of different officials and employees, Division of work, Executive and supervisory responsibility organisation charts.

Management policies with respect to personnel and production, Issue of instructions, Delegation of responsibility, Formation of committees, Reports.

Formation and development of manufacturing undertakings, Factors influencing the type of administration, Choice of site, Suitability of land, availability of raw material and labour, Transportation facilities, Power supply, Local regulations and influence of sales market, Layout of factory and offices, relative positions of buildings and different departments, Flexibility and possibilities of expansions.

Planning of factory, Internal transportation of material, Product and equipments, accommodation, Arrangement of equipment according to Analytical and Synthetic methods of production, Auxiliary services, Factory lighting, Air conditioning and Ventilation.

Function of different departments, Design and drafting, Research and testing, Types of research, Scientific and Industrial research, National laboratories, University laboratories, Finance for research, Research and development, Product development and inventions, Patents and Trademark, Bye-products, product efficiency, Consumers demand, Design for production.

Production organisation, Standardisation, Tools and equipments, Jigs and Fixtures, Measuring instruments, Inspection, Assembly and testing, Motion study and time study, Estimating.

Cost accounting, Material and labour cost, Overhead charges, Factory cost, Cost due to sale, Profit.

Distribution of industrial products, policies, Channels of distribution, Service to customers, Advertising, Sales organisation.

Storage of material, Layout and accessibility, System of records, Packages and containers, Bins and racks, Disposal of scrap and waste, Specialised storage.

Transport organisation, Internal and External transports, Transport by rail, Road, River, Sea and Air, Despatch procedures.

Labour and Labour organisation, Basic wage, Wage incentives, Wage payment systems.

Personnel organisation, Selection, Placement, Transfer, Promotion, Training of technical personnel, Health services, Welfare methods, Working condition, Safety methods, Security of services, Recreations, Trade Unions, Works Committees, Disciplines.

Factory laws, Indian Factories Act, Employees' State Insurance Act, Payment of Wage Act, Workmen's Compensation Act, Employment of Children Act, Social Insurance, Indian Trade Unions Act, Industrial Disputes Act.

M. E. 17. Refrigeration :

M. E. 4th
Year; 2 hrs.
a week;
Lecture
(Elective).

Refrigeration Methods ; Systems of Mechanical Refrigeration ; Air System, Compression System, Absorption System, adsorption system. Refrigerants and their Properties—pressure and boiling point, latent heat of evaporation, inflammability, effect on metals, effect on lubricants ; Testing for leaks ; Refrigeration unit ; Capacity of a refrigeration system.

Household refrigerators and their characteristics ; Refrigerator details and accessories—liquid receivers, expansion valve, evaporator, condenser, absorber, rectifier, etc. ; Compressors of refrigerating plants.

Operation of refrigerating system—Starting and shutting down of compressor ; Charging refrigerant in the system ; Testing of leakage ; Operating practice for absorption system.

Insulation, Insulating materials, Heat transmission through walls, Refrigeration load.

Thermodynamics of refrigerating system ; Work of Compression, P-V diagram T- ϕ diagram ; Effect of superheating and undercooling ; wet compression ; Power required for compression. Co-efficient of performance. Refrigeration Cost and Plant testing.

Ice-making—Can system and plate system ; Raw water ; Removal of core water from ice ; Defects of ice ; Refrigeration per ton of ice.

Eutectic ice, Sodium Chloride and Calcium chloride brine.

Cold Storage—Construction, Insulation ; Insulating materials and their properties ; Heat transfer through composite walls ; Calculation of refrigeration required.

Air circulation and ventilation in cold storage ; Natural and forced circulation ; Cold storage of foods.

M. E. 18. Air Conditioning :

Atmosphere, its nature, air and water vapour mixture ; Law of partial pressures. M. E. 4th
Year; 2 hrs.
a week;
Lecture
(Elective).
Psychrometry ; Dry and Wet bulb temperatures, Dewpoint, Relative humidity, Psychrometers, Psychrometric Chart.

Requirements for comfort ; functions of Air Conditioning ; Ventilation requirements, Comfort Charts.

Air-conditioning systems, component parts ; Winter Air Conditioning, Summer Air Conditioning ; Year-round Air Conditioning equipment ; Central air-conditioning system.

Winter Air-conditioning load ; Air infiltration heat loss, Heat transmission loss ; Total heating and humidifying load.

Heaters ; Warm Air heating system, Hot Water heating system, Steam heating system, Radiators, Unit Heaters.

Humidifiers, Air filters ; Application of Winter Air-conditioning Equipment.

Mechanical Refrigeration system.

Summer Air-conditioning load : Air infiltration heat and humidity gain. Heat transmission and sun-light heat gain; Heat and humidity gain from human occupants, Heat gain from electric lights, motors, etc.

Dehumidifier, Absorbers, Application of Summer Air-conditioning equipment.

Temperature and Humidity control ; Thermostats, Humidistats ; Zone controls.

M. E. 19. Machine Drawing :

2nd Year ;
6 hrs.
a week ;
Practical.

Machine Sketching (Orthographic and Isometric) ; Making of Assembly and Working Drawings from Sketches ; Preparing Detailed Working Drawings from Assembly and Assembly Drawings from Details ; Reading and Checking of Drawings ; Empirical Design of Standard Machine Parts.

