Prospectus: Bolton Street

Mechanical Engineering: Prospectus for Day and Evening Classes
1951-52

City of Dublin Vocational Education Committee

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DEPARTMENT OF
MECHANICAL ENGINEERING
TECHNICAL INSTITUTE
BOLTON STREET, DUBLIN
1951-52

PROSPECTUS
FOR DAY AND EVENING CLASSES
CALENDAR — SESSION 1951-52

1951—SEPT. 3 MONDAY
Trade Apprentice Part-time Day Classes open for enrolment and Wholetime Day Apprentice School resumes work.

10 MONDAY
Trade Apprentice Part-time Day Classes commence work and Higher Technological Course opens for enrolment.

17 MONDAY
Higher Technological Course commences work and Evening Courses open for enrolment.

24 MONDAY
Evening classes commence work.

DEC. 19 WEDNESDAY
Final Class meetings before Christmas Vacation.

1952—JAN. 7 MONDAY
All Classes resume work after Christmas Vacation.

MAR. 17 MONDAY
St. Patrick's Day. School closed.

APR. 8 TUESDAY
Final Class meetings before Easter Vacation.

16 WEDNESDAY
Evening Classes resume work after Easter Vacation.

21 MONDAY
All Day Classes resume work after Easter Vacation.

MAY 2 FRIDAY
Final Meetings of Evening Classes, except where otherwise arranged.

JUNE 2 MONDAY
Whit Monday. School closed.

28 SATURDAY
Summer Term closes except where otherwise arranged.

Schools closed on all Bank Holidays not specified in above calendar.

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department:
MARTIN Keady, B.E., B.Sc., A.R.C.S.C.I.

Assistant Head of Department:
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CITY OF DUBLIN VOCATIONAL EDUCATION COMMITTEE

Alderman Dr. Cormac Breathnach, T.D., 384 Clontarf Road, Dublin.
Alderman Bernard Butler, B.A., T.D., 16 Healthfield Road, Terenure, Dublin.
Alderman John McCann, T.D., 68 Fortfield Road, Terenure, Dublin.
Councillor Joseph Barron, 10 South Circular Road, Portobello, Dublin.
Councillor Blatter Breathnach, 58 Bannow Road, Cabra West, Dublin.
Councillor Patrick J. Cahill, P.C., 64 Aungier Street, Dublin.
Councillor Timothy J. Murray, P.C., "Cresswell", 9 St. Peter's Road, Phibsboro, Dublin.
Councillor Michael J. O'Higgins (Vice-Chairman), 11 St. Mary's Road, Ballsbridge, Dublin.
Mr. W. J. Whelan, 61 Lower Beechwood Avenue, Ranelagh, Dublin.
Mr. Eamonn Delaney, 29 Oulton Road, Clontarf, Dublin.
Micheal O Muircheartaigh (Commdt.), 56 Vernon Avenue, Clontarf, Dublin.
Mrs. M. Mulvey, P.C., Co.C., Readsdale, Main Street, Dundrum.
Micheal O Foghludha, 5 Cabra Road, Dublin.

Chief Executive Officer.

CITY OF DUBLIN VOCATIONAL EDUCATION SUB-COMMITTEE

(Technical Institute, Bolton Street)

Councillor Blatter Breathnach, 58 Bannow Road, Cabra W.
Mr. Gerald Doyle, Dublin Operative Plasterers' Trade Society.
Mr. Robert Murphy, Master Jewellers' Association.
Mr. M. P. Rowan, 52 Capel Street, Dublin.
Mr. W. J. Whelan, Dublin Typographical Provident Society.
Mr. Hillary Williams, Ancient Guild of Incorporated Brick and Stonemasons.
Mr. G. B. Hetherington, Master Printers' Association.
Mr. A. J. Wilson, Dublin Master Printers' Association.
Mr. P. J. Kearney, Irish Engineering Industrial Union.

MARTIN KEADY, B.E., B.Sc., A.R.C.Sc.I., 
Principal.

Telephone: 53443-4.
ADVISORY COMMITTEES

Mechanical Engineering

J. Cassidy, General Secretary, Irish Engineering and Foundry Union, 33 Gardiner’s Place, Dublin.

J. O’Brien, General Secretary, Irish Engineering Industrial Union, 6 Gardiner’s Row, Dublin.

Brian D’A. Patterson, Personnel Officer, Coras Iompair Eireann, 59 Upper O’Connell Street, Dublin.

H. Lennox, General Manager, Liffey Dockyard Co., East Wall, Dublin.

S. O’Flaherty, Managing Director, Messrs. Howard MacGarvey & Sons, 62 Townsend Street, Dublin.


W. P. Bates, District Secretary, United Society of Boilermakers and Iron and Steel Shipbuilders, 11 Richmond Hill, Rathmines.

Motor Engineering

A. McAuley, B.Sc., Rolling Stock Engineer, Coras Iompair Eireann, Broadstone, Dublin.


Patrick Doyle, Secretary, Irish Automobile Drivers’ and Auto-Mechanics’ Union, 9 Parnell Square, Dublin.

J. O’Brien, Secretary, Irish Engineering Industrial Union, 6 Gardiner’s Row, Dublin.

Watchmaking

R. Murphy

G. W. Sleater

J. Ryan, Gold, Silver and Allied Trades Union.

TECHNICAL INSTITUTE, BOLTON STREET

Principal: MARTIN KEADY, B.E., B.SC., A.R.C.S.I.

Vice-Principal: DONAL O’DWYER, B.Arch., M.R.I.A.I.

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department: THE PRINCIPAL

Assistant Head of Department:


Head of Motor Car Engineering Division:


Chief Instructor (Mechanical Engineering Trades):


DEPARTMENT OF ARCHITECTURE AND BUILDING

Head of Department:

The Vice-Principal

Assistant Head of Department:

B. O’Reilly, B.Arch., A.R.I.B.A.

Chief Instructor (Building Trades):


DEPARTMENT OF PRINTING AND BOOK PRODUCTION

Head of Department:


SCIENCE DIVISION

Head of Division:


DAY JUNIOR TECHNICAL SCHOOL

Teacher-in-Charge:

L. Mac Amhlaoibh, B.A.

Stock-taker:

W. J. N. O’Brien, dipl. ing.

Clerk:

TOMAS O SOMACHAIN
DEPARTMENT OF MECHANICAL ENGINEERING

TEACHING STAFF

1. Mathematics; Science; Strength of Materials, and Applied Mechanics:
   J. D. Barry, M.Sc., B.E., A.M.I.MECH.E., A.M.I.A.E.
   J. Boylan, A.M.I.MECH.E., A.M.I.C.E.I.
   E. P. Dunne, A.M.I.MECH.E., A.M.I.C.E.I.
   J. J. Hughes, H.Dip.Ed.
   S. H. Knight, B.A.
   G. Latchford, B.E., B.Sc.
   S. O'Tuama, B.Sc.
   S. Rossiter.

2. Heat Engines: Applied Thermodynamics:
   J. D. Barry, M.Sc., B.E., A.M.I.MECH.E., A.M.I.A.E.
   G. Latchford, B.E., B.Sc.
   S. Rossiter.

3. Machine Design; Theory of Machines:
   J. D. Barry, M.Sc., B.E., A.M.I.MECH.E., A.M.I.A.E.

4. Machine Drawing and Construction:
   J. C. Fitzpatrick, M.I.MECH.E., M.I.C.E.I.
   G. Latchford, B.E., B.Sc.

5. Automobile Electricity:
   J. C. Fitzpatrick, M.I.MECH.E., M.I.C.E.I.
   G. Latchford, B.E., B.Sc.

6. Motor Car Engineering:
   S. Guirke.
   W. D. Pile, A.M.I.MECH.E., A.M.I.A.E.
   T. Giblin.

7. Physical Training:
   M. Doogan

8. Trade:—Theory and Practice:

Boilermaking—E. Bennett.
Brassfinishing—M. O'Carroll
Brass Moulding—C. Maples
Fitting and Turning—
   G. Aungier
   O. W. Crotty.
   H. Fitzgerald
   J. Gribben.
   W. Hunt
   W. De Renzy
   S. Rossiter.
   R. Tynan
   W. Daly

Iron Moulding—T. C. Smith.

Smithwork and Art Ironwork—
   A. J. Ward

Garage Practice—
   W. Cully.
   R. J. Dowling
   J. Guirke
   T. Giblin.

Metalplate Work—
   J. Bryan.
   C. Devine.
   M. Kane.
   T. J. Ryan
   A. O'Toole

Oxy-acetylene and Electric Welding—
   J. O'Toole.
   P. Cowley.

Patternmaking—E. J. Kennedy

Watchmaking—F. O'Kelly
GENERAL REGULATIONS FOR THE SCHOOLS AND CLASSES OPERATING UNDER THE AUTHORITY OF THE COMMITTEE

1. ADMISSION AND ENROLMENT

(a) In general, applicants for admission to the Classes and Courses must be not less than 14 years of age, but admission to a whole-time Day Course may be granted where the applicant is over 13 years of age and has been enrolled for at least one year in the Sixth Standard of a Primary School. This Regulation does not apply to the School of Music or Colaiste Muire, Cathal Brugha Street.

(b) The Committee, in accordance with the means and facilities at its disposal, has provided classes for the sole purpose of supplementing the practical trade training of persons actually employed at and engaged in the various operations of the trade and whose employment as such is accepted by the recognised Unions of the trades concerned.

(c) In determining whether an applicant for admission to one of these practical trade classes complies with the above conditions the Committee is guided, where necessary, by the evidence supplied by the Masters' Associations and the official Trade Unions of the trade concerned.

(d) Admission to a particular class or course is subject to the published regulations relative to that class or course.

(e) One month after the opening date of classes or courses students will be permitted to enrol only with the special permission of the School Authority.

(f) Pupils in attendance at Primary and Secondary Schools are not eligible for enrolment except by special permission of the School Authority.

(g) The educational fitness of a student to enrol in a particular course may be decided by an examination or other means considered necessary.

(h) A student is not entitled to enrol in a class or course which the School Authority decides is too advanced for his/her standard of knowledge.

(i) Enrolment procedure:—

(i) Intending students must enter on the Enrolment Form supplied all the information required by the School Authority.

(ii) The classes or courses to be taken are decided in interview with a member of the School Staff.

(iii) The appropriate fee is then paid to an officer of the Committee and a receipt issued therefor. A student who pays a fee must insist that he receives an official receipt for the amount of the fee paid.

(iv) The appropriate class ticket/tickets is then issued to the student.

(j) (i) No student may attend a class until he/she has received a class ticket.

(ii) On first attendance at each class the student must tender to the teacher in charge his/her appropriate class ticket, together with the receipt for fee paid.

(k) Students will be enrolled during the period and at the times stated in the Committee's publications.

(l) The School Authority is authorised to refuse an enrolment, pending a decision thereon by the Committee.

2. FEES

(a) The fees payable for the several classes and courses included in the Scheme of Instruction are stated in the publications of the Committee, and must be paid in full on enrolment unless otherwise stated.
(b) Where a course includes subjects of different stages, the total fee will be computed on the basis that the initial fee is that of the highest stage.

(c) For enrolments in subjects ancillary to the original enrolment, in the same or another School or Department, the additional fee will be computed on the basis that all the classes have been selected on first enrolment. Where the additional subjects are deemed not to be ancillary, the fee payable will be as for a separate enrolment.

(d) The School Authority is authorised to decide if the additional enrolment is ancillary to the original enrolment.

(e) For fee purposes, Irish and/or Physical Training will be regarded as additional subjects to any class or course.

(f) Fees will not be refunded except where a class does not form.

(g) Cheques should be crossed and made payable to the City of Dublin Vocational Education Committee.

3. TRANSFERS

An enrolment is not transferable from one student to another. Transfer from one class to another, from one School to another, from Day Classes to Evening Classes, or from Evening Classes to Day Classes, with allowance for the fees paid, will be permitted only for a satisfactory reason and by special permission of the School Authority.

4. PRODUCTION OF ORIGINAL RECEIPT

Where applications are made for additional enrolments, or for transfers, the original receipt must be produced.

5. FORMATION AND CONTINUANCE OF CLASSES

The Committee reserves the right at any time to add or delete classes or courses to or from its Scheme of Instruction; to extend the period of a class; and to close a class, or to alter the day or times of a class meeting.

6. DISCIPLINE

The School Authority may suspend any student for breach of rules and regulations; absence from classes; irregular or unpunctual attendance; disorderly conduct in the School or within the School precincts; disobedience to a member of the staff; or for any other reason deemed sufficient. The Committee reserves the right to confirm such suspension and to cancel the enrolment without refund of fee. Where immediate action is required because of indiscipline on the part of the students, any member of the School Staff has authority to take appropriate measures, pending report to the School Authority.

7. SMOKING

Smoking is not permitted in the Schools.

8. INJURY TO STUDENTS

The Committee does not accept responsibility for injury to students resulting from careless conduct or neglect or disregard of regulations.

9. STUDENT PROPERTY

The Committee does not accept any responsibility for loss or damage to any student property—bicycles, hats, coats, books, etc.

10. SCHOOL PROPERTY

Where School property is damaged willfully or through careless conduct on the part of students, such students (or their parents or guardians) may be required, on the order of the Committee, to pay for such repairs or replacements as may be necessary.

11. CHANGE OF ADDRESS

Students should notify the School Authority of any change of address.
12. BOOKS, STATIONERY, EQUIPMENT, DRESS

Students are expected to provide themselves with such books, stationery, equipment and dress as may be required.

13. INFECTIOUS AND NOTIFIABLE DISEASES

The head of the household must inform the School Authority immediately of any infectious or notifiable disease which may occur in the house in which a student is residing. Such a student must not resume attendance until permitted to do so by a medical officer.

14. EXAMINATIONS

Permission to sit for Scholarship, Sessional or other Examinations held under the authority of the Committee, will be governed by the conditions relevant to the examinations.

15. SCHOOL AUTHORITY

The term "School Authority," as used in these Regulations, indicates the Chief Executive Officer, or an officer delegated to act on his behalf.

CONDITIONS REGULATING THE ADMISSION OF STUDENTS TO CLASSES AND COURSES

Practical Workshop Classes in Trade Subjects

These classes are provided for the sole purpose of supplementing the practical trade training of persons actually employed at and engaged in the various operations of the trade. The Committee realise that it is impossible for a person to learn a trade solely by attendance at these classes, and are further of the opinion that the admission to the classes of persons not actually engaged in the trades would be, not only of little use to such persons, but would prejudicially affect the instruction of those for whom the classes have been organised. Accordingly, the Committee reserve the right to restrict enrolment in the trade practical classes to those persons who are actually employed in the several processes and operations of the trade.

In the Mechanical Engineering Department the classes to which this regulation refers in the Session 1951-52 will be:

(i) Evening Trade Classes in:

- Fitting and Turning; Garage Practice; Metal Plate Work; Brassfinishing; Patternmaking; Boilermaking; Smithwork; Art Iron Work; Oxy-Acetylene and Electric Welding; Foundry Work — Iron Moulding; Brass Moulding; Watchmaking.

(ii) Part-time Day Apprentice Workshop Classes in:

- Fitting and turning; Garage Practice; Oxy-Acetylene and Electric Welding.

For admission to the trade classes as named, proof of actual employment in the several processes and operations of the trade will be certificates to that effect from the Masters' Associations and/or the official Trades Unions of the trade concerned.

The above Regulations have been adopted by Resolution of the Vocational Education Committee for the City of Dublin and approved by the Minister for Education.
Conditions Regulating the Admission of Students to Classes and Courses — Continued

DAY AND EVENING TECHNOLOGICAL COURSES

Only such students will be admitted as have attained a standard of general education that will enable them to follow all the subjects of the Course with profit. In the absence of satisfactory evidence on this point, intending students may be required to pass a qualifying examination as a condition of admission.