M. E. 20. Machine Design :

M. E.
4th Year ;
10 hrs.
a week ;
Practical.

In this course complete design of two machines will be required for each student. The student will be given option to select any two from the following of which at least one must be a Prime-Mover : (1) Design of reciprocating Steam Engine, (2) Design of Internal Combustion Engine, (3) Design of Steam Turbine, (4) Design of Water Turbine, (5) Design of Steam Boiler, (6) Design of Pumps or Compressors, (7) Design of Machine Tools.

M. E. 21A. Mechanical Engineering Laboratory :

M. E.
3rd Year ;
7½ periods
per week
and M.E.
4th Year ;
3 periods
per week
Practical.

This course is meant for the Third and Fourth Year students of the Mechanical Engineering course and is intended to familiarise them with the practical application of the theories taught in lecture courses in Applied Thermodynamics, Steam Engines, Steam Boilers, Steam Turbines, Gas Engines, Oil Engines, Gas Producer, Hydraulics, Hydraulic Machinery (Pumps and Water Wheels, etc.), Mechanism,

Applied Mechanics (Strength and Resistance of Materials), by suitably arranged series of graded experiments and to acquaint them with methods of commercial testing of Prime Movers, Boilers, Gas Producers, Pumping Machinery and Engineering Materials.

Work in the course includes the following :—

Calibration, Adjustment and use of Instruments and Meters, such as Planimeters, Thermometers, Pyrometers, Water-meters, Gas-meters, Pressure and Vacuum Gauges, etc., used in Mechanical Engineering Work ; Determination of Calorific value of Fuels (Solid, Liquid and Gas). Testing of different types of machines for lifting. Determination of Bearing Friction, etc., Moment of inertia of fly wheel.

Taking of Indicator Diagrams, Valve Setting ; Location and Correction of Defects in Steam, Oil and Gas-Engines, etc., etc. Running and management of Engines, Boilers and Pumps, etc. ; Determination of Indicated and Brake Horse Power, Fuel and Steam Consumption of Engines and Turbines ; Economy and Efficiency Tests of Engines, Turbines and Boilers ; Heat Balance, Complete Testing of Steam Power Plant.

Determination of coefficient of sliding friction ; Angle of friction ; belt friction ; bearing friction ; bearing friction losses ; moment of inertia of fly-wheel by method of rotation and oscillation ; Mechanical advantage and efficiency of various mechanisms such as pulley blocks, Jack screw, wheel and axle, differential wheel and axle, crabs and winches, etc. ; determination of law of machines.

Calibration of Tank, Measurement of Flow of Water ; Determination of Critical Velocity ; Efficiency Test of Centrifugal and Reciprocating pumps.

Tension, Compression, Bending, Shearing, Hardness and other tests of Cast iron, Wrought iron, Steel, etc., Testing of Wires and Ropes under Tension, Testing of Helical and Laminated Springs, etc. ;

Testing of Cement and other Engineering Materials. Metallographic testing of ferrous materials and study of their structures.

In this course a report is required of each student on every experiment.

M. E. 21B. Mechanical Engineering Laboratory :

This is an abridged course of M. E. 21A.

E. E. 3rd
Year; 3 hrs.
a week;
Practical.

M. E. 21C. Mechanical Engineering Laboratory :

This is an abridged course of M. E. 21B.

Ch. E. 4th
Year; 3 hrs.
a week;
Practical
(8 weeks).

M. E. 22. Abstract :

In this course each student will be required to write an article of about 2,000 words on a current engineering topic assigned by the teacher and give a concise talk on the subjects for 10 minutes in the class, by rotation. The result of these assignments will be considered as that of practical work. There will be no written examination for this course.

M. E. 4th
Year; 2 hrs.
a week;
Recitation.

M. E. 23. Railway Engineering Mechanical ;

Conditions governing the performance of Locomotive Engine, Climate. Civil Engineers Specification, Traffic Managers requirements.

Boiler Power, Boiler Horse Power, Estimation of Radiant Heat in the fire Box of a locomotive by Stefan Boltzman Law. Determination of the temperature of Furnace.

Tractive force formula for two cylinder Engine. Definition of Mechanical Efficiency of two cylinder Engine. Indicated Horse Power to be calculated from tractive force and speed. Resistance to be overcome by the Engine & train.

M. E. 4th
Year; 2 hrs.
a week;
Lecture
(Elective).

Adhesion, Factor of Adhesion, Draw Bar Horse Power. Rail Horse Power, Cause of Wheel sleeping and its prevention. Determination of the number of coupled axles when tractive force and weight of Rail per yard is given. Cylinders and valves. Principles of Stephenson's Link motion. Walschaert Valve gear. Cam operated Lentz and Caprotti Gear.

Locomotive Boiler with fittings and Accessories. Smoke Box, Blast Pipe Principles of Injector. Pulverised fuel firing.

Railway wheels and axles and fixing tyres by method of shrinkage, Frame axle Box and Spring, Vacuum Brake and Brake Gearing, Lubrication of parts by sight feed and Mechanical Lubricator.

Rail Friction and steam sanding gear, Garrett system of Heavier type Locomotive.

Turbine locomotives and Diesel Locos, Construction of carriages and wagons. Laminated Bearing Spring, Semi elliptical type. Sanders formula for deflection per ton and safe working load.

Books followed :

Locomotive management—Hodgson & Lake.

Locomotive of today—Locomotive Publishing Co.