The above Regulations have been adopted by Resolution of the Vocational Education Committee for the City of Dublin and approved by the Minister for Education.

FEES

<table>
<thead>
<tr>
<th>Course</th>
<th>Fees per Session £ s. d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MECHANICAL ENGINEERING TECHNICAL</td>
<td></td>
</tr>
<tr>
<td>Day Courses</td>
<td>2 0 0</td>
</tr>
<tr>
<td>2. PART-TIME DAY APPRENTICE COURSES</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering—all trades</td>
<td>1 0 0</td>
</tr>
<tr>
<td>3. EVENING COURSES AND CLASSES</td>
<td></td>
</tr>
<tr>
<td>All Courses or Single Subjects</td>
<td>0 10 0</td>
</tr>
<tr>
<td>Additional Subjects</td>
<td>0 3 0</td>
</tr>
</tbody>
</table>

GENERAL DESCRIPTION OF THE ACTIVITIES OF THE MECHANICAL ENGINEERING DEPARTMENT

The work of the Department comprises both Day and Evening Courses and is carried out under two main sub-divisions:

(i) Mechanical Engineering Technology.
(ii) Mechanical Engineering Trades.

DAY SCHOOL ACTIVITIES

The Day School activities comprise:

(a) Whole-time Pre-Apprenticeship Courses. (See Day Junior Technical Course Prospectus.)
(b) Whole-time Apprentice Scholarship Courses,
(c) Part-time Apprentice Courses in:
   Fitting and Turning; Motor Mechanics' Work.
(d) Technological Courses in Mechanical Engineering.

EVENING SCHOOL ACTIVITIES

The Evening School activities comprise:

(a) Technological Courses in:
   Mechanical Engineering; Marine Engineering.
(b) Trade Courses in:
   Fitting and Turning; Garage Practice; Metal Plate Work; Brassfinishing; Patternmaking; Boilermaking; Smithwork; Art Ironwork; Oxy-Acetylene and Electric Welding; Foundry Work; Watchmaking; Brass Moulding.
DESCRIPTION OF COURSES
TECHNOLOGICAL COURSES

(i.) Mechanical Engineering (Higher Technological)

Day Course A.

This Course is designed to meet the requirements of the Syllabus of the Associate Membership Examination of the Institution of Mechanical Engineers.

Lectures are given on two days per week from 9.30 a.m. to 12.30 p.m., and from 2.00 p.m. to 5.00 p.m. In addition, the students attend at suitable evening school classes in those subjects in which they may require extra tuition. The lecture work is modelled directly on the requirements of the examination syllabuses and is supplemented by practical work in the mechanical and engine testing laboratories. Students must carry out all homework and drawing exercises which are set by the lecturers.

The Course is designed on a four-years' basis, and the subjects chosen from the Institution programme are as follows:

Section A: Mathematics,
Applied Mechanics,
Engineering Drawing,
Applied Heat,
Workshop Technology.

Section B: Theory of Machines and Machine Design,
Properties and Strength of Materials,
Applied Thermodynamics.

Section C: Industrial Administration.

Permission to sit for the examination must be obtained from the Council of the Institution following the sending in of Proposals for Election.

On passing the requisite examinations the students may be elected as Graduate Members, provided that they fulfil the following requirements of the Institution:

(1) That they are between the ages of 21 and 30 years; and

(2) That they satisfy the Council that they have received or are receiving such regular training as Mechanical Engineers as would, in due course, fit them for employment as Mechanical Engineers.

For enrolment in this Course, students must be at least 18 years of age and must possess such a standard of general education as would, in the opinion of the Principal, enable them to follow the instruction given.

The students must provide themselves with the specified textbooks, note-books and drawing instruments.

(ii.) Mechanical Engineering Technological Day Course B.

Apprentices successful at the Department of Education elementary stage examinations in Mechanical Engineering and Mathematics at the end of the second year, Course 2, are promoted to this course and are prepared for the Intermediate and Advanced Stage Examinations of the Department of Education.

(iii.) The Evening Course in Mechanical Engineering Technology (Nos.13-18) is a 6-years’ course designed for students in engineering employment who wish to qualify in the technological branches of their work. A good standard of general education is required on entrance. Apprentices to the engineering trades who enjoy full opportunity for learning all branches of their trade in the works and who have the required standard of general education, are advised to choose the technological in preference to the trade course.

The course prepares students for the Higher Technological Certificate Examinations in Mechanical Engineering of the Department of Education.
(iv) Heating, Ventilating and Air Conditioning. Course A

This Course is designed to meet the requirements of the Syllabus of the Associate Membership Examination of the Institution of Heating and Ventilating Engineers.

Lectures are given on two days per week, from 9.30 a.m. to 12.30 p.m. and from 2.0 p.m. to 5.0 p.m., for the Section A Examination. The students attend evening classes for the professional subjects of Section B Examination. The lecture work is modelled directly on the requirements of the Institution examination syllabuses and is supplemented by practical work in the laboratories. Students must carry out all homework and drawing exercises set by the lecturers.

Permission to sit for the examination must be obtained from the Council of the Institution.

For enrolment in this Course, students must be at least 18 years of age and must possess such a standard of general education as would, in the opinion of the Principal, enable them to follow the instruction given.

(v) Heating, Ventilating and Air Conditioning. Course B

This is a six-years evening Course which prepares students for the Associate Membership Examination of the Institution of Heating and Ventilating Engineers.

(vi) The Evening Course in Marine Engineering (Nos. 13-16) is a 4-years' course designed for students who are employed in engineering works and who intend to go to sea as marine engineers. The course covers the syllabus of Part A of the Certificate of Competency Examination (2nd Class) of the Board of Trade, and examinations giving exemption therefrom (See p.33). Before going to sea, a student is required to have completed at least four years of approved apprenticeship, and it is a distinct advantage to have already passed Part A of the Examination. The Institute is recognised by the Board of Trade for exemption purposes and students who have attended courses satisfactorily will be entitled to claim partial exemption from the four years of approved apprenticeship specified. Further particulars may be obtained from the Head of the Department or by consulting the Board of Trade Regulations.

2. TRADE COURSES

These courses are designed for apprentices and young journeymen engaged in the several trades. Every facility is given to students who wish to enter for the Trade Certificate Examinations of the Department of Education or of the City and Guilds of London Institute, these examinations being conducted in the School at the close of the evening session.

Evening Courses leading to the Department of Education Examinations are provided in the following trades:

- Fitters' and Turners' Work; Metalplate Work; Brass-finishing; Motor Car Engineering; Boilermaking.

Evening Courses are also provided in the following trades:

- Patternmaking; Foundry Work; Smithwork and Art.Ironwork; Oxy-acetylene and Electric Welding; Watchmaking; Brass Moulding.

Part-time Day Apprentice Courses. By agreement with certain employers, apprentices are allowed time off to attend this course on one day (6 hours) per week. It is a two-year course which aims at the attainment of the standard of the Elementary Technological Certificate of the Department of Education.

Part-time Day Courses: Fitters and Turners, and Motor Mechanics (Scheme A). By agreement with certain employers, apprentices are allowed time off to attend these courses on one day (6 hours) per week. The course aims at the attainment of the standard of the Junior and Senior Trade Certificates in Motor Car Engineering of the Department of Education.

Part-time Day Courses: Apprentice Motor Mechanics (Scheme B). By agreement with the Society of Irish Motor Traders, the apprentices of all city members of the Society are allowed off to attend this course on one half-day per week. The course is a five-year course which aims at the standard of attainment of the Junior and Senior Trade Certificates in Motor Car Engineering of the Department of Education.

3. PHYSICAL TRAINING

Evening Courses in Physical Training for men are provided.
EXAMINATIONS

The Courses are designed to prepare students for the following External Examinations:

1. Department of Education Examinations.
   (a) i. Elementary, Intermediate and Advanced Technological Certificate Examinations in Mechanical Engineering.
   ii. Higher Technological Certificate in Mechanical Engineering.
   (b) Junior and Senior Trade Certificate Examinations in:
       Fitters' Work; Turners' Work; Metal Plate Work; Brassfinishing; Motor Car Engineering; Boilermakers' Work.

2. Examinations of Professional Institutes.
   The Institution of Mechanical Engineers.
   The Institute of Marine Engineers.
   The Institution of Civil Engineers of Ireland.
   The Institution of Heating and Ventilating Engineers.

3. Board of Trade Examination for the Certification of Marine Engineers


5. University of London.

Further particulars regarding the above Examinations may be obtained from the Head of the Department.

SCHOLARSHIPS AND PRIZES

Day Apprentice Scholarships, entitling the holders to free training for two years in the Whole-time Day Apprentice Scholarship Courses, together with a payment of twelve shillings per week during the first year and sixteen shillings per week during the second year of the Courses. On the conclusion of the Courses, students are accepted as third-year apprentices to the trades. The scholarships are awarded to candidates between the ages of 14 and 16 years who have passed a qualifying examination of Primary Leaving Certificate standard and who have been selected on the result of an interview by a board consisting of representatives of the School and of the Employers' and Operatives' Associations of the trades concerned. Examinations and interviews are generally conducted in the month of March.

The Dublin Mechanics' Institute Scholarships are provided for by the Dublin Mechanics' Institute Residuary Fund. One scholarship is awarded annually to apprentices between the ages of 16 and 19 years who have been in attendance at a Technical Course during the previous session and made a specified minimum attendance. The Scholarships are tenable for three years and are valued about £3 each per year.

The Department of Education offers the following medals and prizes annually in connection with their examinations:

   (a) Technological Certificate Examinations. A prize of £1 in each subject of the Elementary and Intermediate Stages. A silver medal, a first prize of £2 and a second prize of £1 in each subject of the Advanced Stage.

   (b) Trade Certificate Examinations. A prize of £1 in each of the practical and written examinations of the Junior Stage. A bronze medal and a prize of £2 in each of the practical, and a prize of £1 in each of the written, examinations of the Senior Stage.
The William Rooney Memorial Prizes are provided for by a trust fund, established in memory of William Rooney (Fear na Muinntir), the Irish poet and patriot. A sum of approximately £12 is available annually for awards to students who are apprentices to the Mechanical Engineering and Building trades. The award alternates in successive years between students of the Engineering and Building trade groups, but is not available to holders of scholarships in the Day Apprentice Courses. A competent knowledge of Irish is an essential requirement, in addition to regular attendance and proficiency.

The Union of Sheet Metalworkers’ Prize, value £7 7s., is awarded annually to apprentices of the Sheet Metalwork Classes, mainly on the results of the Trade Certificate Examinations of the Department of Education.

EQUIPMENT


Laboratories

The Laboratories, covering a floor area of 7,500 sq. feet, are five in number:

(a) **Physics and Chemistry Laboratory** with Preparation Rooms and Stores equipped with the usual apparatus required for general courses in Science.

(b) **Applied Mechanics and Materials Testing Laboratory** well equipped with apparatus for demonstrating the laws of statics and dynamics and with machines for testing engineering and building materials in compression, tension, shear, bending and torsion, and for measuring deflections and extensions under load. The equipment includes an Avery vertical single-lever testing machine capable of applying tension or compression up to 5 tons; a vertical-screw testing machine for deflection and cross-breaking tests; a torsion testing machine; a cement testing machine of the compound lever type; a beam testing apparatus; a Searle extensometer and several wire extensometers and compression and tension testing machines for springs; strut apparatus; Fletcher's trolley; experimental flywheels; gyroscope; balancing machine; whirling speed apparatus; fatigue testing machine; various apparatus for determining the moduli of elasticity, etc.

(c) **Applied Heat Laboratory** with equipment for experimental work on Heat and Heat Engines, including Jünker and Bomb Calorimeters; flashpoint and viscosity apparatus;
Orsat apparatus; pyrometer (Whipple’s Heat Recorder); equipment for the study of the gas laws (including temperature-pressure apparatus for high pressures); steam pressure gauges; Peugeot Engine and the Davidson apparatus demonstrating the principles of domestic hot-water installations, etc. Several engine and boiler models including the principal steam engine valve mechanisms, etc.

(d) An Electricity Laboratory fitted with equipment for experimental work on magnetism, static electricity and D.C., including M.C. Ammeters; Voltmeters; Galvanometers; Metre Bridges; P.O. Box; 1½ K.W. Canning Motor Generator Set feeding through bus-bars to work benches. Special equipment for use in connection with courses in Automobile Electricity include Newton Test Bench for 6 V. and 12 V. Automobile equipment; Davenset; two-circuit metal Rectifier Battery Charger (2V-60V., 3A. and 10A outputs). Varied selection of motors, dynamos and associated electrical apparatus.

(e) An Engine Testing Laboratory fully equipped for Experimental work on Petrol, Oil, Gas and Steam Engines. The plant includes:

A 4-cylinder Wolseley petrol engine fitted with Hopkinson Indicator for photographing the indicator diagrams; a water-cooled Prony brake; calorimeters for measuring heat loss in jacket water and exhaust gases and measuring tank for finding petrol consumption.

A 50 B.H.P. Diesel oil engine by Mirrlees, Bickerton and Day fitted with motor-driven compressor; Froude dynamometer; indicator; Orsat apparatus; etc., for engine and heat balance tests.

A 28 B.H.P. gas engine by Crossley Bros. fitted with the usual apparatus for making B.H.P. and I.H.P. tests, etc.

Three experimental steam engines with apparatus for making B.H.P. and I.H.P. tests.

Experimental apparatus for the study of the properties of steam, including throttling calorimeter; injectors; steam traps; apparatus for illustrating relative conductivity of lagging materials, etc.

NOTE:—Senior Students specialising in advanced experimental work must obtain permission of the Head of the Department before proceeding with engineering investigations.

Drawing Offices and Art Room

There are six well equipped and well lighted Drawing Offices and an Art Room covering in the aggregate a floor area of 7,000 sq. ft. The Art Room is provided with a good selection of models and plaster casts, while the Drawing Offices are stocked with a large number of engineering models for machine construction and design purposes.

Workshops

Trade workshops, having an aggregate floor area of over 30,000 sq. ft., are individually equipped for each of the trades covered by the activities of the Institute.

The Fitting and Turning Workshops are well provided with modern machine tools, including: fourteen power driven screw-cutting surfacing lathes, seven drilling machines, one vertical and one horizontal universal milling machine, a 3-ft. planer, two shaping machines, a universal grinding machine, a power saw and grinders for twist drills and lathe tools. There are five smiths hearths.

The Garage is equipped with the usual small tools for repairing British and American cars and with an hydraulic hoist; portable electric drilling machine; hydraulic press; boring bars for big-end and main bearings and for cylinder reconditioning; connecting rod
and steering aligning tools; battery-charging equipment; stenor tyre vulcanizer; air meter for tyre inflation; Stromberg engine test apparatus and Weston electrical fault-finding instruments.

Other fully equipped workshops are provided in the Mechanical Engineering Department as follows:

- Boilermaking; Foundry; Patternmaking; Metal-plate Work;
- Oxy-acetylene and Electric Welding; Smithwork and Art Ironwork; Watchmaking.

Classrooms and Lecture Rooms

There are a number of well-lighted classrooms equipped on modern lines and covering in the aggregate a floor area of over 6,000 sq. ft., and a Cinema Theatre with seating for 200 students.

Gymnasium

A large Gymnasium covering a floor area of 2,200 sq. ft. is provided for Physical Training.

Surveying and Levelling Equipment for class work and field work includes 100-ft. and Gunter’s chains and accessories; two improved Dumpy levels and one Crooke Throughton level; theodolite; levelling staffs; plane-table clinometer; prismatic compass; planimeter; the usual scales, computing scales, proportional dividers, protractors, etc.