Locomotive Engineers Pocket Book—Locomotive Publishing Co.

Locomotive Design Data and Formula—Philipson.

Railway Carriage & Wagon Hand Book—Locomotive Publishing Co.

Heat Engine—D. A. Low.

Lubrication of Loco—by Bhrous.

M. E. 24. Boiler and Power Plant :

Heat transmission in Boiler furnace. Steam Boilers. Various Types. High Pressure Steam Generation. Boiler Mountings and accessories. Feed Pumps. Chimney Draught. Boiler Performance. Boiler house equipments. Different types of grates and stokers. CO₂ recorder and other measuring instruments. Feed heating. Water softening Plant. Superheater.

E. E. 4th
Year; 2 hrs.
a week;
Lecture.

Economiser. Fuel handling Plant. Circulating Water.

Economics of Steam Plant condensers, cooling power Air pump. Oil Engine Plant and Hydro Electric Plant Economics. Fundamentals of Station Design. Works Buildings. Pipe work. Station costs and organisation Load Division. Incremental Rate Curves.

M.E. 25. Production Engineering I (Quantity Production and Methods):

M. E. 4th
Year; 2 hrs.
a week;
Lecture
(Elective).

System of production, mass production, interchangeability of machine parts, tolerances, fits and standardisation, measuring instruments for mass production and checking, measurement of quality.

Machine tools for mass production, viz. Automatic Screw Machine, Gear Cutting Machine, Gear Grinding Machine, etc.

Design of cutting tools, application of machinability to cutting practice.

Jigs and fixtures, Economic principles, Principles of design, Locating schemes, Clamps and clamping methods, Standard bushing, Design of standards, Types of jigs and fixtures, Welded, Cast-iron and light metal fixtures; Pneumatic fixtures.

Press work, Products manufactured by metal stamping, Blanking, Piercing, Perforating, etc., Blanking & Cutting dies, Design Principles of dies and punches, Progressive dies.

Plastic metal working, forging, drop forging, bending, forming, embossing and drawing operations and Die design principles, Types of presses, accessories and attachments, selection of presses.

Die casting and plastic moulding methods, Products manufactured by Die casting and plastic moulding. Die casting and plastic moulding machines.

Relative costs of different production methods.

M. E. 26. Production Engineering II (Production Planning):

It will be a two periods per week lecture course and three periods per week practical by arrangement with the teacher. The outline of the course will be as follows:—

M. E. 4th
Year; 2 hrs.
a week;
Lecture
(Elective).

Formation and development of a manufacturing undertaking, Objectives and Policies, Types of Manufacture, Mass Production and Job order production, Organisation charts, Inter-relation among the departments such as design, development, sales, purchasing, store-keeping and personnel.

Market research, Production forecasting, seasonal fluctuations, Sales forecast.

Pre-production Work, Approval and modification of Design for Manufacture, Delivery Dates, Drawing and Material Schedule, Production Planning, Routing, Interrelation of Routing, Classification and Layout, Preparation of Route Sheets, Combination Routing, Scheduling, Despatching, Master Schedule, Machine Loads and Load Charts.

Machine operations, Speed, Feed, Depth of Cut, Capacity of Machines, Selection of Machines, Tools and Equipments, Factory Layout, Layout for Job Order Type Manufacture, Layout for Mass Production.

Production Planning in Standard Quantity Manufacture, Machine Time, Handling Time.

Production Control, Control through budgeting, inventory Control, Manufacturing Order Control.

Motion Study, Analysis of elements, Process Chart, Analysis of Process Chart, Steps in Motion Analysis, Questioning Technique, Development of New Methods, Principles of Motion Economy, Normal Working Area, Work Place Layout, Man and Machine Chart, Waste Elimination, Fatigue Study.

Time Study—Organisation, Equipment and Methods, Technique of Making a Study, Rating, Skill, Effort and Working Conditions, Standard Time,

Allowances, Preparation and Idle Time, Synthetic Time Study, Standard Data.

Job Analysis, Classification of Job, Importance of equitable rates, Technique of Job Evaluation, Grading of Jobs, Salary Grading, Rate Fixing.

Estimating in Engineering, Methods Used, Records and Charts, Direct and Indirect Labour and Material, Handling and Machinery time, Setting Time, Fatigue etc., Tool Costs, Overheads, Estimating Forms.

Object of Quality Control, Setting up Standards and Specifications, Organisation of Inspection Department, When to Inspect, Where to Inspect and how much to Inspect, Inspection Methods Tools, Statistical Methods of Quality Control, Control Charts.

O. 1. Surveying :

E. E. &
M. E. 1st
Year ; 2 hrs.
a week ;
Lecture. 2nd
Semester.

Principles of Surveying, Chain Survey, Methods Chaining ; obstacles and sources of error and how to avoid them. Compass Survey ; Methods of Surveying ; Field book ; Methods of plotting ; Working in magnetic areas, Traverse along road, river, etc.

Plane Table Survey—Equipments Methods, Sources of error, Relaying a missing station.

Levelling—Y—level, Reversible levels and Dumpy levels ; Temporary and permanent adjustment ; Method of running a line of levels, Sources of error ; Stadia reading ; Curvature and refraction ; Field book, Bench Mark ; Datum level ; Limits of error.

WORKSHOP PRACTICE

In workshop courses, instruction and training are given through assigned readings, lectures, demonstrations and carefully planned and graded practical exercises in different shops.