Models and Specimens

A large collection of Mechanical Engineering models has been acquired and is constantly being added to. These include: models of machine tool parts; sectioned models of engine parts and of all common types of valve gears; structural engineering details; boilers and mountings; engine cylinders; hydraulic details, etc.

Visual Aids

The following visual aids are provided:—
35 mm. silent film projector; 16 mm. sound film projector; film strip projector; slide projectors and epidiascope.
### MECHANICAL ENGINEERING TECHNOLOGICAL COURSE A

#### FIRST YEAR

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**Note:** Applied Mechanics includes: Strength and Properties of Materials, Theory of Machines.

Mechanical Engineering includes: Mathematics, Machine Design, Laboratory work and lectures on General Mechanical Engineering.

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### HEATING, VENTILATING and AIR CONDITIONING — COURSE A

#### PART I—FIRST YEAR

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**MECHANICAL ENGINEERING TECHNOLOGICAL COURSE B**

**THIRD YEAR**

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**PART-TIME DAY COURSE IN FITTING AND TURNING**

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### Technological Certificate Courses

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### MARINE ENGINEERS' CERTIFICATE COURSE (Part A)

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**Note:** Students successful at the Department of Education Advanced Stage Examinations in Applied Mechanics and Heat Engines and the Inter. Stage Examination in Machine Drawing and Construction, Mechanical Engineering Course, are exempt from part A of the Certificate of Competency Examination (2nd Class) of the Board of Trade.

### HEATING, VENTILATING and AIR CONDITIONING — COURSE B

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# TRADE CERTIFICATE COURSES

(Trade Apprentices and Mechanics)

**FITTERS' WORK AND TURNERS' WORK**

## JUNIOR STAGE

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## SENIOR STAGE

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## PATTERNMAKING

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## FOUNDRY WORK

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**THIRD YEAR:**

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Students are recommended to add a class in Free Drawing and Design.

### BOILERMAKING

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Students are recommended to add a suitable class in Mathematics.

### SMITHWORK AND ART IRONWORK

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Students are recommended to add a class in Design.

### METAL PLATE WORK

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**THIRD AND FOURTH YEARS**

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### OXY-ACETYLENE AND ELECTRIC WELDING

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Students are recommended to add a class in Design.
## Watch and Clock Making

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## Physical Training (Men)

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## Apprentice Motor Mechanics Evening Courses

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### PART-TIME DAY AND EVENING COURSES

#### C.I.E. APPRENTICE MOTOR MECHANICS

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### PART-TIME DAY AND EVENING CLASSES

#### S.I.M.T. APPRENTICE MOTOR MECHANICS

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Syllabuses of Subjects
1—MATHEMATICS I


2—MATHEMATICS II


3—MATHEMATICS III

4—MATHEMATICS IV


4A—MATHEMATICS

Algebra—Indices, the exponential theorem, logarithms, arithmetical and geometrical series; the binomial theorem and its application to approximations; graphical representation of functions; graphical solution of equations; determination of law connecting variables.

Trigonometry—The solution of plane triangles; the representation of directed quantities by vectors; the summation of vector quantities; the functions of the sum and difference of two angles with derived formulae; simple trigonometrical equations.

Differentiation and Integration—Differentiation of simple functions; differentiation of products and quotients of two functions and of a function of a function; applications to maxima and minima; expansion in a series, and curvature; integrations of simple functions; graphical methods of integration; applications of the integral calculus to the evolution of plane areas, surfaces, volumes; moments of inertia; mean values, and root mean squares.

5, 6—MATHEMATICS V, VI


6A—MATHEMATICS

Further partial differentiation; maxima and minima of functions of several independent variables, including method of least squares; change of independent variables. Elementary vectors, including scalar and vector products. Fourier series and numerical harmonic analysis. Line, surface, and volume integrals. Differential equations, including first and second order equations, integrable by quadratures; linear differential equations with constant co-efficients, equations reducible to these, and simultaneous linear equations with constant co-efficients; easy examples of solution by separation of variables. Functions of a complex variable, elementary ideas and simple examples of conformal transformation. Three-dimensional co-ordinate geometry of the straight line, plane, and the simpler curved surfaces; tangent planes and normals. Spherical trigonometry. Plane motion of a rigid body: work, energy, momentum and moment of momentum. Virtual work; stationary energy; stability of equilibrium. Mathematical problems associated with engineering subjects.
7—MECHANICS I


8—MECHANICS II


9—APPLIED MECHANICS III.


10—APPLIED MECHANICS IV


10A—APPLIED MECHANICS

Statics—Forces acting on a rigid body; moments of forces; composition and resolution of forces; friction; machines; efficiency couples; conditions of equilibrium, with application to simple framed structures and beams; bending-moment and shear-force diagrams.

Hydrostatics—Pressure at a point in a liquid; centre of pressure on an immersed plane area; equilibrium of floating bodies.

Kinematics (of Motion in a Plane)—Velocity and acceleration of a point; relative motion; acceleration of a point moving in a circular path with uniform speed; simple harmonic motion; velocity-ratio diagrams of simple mechanism; instantaneous centre.

Kinetics—Force, mass, impulse, momentum, work, energy, power; moment of momentum; moment of inertia; their relations and measurements; conservation of energy; conservation of linear momentum; rectilinear motion of a body under a force (constant or variable); equation of motion of a particle; motion of a body in a circular path with uniform speed; balancing of rotating masses; rotation and oscillation of a body about a fixed axis.

Hydraulics—Pressure and velocity charge along a streamline. Bernoulli's theorem; flow through an orifice.

Strength of Materials (Elementary)—Hook's law; Young's modulus; modulus of rigidity; analysis of stress; theory of simple bending; theory of torsion of round and hollow shafts.

11—STRENGTH OF MATERIALS V

Revision of Compound bars. Live loads. B.M. and S.F. diagrams. Beams and structures. Structures; Stress diagrams; Method of sections. Theory of bending; Application; Built-up joists, etc. Short

12-STRENGTH OF MATERIALS VI


12A-PROPERTIES AND STRENGTH OF MATERIALS

Stress and Strain—Stress and strain in tension, compression, and shear; Hooke's law; relations between elastic constants. Combined stress in two dimensions. Circle diagram.

Compound bars in tension and compression; elementary consideration of stress due to temperature changes. Riveted and welded joints.

Cylinders—(1) Thin cylindrical and spherical shells under internal pressure. (2) Stress in thick-walled cylinders under internal and external pressure. Force and shrink fits.

Beams—Direct and shear stresses in beams.

Slope and deflexion of cantilevers and freely supported and built-in beams for simple cases of loading.

Torsion.—Torsion of round bars. Transmission of power by shafts.

Combined Stresses.—Combined bending and direct stress, and combined bending and torsion.

Strain Energy.—(1) Work done in elastic deformation. (2) Stresses due to suddenly applied loads.

Springs—Laminated springs and close-coiled helical springs.

Struts—Elementary theory of struts with use of empirical formulae.

Properties of Materials—The mechanical properties of materials; composition and properties of the important metals used by engineers; effects of heat treatment, annealing and normalising; the effect of cold work on the properties of metals; elasticity, plasticity, ductility, tenacity, hardness, resistance to shock; resistance to repeated and alternating stress; effect of form and surface conditions; failure under combined stress; creep at high temperatures; considerations affecting the choice of the safe working stress in design.

Testing of Materials—Common types of machine and instruments for the investigation of mechanical properties. Forms of specimen; procedure in carrying out tests, and methods of expressing results.
12B—STRENGTH AND ELASTICITY OF MATERIALS


(b) More difficult questions on the work of (a) together with:—Deflections of beams due to shear. Theory of bending of curved bars with simple applications. Laterally loaded struts and ties. Wire wound cylinders. Open coiled helical springs. Stress analysis of rotating rings and discs. Stresses in the simple cases of thin plates subjected to normal loading.


12C—THEORY OF MACHINES

Kinematics—Location of rigid bodies. Pairings, kinematical chains, mechanisms, inversion.

Methods of determining the relative velocities of parts in machines by calculation and by graphic methods. Simple cases of acceleration diagrams.

Cams: harmonic, constant-velocity, and constant-acceleration types; displacement, velocity, and acceleration of follower.

Gears: theory of shape and action of teeth; simple, compound, and epicyclic trains. Worm gears.

Kinetics—Inertia forces; on elements of mechanisms, cam followers, etc.


Engine turning moment diagrams; flywheels; governors.

Balancing: rotating parts; primary balancing of reciprocating parts, including locomotive balancing and secondary balancing of “in line” engines.

Vibrations: body with single degree of freedom; torsional oscillations of shafts with attached masses; transverse vibrations of beams; whirling of shafts; forces vibrations with viscous damping; use of vector diagram for determination of amplitude.

Gyroscope: theory and action.

Ttractive effort and performance curves for vehicles.

Friction and Lubrication—“Dry” friction; friction circle, plate and cone clutches, screws and pivots.

Belt and rope drives.

Elementary qualitative treatment of boundary and film lubrication applied to journal and thrust bearings.

General characteristics of ball and roller bearings.
12D—THEORY OF MACHINES


13—HEAT I


14—HEAT II


15—HEAT ENGINES III

16—HEAT ENGINES IV


16A—APPLIED HEAT

Thermometry — Measurement of temperature; pyrometry; platinum-resistance and gas thermometers; thermocouples, radiation pyrometers.

Transfer of Heat—Conduction, convection, radiation.

Calorimetry.—The first and second laws of thermodynamics; the gas laws of Charles, Boyle, Avogadro, Dalton, and Joule (internal energy); absolute temperature; the two specific heats; use of the gas constant R; internal and external energy; distinction between gases and vapours; phenomena of the critical state, total heat of wet, dry and superheated steam; dryness fraction of steam; use of steam tables, isothermal and adiabatic expansion and compression; heat added = increase of internal energy plus work done; application to constant volume, constant pressure, isothermal and adiabatic change; the P/V Diagrams for constant volume (Otto), constant-temperature (Carnot) and constant-pressure cycles; calculations of pressure, volume, and temperature throughout the cycles.

Heat Engines—The indicator card for the reciprocating engine; mean effective pressure; horsepower.

Combustion—Calorific value of fuels; higher and lower values; quantity of air required for combustion of carbon and hydrogen.

Properties of Matter—Viscosity of gases and liquids and its dependence on temperature, surface tension and its variation with temperature.

17—APPLIED THERMODYNAMICS V


18—APPLIED THERMODYNAMICS VI


18A—APPLIED THERMODYNAMICS

Thermodynamics—General therodynamics of gases and vapours. Internal and external energy, total heat and entropy. Energy charts for gases and vapours, including pressure-volume, pressure-total heat, temperature-entropy and total heat-entropy charts. Reversible and irreversible processes; throttling, isothermal, adiabatic and polytropic operations, and their representation on the energy diagrams. The Carnot cycle and the absolute scale of temperature.

Ideal Cycles for Vapour Engines—The Rankine cycle, including incomplete expansion and use of the steam jacket. The reheat cycle; the regenerative cycle by extraction of vapour during expansion; the binary vapour cycle. Representation of the cycles on energy diagrams and the calculation of their thermal efficiency.

Ideal Cycles for Internal Combustion Engines—The Ericsson, Stirling, constant volume and constant pressure cycles, including their modified forms; Diesel, Atkinson and dual combustion cycles. Representation of these cycles on energy diagrams and calculation of their thermal efficiency.

Elements of Heat Transfer, including: conduction through simple and composite walls; radiation to surfaces of simple geometrical shapes and between parallel planes; natural and forced convection.


Air Compressors and Motors. Simple treatment of air compressors and motors; multistage compressor and inter-cooling; volumetric efficiency; rotary compression; isothermal and adiabatic efficiencies.

Refrigeration and Heat Pump Cycles—The Carnot and the Joule cycles reversed; the vapour compression and the vapour absorption cycles; representation on energy diagrams and calculation of co-efficients of performance.

Steam Plant—Description of and simple calculations on boilers (standard forms), economizers, superheaters, and air preheaters; condensers (simple form of jet and surface types) and extraction of air and condensate. The steam reciprocating engine; the action of steam in the cylinder. Compounding. Diagram factor and efficiency ratio. Simple principles of the flow of steam through nozzles and of the impulse and reaction turbines, including velocity diagrams.

Internal Combustion Engines—Internal combustion engines and turbines and their cycles of operation as modified by the properties of the working fluid.

18B—APPLIED THERMODYNAMICS

(a) APPLIED THERMODYNAMICS


(b) STEAM ENGINES

INTERNAL-COMBUSTION ENGINES


19—MACHINE DRAWING I


20—MACHINE DRAWING II

21—MACHINE DRAWING AND CONSTRUCTION III


21A—ENGINEERING DRAWING


Construction of working drawings and sketches, including assemblies of the following:

MACHINE CONSTRUCTIONAL DETAILS:

Fastenings. Nuts, bolts, studs; keys, cotters, pins, locking devices.

Fixed and Flexible Joints. Riveted joints, forms and proportions of rivets; knuckle and cottered joints.

Transmission of Motion and Power:

Bearings. Types; details of construction; adjustment for wear and alignment. Lubrication. Supports and housing.

Shafts and Shafting. Couplings and simple clutches.

Tooth Gearing. Ordinary proportions of wheels and wheel teeth; tooth profiles.

Cams. Simple forms; determination of profiles.

Belt and Rope Drives. Pulleys.

Pressure Transmission:

Pipes and joints for steam, gas and water; valves; expansion joints; pressure packing.

22—MACHINE CONSTRUCTION AND DESIGN IV


Steam Engine Cylinder Details, including Design: Piston and piston rod. Stuffing box. Crosshead. Eccentric sheaves. Valve chest details, etc.

Boiler Mountings: Steam valves; pump details; steam trap, etc.


23—MACHINE DESIGN AND THEORY OF MACHINES V

General revision; Linear and Circular motion. Crank effort and Turning Moment Diagrams for reciprocating engines. Fluctuation of energy. Flywheels. Friction; Theory of Screw and Nut, etc. Frictional torque. Bearings; Collar; Thrust, etc. Banking of roads,

**MACHINE DESIGN:**

*Short Lectures on:* Stress concentration; overstrain; loads repeatedly applied and removed; temperature stresses; fatigue of metals; creep of metals; choice of working stresses; fits and tolerances; shrinking and forcing fits; methods of manufacture.


*A few representative designs such as:*

A double purchase crab winch; a bushed-pin type of flexible shaft coupling; a short centre belt drive and pulleys; a dry single plate clutch; bracket and bolts for a tilting gear, wall crane; hydraulic cylinder and pipe joint; a differential hydraulic accumulator; an exhaust-valve gear for a gas engine; centrifugal clutch; welded steel crane gantry girder.

**24—MACHINE DESIGN AND THEORY OF MACHINES VI**


**MACHINE DESIGN**

Representative designs of modern Mechanical Engineering Practice. The design for a number of the following items will be worked out and sketched in class and the students will make drawings of the design at home.


**27—ELECTRICITY I**

*MAGNETISM:*


MAGNETISM:


ELECTRICITY:


The heating effect of the current—its dependence on the current, voltage and time. Electrical energy—the watt, the joule, the Board of Trade unit. The relationship of electrical to mechanical power. Wattage of lamps.

The magnetic effect of the current. The electro-magnet—its polarity in relation to direction of current flow. Winding of electromagnets. The field of force of an electro-magnet. The strength of the electro-magnet dependent on the ampere turns. Effect of the core—magnetic saturation and residual magnetism. Pull of electro-

magnet—effect of an air gap. Simple application of the electro-magnet. The electric bell, the electric horn, etc. Inductive and non-inductive windings. The moving coil galvanometer. Magnetic types of ammeters and voltmeters. Essential differences between the ammeter and voltmeter.