W. 1. Carpentry and Moulding :

Use of Carpenter's and Joiner's tools, Sawing, Planing, Making of Joints, Wood turning, Chiselling, Boring, Laying out of work, Jig, Band and Circular Sawing. E. E. &
M. E. 1st
Year ; 3 hrs.
a week ;
Practical.

The use of various Moulder's tools, Cutting over, tempering and mixing foundry sand and loam, making two and three parts green sand mould from pattern supplied ; sweep moulding and pipe moulding ; making, backing and testing Core ; preparing and charging Cupolas and casting.

Study of large Flood and Sweep moulding, Steel casting, Foundry appliances and modern methods of foundry production, etc., etc.

W. 2. Patterns and Forging :

Pattern making consists of designing wood pattern from working drawing and pattern construction. The course includes patterns of pipe fittings, Pulleys, Hangers, Gears, Valves and Machine Parts, etc., etc. It also includes the study and construction of spirit and loose piece of patterns ; large, complete, part, skeleton, patterns for floor, loan and sweep work, metal pattern, etc., and making of core boxes. The use and handling of blacksmith's tools ; Laying and managing fires, heating, drawing, bending, forming, twisting, upsetting, bending while upsetting, upsetting of square corners ; bolt making, punching, chamfering, construction of hooks and ring bolts ; tempering, spring and tool making, study of the use of power hammer, study of the physical properties of iron, steel and other metals, heat treatment of steel, tool making, etc., etc. E. E. &
M. E. 2nd
Year ; 3 hrs.
a week ;
Practical.

W. 3. Fitters' Shop :

Laying out work ; chipping, filing and fitting, angles of cutting tools, chipping of key-ways, grinding, drilling, production of plane surfaces by hand methods, fitting parallel parts together, lining and E. E. &
M. E. 2nd
Year ; 3 hrs.
a week ;
Practical.

making off, tapping, stud fitting ; fixing pulleys in position, etc., etc.

W. 4. Machine Shop :

M. E. 3rd
Year ; 6 hrs.
a week ;
Practical.

Turning and boring steel, wrought iron and cast iron from working drawings, face plate and chuck work, outside and inside screw cutting, use of various tools, study of cutting angles, speed and different feeds suitable for each tool, machine and material, centering, squaring, taper turning, reaming, finishing, polishing, drilling, tapping, mandrel making, grinding, lapping plane, flat, and V-surfaces, the use of Milling machines, gear cutting, tool-making, making of taps, drills, reamers, Milling cutters and gauges, etc., etc.

In this course every student is required to work on modern standard machine tools such as lathes of different types, planing machines, grinding machines, slotting machines, shaping machines, etc., etc.

The students are required to study and use different measuring tools and devices with their advantages and limits of accuracy.

Instruction is also given whenever necessary in the mechanism of the standard machines found in modern factories and the attention of the student is drawn to the various possible adjustments for different works.

W. 4A. Machine Shop :

This is an abridged course of W. 4.

Ch. E. &
E. E. 3rd
Year ; 3 hrs.
a week ;
Practical.

W. 5. Advanced Workshop Practice :

In this course the students will be taught to apply the principles studied in other workshop courses in Commercial production of finished articles from crude materials. Each class will be required to manufac-

M. E. 4th
Year ; 6 hrs.
a week ;
Practical.

ture some useful articles and at least one complete machine or a standard machine tool from the drawing supplied.

GENERAL STUDIES

G. 1. English :

The course includes the following :

- (i) Some selected Prose and Poetical Pieces.
- (ii) Précis writing.
- (iii) Commercial Correspondence.
- (iv) Essays on current topics.

1st Year ;
2 hrs.
a week ;
Lecture.

(For the purpose of examination one-fourth of the total marks is allotted for each of the items included in the course).

G. 2. Modern World I :

History of modern times with special reference to the following topics :

European History : Renaissance and Reformation ; Rise of Modern States ; French Revolution ; Effect of the Revolution on the European state system in the 19th century ; Industrial Revolution ; Scramble for overseas colonies and market ; Factors leading to the First World War ; Post-war Europe ; Socialist movement in the 19th century ; Russian Revolution and the development of the U.S.S.R.

1st Year
2 hrs.
a week ;
Lecture. 2nd
Semester.

Non-European History : Rise of a new Turkey after World War I ; Egypt, from the first British Occupation to World War II ; Arab World since World War I ; India,—history of the Nationalist Movement and Constitutional Development from the middle of the 19th century to the achievement of Independence ; China and Japan, from the middle of the 19th century to the present day ; U.S.A.—outline of internal development, Foreign Policy since the close of the 19th century.

G. 3. Modern World II :

2nd Year ;
2 hrs.
a week ;
Lecture. 1st
Semester.

The course includes :

(i) The Governments of India, Britain, the U.S.A. and the U.S.S.R.

(ii) Social and Economic conditions of Modern India, with special reference to the following topics : Industry, Agriculture, Trade and Public Finance ; Features of Indian social organisation and educational system.

G. 4. Engineering Economics :

4th Year
2 hrs.
a week ;
Lecture.