MAGNETISM:

Magnets; natural and artificial; magnetic substances; magnetic poles, reactions between poles, identification of poles. Magnetisation and destruction of magnetisation; care of magnets; inseparability of poles. Lines of magnetic force, magnetic fields. Iron and steel; temporary and permanent magnets. Effect of iron on magnetic field.

ELECTRICITY:


MAGNETISM:

Revision of first year material, dealing in more detail with; iron and steel, magnetic induction, saturation.
ELECTRICITY:


30A—AUTOMOBILE ELECTRICITY

Third Year

Electrical equipment of the automobile. Ignition systems, magneto and coil; contact breaker, distributor, plugs, high tension wiring. Dynamo, cut-out and voltage regulators, battery, ammeter and fuses. Lighting and auxiliary circuits. Starter motor. Wiring of the various circuits and tracing of faults, etc.

30B—AUTOMOBILE ELECTRICITY

Fourth Year

Third year Course in more detail, with particular application to tests and fault-finding on individual automobile circuits.

31—ENGINEERING SCIENCE I


32—ENGINEERING SCIENCE II


33—ENGINEERING WORKSHOP THEORY I

Ferrous metal; reducing ores to metal. Cast-iron manufacture of properties; uses. Wrought-iron and low carbon steels—how made. Properties; uses. High carbon steels. Properties; uses. Non-ferrous metals; copper; reducing copper from ore. Copper; grades; properties; uses. Copper alloys; brasses; bronzes; properties; uses. Aluminium, tin, lead. Properties; uses. General revision of ferrous metals. General revision of non-ferrous metals. Measuring instruments: rule, straight edge, Callipers. Jennies; dividers. Hammers; chisels; use; sizes; forms for different purposes. Marking-out tools: scriber, centre punch, square level. Marking-out tools; V. blocks; surface plate; angle plate; level scribing block. Bolts, nuts, studs, set screws; different types of joints. Washers; locking devices. Screw threads; forms; lead; pitch whit. B.S.F., B.A. Hand cutting of
threads; dies; different types. Stocks. Hand cutting threads; taps. Drills; types, sizes, shanks. Straight flute drills; countersinks, rose heads, spot facers. Hacksaws; blades; frames; pitch of teeth cutting; various metals. Files; use, sizes, shapes. Files; character of cut, grades of cut. Pipes and pipe fittings; various joints; brass and gas threads. Soldered joints; solders; fluxes. Problems in marking out; holes in flanges; key seats or shafts. Problems in marking out; centring shafts, simple brackets; bearings.

34—ENGINEERING WORKSHOP THEORY II


35—ENGINEERING WORKSHOP THEORY III


36—ENGINEERING WORKSHOP THEORY IV


36A—WORKSHOP TECHNOLOGY

MATERIALS. The composition, physical properties and engineering uses of the more common metals and their alloys, such as cast iron, wrought iron, malleable iron, mild steel, medium-carbon steel, copper, gunmetal, brass, phosphor bronze, bearing metals, and light alloys.

Tool steels, carbon and high-speed steels, and special tool alloys; their suitability for different kinds of tools.

Market form of supply and relative costs, e.g., castings, forging, drop forging, bars, sheets, plates, rod and wire.

HEAT TREATMENT. The relation between heat treatment and the physical properties of plain carbon steels.


MANUFACTURING PROCESSES. An outline of the preparatory processes for forming, materials, e.g., moulding and casting, forging, drop stamping and die casting, rolling and drawing metal bars, dishing, drawing, and embossing sheet metal, pressing, spinning, and extruding, brazing and soldering, welding and cutting by arc and oxy-acetylene blowpipe flame.

MEASURING, GAUGING AND INSPECTION. General principles of interchangeable production and limit gauging.

B.S.I. Standards. Systems of limits and fits for plain and screwed work. Tolerances, limits, clearance, interference and transition fits. Tolerances associated with different machining operations.


CUTTING TOOLS. Cutting action of tools such as hand tools, lathe tools, drills, reamers, milling cutters, dies, taps, etc. Tool angles for different materials and purposes; measurements of tool angles. Cutting speeds and feeds. Estimation of machining times.

MACHINE TOOLS. Fundamental principles in the production of machine surfaces. Copying or forming and generating. Principal features of construction and functions of the more important general purpose machines, such as lathes, sensitive, vertical and radial drilling machines; shaping, slotting, planing and boring machines; plain milling machines and accessories; capstan and turret lathes; grinding and lapping machines. Chatter and the use of steadies. Lubrication. Types of lubricants. Types and use of cutting oils and solutions. Selection and methods of application.

SAFETY MEASURES. Sources of danger and methods of protection. Types of guards and safety devices. Home Office Regulations.

OPERATION PLANNING. Planning the operation layout, and estimation of floor-to-floor times for simple machined parts.

37—WORKSHOP CALCULATIONS 1, II

Foot rule and its sub-divisions as a basis of manipulation of fractions up to 1/64 in., including function of brackets. Decimals in relation to British and metric units. Decimalisation of fractions and vice versa, especially in relation to use of drill tablets. Powers and square root. Practice in evaluation and transformation of workshop formulae. Percentages, ratio, and proportion. Area, volume and weight (with density and specific gravity) in relation to cubes.
rectangular solids, cylinders, etc. Solution of simple equations with practical applications (extension of No. 4 above). Use of logarithms. Graphs. Angular measurement. Exercises on simple geometrical principles (e.g., theorem of Pythagoras).

38—WORKSHOP CALCULATIONS III, IV

Surface, area, volume, weight of regular solids, and of right composite solids built up from them. Surface area, volume, and weight of prisms, pyramids, and cones. Mid-ordinate and Simpson rules applied to areas and volumes. Simultaneous and quadratic equations with practical applications. Harder graphs. Degrees and circular measure. Properties of the right-angled triangle trigonometrical ratios. Simple trigonometry related to marking out, tapering, levelling, chordal distances, tangential lines. Mathematical treatment of harder aspects of (a) pitch and lead of a screw; (b) gear ratios, simple and compound trains; (c) torque, axial pressure, and transmission of power.

39—MECHANICAL DRAWING I


40—MECHANICAL DRAWING II


Components of different types of connecting rod ends. Three views of connecting rod end—part sectional (from freehand sketches). To complete plan and end elevations of a truncated hexagon prism, truncated hexagon pyramid and cylinder, and also to draw true shape of cut faces of truncated prism, pyramid and cylinder. To develop the sides, top and bottom of truncated hexagon prism, and pyramid. Development of truncated hexagonal pyramid and a truncated hexagonal pyramid and a truncated cone. Development of curves of intersection. Upright pedestal for 2½” shaft—three views elevation and plane part in section. Freehand sketches of workshop details. Working drawings.

41—MACHINE DRAWING III

ventions. Sections: full, half, broken, revolved, removed, phantom, auxiliary. Dimensions for workshop drawings: the pattern shop, the foundry, the forge shop.

Dimensions and notes. Decimal dimensioning. Allowances and tolerances—classification of fits. Metric system; Ford system.

Detail drawings made from actual machine parts: Lever safety valves; pump links for marine engineers; slide valves; stop cocks; angular and adjustable crachets. Piston heads, cross heads of various types. Automobile cylinder heads, gear and cams. Elements of structural, electrical and aircraft drawing.

In addition to the above, approximately 26 short lectures on special machine details are given.

42—MACHINE DRAWING IV


Approximately 26 short lectures on standard drawing office practice will be given during the course.

43—FITTING AND TURNING I


44—FITTING AND TURNING II


44A—FITTING AND TURNING. 3rd YEAR


Lathe Work: Advanced exercises in turning (parallel and taper) Screw-cutting (external and internal) involving Whitworth, Acmer, Buttress and square threads. Assembly of component and interchangeable parts.

Machine Work: Planing, shaping, milling; use of dividing head, angle plate, etc.

Grinding of lathe tools and drills.