Economic Wants and the Satisfaction, Division of Labour, Specialisation, Wealth and Capital, Fixed Capital, Loan Capital, Banks, Income, Economic Law, Increasing and Diminishing Return, Cartels, Trusts, Desire and Utility, Law of Diminishing Utility, Law of Demand The Concept of Elasticity, Elasticity of Demand, Market Prices, Market Speculation, Short Period and Long Period Monopoly, Theory of Money, Function of Money, Gresham's Law, Inflation and Deflation, The Doctrine of Comparative Costs, The Relation of Imports and Exports, Foreign Exchange, Rents, Quasi-Rent, Profits, Interest and Wage.

Organisation of Purchasing Offices, Buying by local authorities, Special buying, Buying for export, Speculation buying, specification, Standardisation, Quotations.

Commercial Laws, Contract, Agency, Sale of Goods, Hire Purchase, Legal Forms.

Monetary efficiencies, General level of prices, Commercial Currency, Cheques, Bills of Exchange, etc., Types of business—One man enterprise, Partnership, Joint stock Company, Competition and Monopolistic agreements, Public Control.

Interest and Annuity, Accumulation at Compound Interest, Nominal and Effective Rate, Present Values, Discounts, Sinking Funds, Amounts and Present Values of Annuities.

Book-keeping and Accounting, Place of accounting in industrial undertakings, Capital and Revenue Depreciation and Obsolescence, Reserves, Relationship between Financial Accounts and Cost Accounts.

Recording Transactions in Cash Book, Invoice Books, Sale day book, Purchase Returns, Sales Returns, Journal and Posting them into Ledgers, Preparation of Trial Balance, Trading Account, Profit and Loss Account, Balance Sheet, Cost Accounting, Application of costing to manufacture, Wholesale, Retail, Public Utility undertakings, Cost Control Accounts.

Cost Department Organisation, Presentation of Cost, Cost data.

Methods of labour remuneration, Various piece work system, Premium Bonus Scheme, Overhead Classification, Fixed and Variable expenses, Selling and Distributing Expenses.

Departmental overhead allocation to product distribution of cost of overhead expenses and their computation, Job or terminal costing, Process costing, Unit or single output cost.

Fatigue, Work and rest periods, Study of movements, Elimination of unnecessary movements.

G. 5. General Geology and Dynamical Geology :

Study of the general principles of geological phenomena, study of minerals and specially the rock-forming minerals. Volcanoes and igneous actions, igneous rocks, sedimentary rocks and metamorphic rocks. Movements of the earth and the earth structure. Structural geology—definitions of different structural features and geometrical problems, folding and faulting. Elementary stratigraphy and elementary palaeontology. Geological maps and sections.

Laboratory work—map reading, drawing of sections, identification of common rocks, minerals and fossils.

4th Year
2 hrs.
a week ;
Lecture.

G. 6. Engineering Geology :

M. E. 4th
Year ; 2 hrs.
a week ;
Lecture
(Elective).

Choice of materials for engineering operations,—sands, clays, pebbles, building materials like sandstones, lime-stones, laterite, etc. Preservation of building stones, road metals like basalt, dolerite etc. Elementary notion about quarrying, tunnelling and mining operations. Drilling of different types of rocks, study of different parts of the machinery and engine required for running various types of drilling machines.

Geology applied to hydro-electric projects—construction of dams on different types of rocks. Earth dams, concrete dams, flood dams etc. Geological materials used in building dams. Revetments, quay walls, protecting walls, erosion walls, breakwater, earthquake considerations affecting the site of dam construction. Study of the geological considerations regarding the proposed dams in different parts of India.

Water prospecting and tube-well problems. Quality of water, surface water and underground water, boiler-feed water, water for sanitary purpose, drinking water, etc.

Industrial minerals and rocks, origin, occurrence of metallic and non-metallic minerals of economic importance. Study of coal-fields of India and geology and mineralogy of coal substance. Gasification of coal—underground and surface. Petroleum geology—chemical and physical properties of petroleum, origin and accumulation of petroleum and natural gas, reservoir rocks, petroliferous provinces of India and other parts of the world.

COLLEGE OF ENGINEERING & TECHNOLOGY, BENGAL, JADAVPUR, CALCUTTA - 32

RECOGNITIONS

THE INSTITUTION OF ENGINEERS (India)

INCORPORATED BY ROYAL CHARTER, 1935.
8, Gokhale Road, Calcutta.
Established 1920.

Ref : 41/01067

11th October, 1944.

To

The Principal,
College of Engineering & Technology, Bengal,
P.O. Jadavpur, 24 Parganas.

Dear Sir,

With reference to your letter No. 7795 dated 18th November, 1941, I am directed to inform you that the Council of this institution have decided that the Diploma in Mechanical and Electrical Engineering of the College of Engineering & Technology, Bengal, from 1941 onwards will be recognised as exempting from Sections A & B of the Associate Membership Examination of this institution provided that the candidates have passed the Intermediate Examination in Science of a recognised University with Physics, Chemistry & Mathematics.

The question of recognition of the Chemical Engineering is under consideration.

Yours faithfully,
Sd/- C. C. SEAL,
Secretary.

Copy of letter No. 41/10219 dated 30th July, 1945 from the Secretary, Institution of Engineers (India), 8, Gokhale Road, to the Principal, College of Engineering & Technology, Bengal.

In continuation of this office letter No. 41/010167 dated 11th October, 1944, I write to inform you that the Council of this Institution have decided that the holders of the Diploma in Chemical Engineering from 1941 onwards of the College of Engineering & Technology, Jadavpur, Bengal, would be exempted from Sections A & B of the Associate Membership Examination of this Institution provided they have passed the Intermediate Examination in Science of any recognised University with Physics, Chemistry and Mathematics.

Copy of letter No. 41/9502 dated 21st April, 1947 from the General Secretary, The Institution of Engineers (India) to the Principal, College of Engineering & Technology, Bengal, Jadavpur, 24 Parganas.

I am directed to inform you that the Council of this Institution has been pleased to recognise the passing of the Degree Course of the College of Engineering & Technology, Bengal, as exempting from Sections A & B of the Associate Membership Examinations of the Institution irrespective whether the candidate has passed the Intermediate Examination or not.

Copy of letter No. 41/9128 dated 11th April, 1947 from the General Secretary, the Institution of Engineers (India), 8, Gokhale Road, Calcutta, to the Principal, College of Engineering & Technology, Jadavpur P.O., Bengal.

Sub: Recognition of the passing of the Special Degree Examination of your College as exempting from Section A & B of the Associate Membership Examination.

Ref: Your letter No. DI/15/47 dated 20th January, 1947.

With reference to the above I am directed to inform you that the Council of this Institution has been pleased to recognise the Special Degree Examination of the College of Engineering & Technology, Bengal, as exempting from Sections A & B of the Associate Membership Examination of this Institution.

Copy of letter No. 41/13628 dated 5-5-49, from the General Secretary, Institution of Engineers (India), 8, Gokhale Road, Calcutta 20, to the Principal, College of Engineering & Technology, Bengal, P.O. Jadavpur College, Calcutta.

I am directed to inform you that the Council at their meeting held in Madras on the 20th ultimo have extended their recognition of the Special Degree Examination of your College for exemption from Sections A and B of the Associate Membership Examination of the Institution upto April, 1950 examination.

UNIVERSITY OF CALCUTTA.

Resolution No. 2 of the Faculty of Engineering dated 24-3-47, confirmed by the Syndicate of the Calcutta University dated 18-4-47.

Resolved—That in the opinion of this Faculty the present degree (B.Sc. Engineering) of the National Council of Education which was introduced in 1945, be considered equivalent to the B.E. degree of the Calcutta University.

Copy forwarded for information to Dr. T. Sen, Principal, College of Engineering and Technology, Jadavpur.

GOVERNMENT OF WEST BENGAL.

EDUCATION DEPARTMENT.

RESOLUTION No. 414 EDN.

Calcutta, the 26th October, 1947.

The College of Engineering & Technology, Jadavpur, Bengal, established and maintained by the National Council

of Education, Bengal, has been imparting Engineering, Technological and Industrial Education for the last 40 years. The training imparted in the Institution having been of the standard as obtains in other recognised Engineering Institutions and its successful students having been found of the same quality as of other recognised degree-holders, Government with the concurrence of the Government of India are pleased to declare that such degrees and diplomas of the College which exempt a candidate from Section A and Section B of the Associateship Examination of the Institution of Engineers (India), should be regarded as professionally equivalent to the Engineering degrees of the Calcutta University and of other recognised institutions in India, for the purpose of entry into Engineering services.

ORDER.—Ordered that a copy of the Resolution be published in the Gazette and all Public Service Commissions in India be informed.

By order of the Governor,
Sd/- S. K. GUPTA,
Secretary.

No. F. 2/65/44-E.

FEDERAL PUBLIC SERVICE COMMISSION.

Simla, 13-11-46.

From

Rai Sahib T. C. Chopra, B.A.,
Deputy Secretary, Federal Public Service Commission

To

The Principal,
College of Engineering & Technology, Bengal,
Calcutta.

Sir,

With reference to your letter No. G. 5/17/46, dated the 23rd October, 1946, I am directed to say that the Federal Public Service Commission are asking the Government of India

to include in App. I, to the rules for the combined Engineering Services Examination, the Indian Audit and Accounts etc. Service examination, and the Survey of India Class II examination respectively the diplomas in Mechanical, Electrical and Chemical Engineering of the College of Engineering and Technology, Bengal, as educational qualifications securing exemption from Sections 'A' and 'B' of the Associate Membership Examination of the Institution of Engineers (India).

I have the honour to be,
Sir,

Your most obedient servant,
Sd/- V. G. R. AIYANGER,

for Deputy Secretary,
Federal Public Service Commission.

GOVERNMENT OF BOMBAY.

POLITICAL AND SERVICES DEPARTMENT.

Resolution No. 206/46.

Bombay Castle, 18th October, 1948.

Resolution :—The Government of Bombay is pleased to recognise the degrees in Electrical Engineering and Mechanical Engineering awarded by the College of Engineering and Technology, Jadavpur, West Bengal, as equivalent to the corresponding degrees of the Bombay University for the purpose of recruitment to Government Service.

By Order of the Governor of Bombay,
Sd/- M. D. BHAT,
Chief Secretary to the Govt. of Bombay,
Political and Services Department.

GOVERNMENT OF ORISSA

DEVELOPMENT DEPARTMENT.

Memo No. 6176-D. Dated, Cuttack, the 21st May, 1947.

Sub : Recognition of diploma in Electrical and Mechanical Engineering of the College of Engineering and Technology, Jadavpur, Bengal.

The Government of Orissa are pleased to decide that the Diploma in Electrical and Mechanical Engineering granted by the College of Engineering and Technology, Jadavpur, Bengal, will be considered as an adequate technical qualification for employment as Assistant Electrical and Mechanical Engineers in the Provincial Service, in the case of candidates' holding such diploma who have passed the Intermediate Science Examination of a recognised University before admission to the Engineering Course.

2. Candidates who have successfully completed the Junior Technical Course in the Electrical and Mechanical Engineering at the College of Engineering and Technology, Jadavpur, Bengal, will be considered technically qualified for recruitment as Electrical and Mechanical Subordinates in the Subordinate Engineering Service of the Orissa Public Works Department.

By order of the Governor

Sd/- Illegible

Secretary to Government.

Copy forwarded to the Principal, College of Engineering and Technology, Jadavpur, Bengal, for information.

Sd/- Illegible

Secretary to Government.

GOVERNMENT OF ORISSA

DEVELOPMENT DEPARTMENT.

ORDER

Dated, Cuttack, the 7th August, 1947.

In modification of G.O. No. 6176D dated 21-5-47 the Government of Orissa, after reconsideration are pleased to decide that as degrees, instead of diplomas are being awarded to successful candidates in the Final Engineering Examinations of Jadavpur Engineering College, the word "diploma" occurring in the G.O. referred to above should be substituted by the word "degree".

Sd/- N. M. PATNAIK

For Additional Secretary to Government.

Memo No. 9546-D, dated 7-8-47.

Copy forwarded to the Principal, Jadavpur Engineering College for information with reference to his letter R2/10/47 dated 11-7-47.

GOVERNMENT OF ASSAM

Dated, Shillong, the 22nd Oct., 1946.

No. E. 3M/52/46/8367.

From—F. R. Cormack, Esq., B.Sc., C.I.E., I.S.E.,
Secretary to the Govt. of Assam in the P.W.D.

To—The Principal, College of Engineering & Technology,
Bengal, P.O. Jadavpur College, Calcutta.

Sub : Recognition of the Degree in Electrical and Mechanical Engineering.

Ref: Your letter No. R3/1/46 dated 10-5-46 to the address of the Hon'ble Chief Minister to the Government of Assam.

Sir,

I am directed to say that the Government of Assam are pleased to accord recognition to the Degrees or Diplomas in Electrical and Mechanical Engineering of your College for the purpose of recruitment of students from that College in services under the Government of Assam in the Electrical and Mechanical branches only.

I have the honour to be,

Sir,

Your most obedient servant,

Sd/- Illegible

For Secretary, P.W.D., Assam.

GOVERNMENT OF E. PUNJAB

From—R. B. Gita Ram Garg, I.S.E.,
Secretary to the Government, East Punjab,
P.W.D., Irrigation Branch.

To—The Secretary to the Government of West Bengal,
Education (Edn.) Department, Calcutta.

No. 1091 E/1718/46, dated, Simla East, the 20-1-48.

Sub: College of Engineering and Technology, Jadavpur,
Bengal, Recognition of the degrees and diplomas
for the purposes of recruitment to Engineering
services.

Sir,

With reference to your letter No. 416(30)-Edn., dated the
16th October, 1947, copy received with East Punjab Public

Works Department, Buildings and Roads Branch, endorsement No. 2401-E, dated 13-12-47, I am directed to state that any educational qualifications as entitle their holders to exemption from passing Sections A and B of the Associate Membership Examination of the Institution of Civil, Mechanical and Electrical Engineers (London) and the Institution of Engineers (India) are recognised inter-alia for recruitment to P.S.E.I., and P.S.E.II in the P.W.D. Irrigation Branch East Punjab. Students of the College of Engineering and Technology, Jadavpur, who hold degrees and diplomas which exempt them from parts A and B of the Associate Membership Examination of the Institution of Engineers (India) are therefore eligible for entry into the Engineering Services in this Branch.

I have the honour to be,

Sir,

Your most obedient servant,

Sd/- Illegible,

Under Secretary,

for Secretary to the Govt., East Punjab,
P.W.D. Irrigation Branch.

A.S.R. 20-1-1948.

No. 321-Edn.

Copy forwarded to Principal, College of Engineering and Technology, Jadavpur, in continuation of this Department Memo No. 1126-Edn., dated the 27th December, 1947.

Education Department, Calcutta,
The 2nd February, 1948.

Sd/- Illegible,

Assistant Secretary.

GOVERNMENT OF WEST BENGAL

DEPARTMENT OF COMMERCE AND INDUSTRIES

Commerce

Calcutta, the 30th October, 1948.

No. 5265-Com.

From—Sri N. M. Majumdar, M.A.,
Deputy Secretary to the Government of West Bengal.

To—The Chairman, Licensing Board,
1, Harish Mukherjee Road, Calcutta.

Subject:—Proposed grant of exemption to the successful candidates of Electrical Engineering of the College of Engineering and Technology, Jadavpur and graduates of B. E. College from appearing at the written examination for grant of certificate of competency of supervisors.

Sir,

Having to the standard of education imparted in the Senior and Degree courses of the College of Engineering and Technology, Jadavpur, Government are pleased to grant the concessions provided for under the second proviso to regulation 19 of the Regulations for the grant of Licenses, certificates of competency and permits to electrical contractors, supervisors and electrical workmen, to the candidates for supervisor's certificates of competency who have passed out of the College of Engineering and Technology, Jadavpur in the Senior and Degree Course of Electrical Engineering and the graduates in Electrical Engineering of the Bengal Engineering College and have subsequently completed two years' practical experience in actual electrical work.

They may however be required to appear for the oral and practical tests.

Yours faithfully,
Sd/- N. M. Majumdar,
Deputy Secretary.

No. 5265/3 (I)-Com.

Copy forwarded to the Principal, College of Engineering and Technology, Jadavpur, for information with reference to his letter No. G4/53/48, dated 16-2-48 addressed to the Hon'ble Minister, Commerce and Industries, West Bengal.

Sd/- N. M. Majumdar,
Deputy Secretary.

Calcutta, the 30th Oct., 1948.

INDIAN POSTS AND TELEGRAPHS DEPARTMENT

From—The Director General of Posts & Telegraphs

To—The Superintendent, College of Engineering & Technology,
Bengal, P.O. Jadavpur College, 24 Parganas, Bengal.
No. S-97/1.

New Delhi, the 14th June, 1940.

Subject:—Recognition of the diplomas of the College of Engineering & Technology, Bengal, for admission to the examination for recruitment to the grades of Engineering Supervisors, Assistant Foreman, Examiners and Instrument Testers.

Sir,

With reference to the correspondence ending with your letter No. 2282 dated the 27th March, 1940, I am directed to say that the Governor General in Council is pleased to recognise the diplomas in Mechanical or Electrical Engineering granted by the College of Engineering and Technology, Bengal, at Jadavpur as a qualification for admission to the examination for recruitment to the grades of (a) Engineering Supervisors, and (b) Assistant Foreman, Examiners and Instrument Testers.

I have the honour to be etc.

Sd/- Illegible,
Senior Deputy Director General.

UNIVERSITY OF EDINBURGH

14th November, 1923.

Dear Sir,

I write to inform you that the University Court, on the recommendation of the Senatus, have granted recognition to the Bengal Technical Institute under Section IV(2) of the Ordinance controlling Degrees in Engineering, and under Section VI(2) of the Ordinance controlling Degrees in Mining. For your information I enclose a copy of the Mining Ordinance and the section referred to therein is practically the same as the section in the Engineering Ordinance.

I am,
Yours faithfully,
Sd/- THOS. F. HARLEY
Assistant Secretary.

The Secretary,
Bengal Technical Institute,
Bengal, India.

GOVERNMENT OF HYDERABAD

From—The Secretary, Board of Chief Engineers, P.W.D.,
Iram Manzil, Hyderabad, Deccan.
(Extract from the Minutes of 68th Meeting of Board of Chief Engineers held on 16-6-1950).

Degree of Engineering of the Jadavpur Engineering College, Calcutta.

The letter of the Principal, College of Engineering Jadavpur for recognizing the degree of Jadavpur Engineering College was considered and it was resolved that the degree be recognized for appointments to posts in Engineering Department on the same conditions as accepted by the Institution of Engineers (India) which are as follows:—

"1. Engineering Degree has been recognized as exempting from Sections A & B of A.M. Examination.

2. Special Degree Examination has been recognized up to the examination in April 1950.

Further diplomas in Mechanical, Electrical and Chemical Engineering of the College have been recognized from 1941 onwards, provided the candidate has passed the Intermediate Examination in Science of a recognized University with Physics, Chemistry and Mathematics."

No. 3248/B.M.d/-9.8.50.

Sd/- Illegible,
SECRETARY,
Board of Chief Engrs. P.W.D.

Copy forwarded for information to the Principal, College of Engineering & Technology, Bengal, P.O. Jadavpur College, Calcutta, with reference to his letter No. R2/32/50 dated 17-3-1950.

THE INSTITUTION OF ENGINEERS (INDIA)

Established 1920. Incorporated by Royal Charter 1935.
8, Gokhale Road, Calcutta-20.

Telegrams: ENJOIND.
Ref. No. 41/00659

Telephone: Park 1034

16th September, 1952.

The Principal,
College of Engineering and Technology, Bengal,
P.O. Jadavpur College, Calcutta—32.

Re: Recognition of Bachelor of Electrical Engineering Degree Examination (Communication Option) of the College of Engineering and Technology, Bengal.

Dear Sir,

I am directed to inform you that the Council in their last Meeting held in Calcutta on 30th August 1952 resolved to recog-

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nise the Bachelor of Electrical Engineering Degree Examination (Communication Option) of the College of Engineering and Technology, Bengal, for exemption from Sections A and B of the Associate Membership Examination of the Institution.

Please acknowledge receipt of this letter.

Yours faithfully,
Sd/- P. P. ADALJA
Secretary.

COPY OF THE RECOGNITION
GOVERNMENT OF INDIA
MINISTRY OF COMMERCE

New Delhi, the 9th November, 1949.

No. 104-M.I. (13)/48

From

H. C. Sarin, Esquire, I.C.S.,
Deputy Secretary to the Government of India.

To

The Principal,
College of Engineering & Technology, Bengal,
P.O. Jadavpur College, Calcutta—32.

Subject :—Recognitions of the College of Engineering & Technology, Bengal, for purpose of the Rules Regulating the granting of certificates of competency to engineers (including motor engineers).

SIR,

With reference to your letter No. G5/12/48 dated the 11th September 1948, on the above subject, I am directed to