45—FITTING AND TURNING III

Lathe work: Advanced exercises in turning, boring, multiple screwcutting, involving the assembly of component and interchangeable parts. Machine work: Planing, shaping, milling; use of the dividing head, angle plate, etc.
45A—FITTING AND TURNING. 4th YEAR
The application and use of modern high-grade measuring instruments and gauges. Advanced turning exercises on syllabus of previous years. Machining, fitting and assembly of machine and engine parts, requiring a high degree of accuracy and finish.

Grinding external and internal engine parts. All precision work. Milling of spur and ratchet wheels, bevel wheels, etc. Complete making of crank, connecting rod, cross head, etc. Steam engine parts complete. Screw jacks and other workshop accessories.

Advanced work on screwing. Tapered work. Cottered connections and other workshop accessories.

46—FITTING AND TURNING IV
Advanced work on syllabus of previous years, involving the complete turning, machining, fitting and assembly of machine and engine details requiring a high degree of accuracy and finish. The application and use of modern high-grade measuring instruments and gauges. Production of spur and ratchet wheels, tapered work, cottered connections, screw jacks and other workshop accessories.

46A—FITTING AND TURNING. 5th YEAR
Complete overhauling, assembling and renewals of component parts of twin cylinder steam engine. Complete manufacture of simple jigs for drilling and milling. More advanced external grinding.

47—PATTERNMAKING I
Selection, qualities and application of timbers and other materials used. Use of patternmaking tools and appliances; the contraction rule. Operation of wood-turning lathe. Construction of simple patterns of flanges, brackets, bearings, brasses and cocks. Core box making; use of core prints.

48—PATTERNMAKING II
Patterns of more advanced type: built-up patterns, pedestals, wall brackets, hangers, toothed wheels, pulleys, clutches, pipe bends, valves, cocks, pistons. Use of strickles and loam board.

49—PATTERNMAKING III
Cylinders and connections for engines and pumps, hydraulic details. Patterns of complex nature, involving coring of passages, chambers and recesses. Patterns for ornamental castings in iron, brass and bronze.

50—FOUNDRY WORK

51—BRASSFINISHING
Bench and lathe operations involved in finishing and assembly of cocks, valves, lubricators, injectors, gauges, steam whistles. Turning of screwed spindles and of balls. Preparation of small switches and other simple electrical fittings. Ecclesiastical and ornamental brasswork, requiring a high degree of finish. Chasing, knurling, spinning, brazing, polishing and lacquering operations.

52—BOILERMAKING: THEORY AND DRAWING I, II
53—BOILERMAKING: PRACTICAL I, II

Marking out, cutting and bending to required shape and dimensions of cylindrical and coned rivetted bodies. Preparation of plates for boiler construction, levelling, squaring, cutting and drilling. Simple rivetted joints, caulking and fullering. Rivetted tank work, water-tight joints, corner connections, stiffening and staying. Boiler smithwork, heating of angle and channel bars in the fire, bending to required shape and size, welding and finishing. Flanging of boiler end plates. Oxy-acetylene processes applied to boilermaking.

54—SMITHWORK


55—ART IRONWORK

Iron, its nature and properties. Various kinds of iron used by art iron workers; tools used. Treatment and manipulation of wrought iron: forging, welding, jumping, bending and embossing. Methods of joining ironwork. Details used in art smithing, riveting, intersecting, slitting, tenoning, shrinking on collars, twisting, scrolls and volutes.

56—METAL PLATE WORK: DRAWING AND THEORY I

Lectures: Fuels used in actual plate work. Metals: Characteristics and applications of tinplate, zinc, copper and iron. Solders and brazing materials. Galvanising, tinning and re-tinning processes. Calculations of dimensions, capacities and weights of vessels of various designs.

Drawing: Geometrical problems involved in metal plate work; intersections and penetrations. Development of patterns for vessels and other objects of simple form, such as: Cylindrical pipes and branches; coned articles in two or more pieces; equal tapering bodies; baking pans; objects with combined flat and coned surfaces, tee pipes, bends in two or more pieces, V and Y pipes. Patterns for finials, simple mouldings, gutters and other roof work details. Principal joints used in metal plate work practice.

57—METAL PLATE WORK: PRACTICAL I


58—METAL PLATE WORK: DRAWING AND THEORY II, III


59—METAL PLATE WORK: PRACTICAL II, III

In addition to advanced work on the syllabus for the first year, special attention will be given to the following: Oxy-acetylene processes applied to the cutting and welding of sheet metal objects; the choice and use of blowpipes, welding rods and fluxes. Oxy-acetylene methods in the treatment of sheet copper, aluminium, brass, and stainless steel. Sifbronze welding. Preparation of lamps, vases, caskets and other ornamental work, involving a high degree of finish. Flashings for domes, spires and special roof forms.
60—OXY-ACETYLENE WELDING I-IV

Dissolved acetylene; care of high pressure acetylene and oxygen cylinders, valves, gauges and other fittings. Precautions to be observed in use of plant. Choice and use of blowpipes for various purposes. Cutting and welding processes. Practical exercises in cutting and welding plates, angle and bars of other sections. Welding of framed structures. Oxy-acetylene methods applied to cast-iron. Aluminium alloys, brasses, bronzes and copper. Use of welding rods and fluxes for different metals.

61—ELECTRIC WELDING I-IV

Details of equipment in care and maintenance of plant; precautions in use. Correct sizes of electrodes and current density for various purposes. Electric arc travel for various kinds of work. Types of joints and their preparation for arc welding. Perpendicular line of welding and overhead welding. Cutting with the arc. Jointing of plates, bars and tubes, etc.

62—GARAGE PRACTICE I

First Year

Demonstrations of structural arrangement of motor car chassis and units of various types; mechanics' hand tools and common garage appliances; retaining and securing devices, and methods of dismantling and re-erecting.

Practical exercises in identifying principal components of main units; ascertaining methods of working and of adjustment; inspection for wear; removing, dismantling, reassembling and replacing easily detachable components of simple construction; cleaning, replenishing and maintaining oil, fuel, water and air containers.

63—GARAGE PRACTICE II

Exercises in removing and replacing less detachable or accessible units and components; dismantling, effecting simple repairs, involving substitution for worn parts and reassembling; making adjustments of related operating and controlling mechanism; detecting and correcting simple causes of improper operation.

64—GARAGE PRACTICE III

Exercises in removing and replacing units and components complicated by variations in layout and design; effecting repairs involving workshop processes; making adjustments related to functional operation of components affecting the performances of units; detecting and correcting more abstract causes of improper performance.

65—GARAGE PRACTICE IV

Effecting major repairs to power and transmission units; alignment and adjustment operations to undercarriage and chassis as a whole; checking and testing repaired units and vehicles in the workshop.

66—WORKSHOP PRACTICE I

Demonstration of the forms; purposes and care of fitters' hand tools; forms and working properties of commonly used materials; forms and uses of fastenings and other finished stock. Exercises in the use of tools in measuring, marking off and marking out; cutting; filing and fitting; drilling by hand and machine; punching; hot and cold bending; hot and cold rivetting; soft and hard soldering; brazing; hand tapping and screwing; annealing, hardening, tempering and casehardening. Use of surface plate, surface gauge and vee blocks. Making useful household fittings, simple metal workers' tools, garage and workshop appliances. Simple pipe work.

67—WORKSHOP PRACTICE II

More advanced treatment of matter outlined in first year syllabus. Additional exercises in producing flat surfaces; chipping, scraping; also reaming; drifting; cutting keyways and oil grooves; scraping bearings.

68—WORKSHOP PRACTICE III

See Third Year Syllabus in Workshop Practice for Fitters and Turners.
69—WORKSHOP PRACTICE IV
See Fourth Year Syllabus in Workshop Practice for Fitters and Turners.

70—MOTOR ENGINEERING (LECT.) I
FIRST YEAR
General arrangement of conventional passenger chassis. Single, and multi-cylinder spark ignition engines; arrangement of power system; valves and valve operating mechanisms; fuel system; constant vacuum carburettor; coil ignition; pressure lubrication; water cooling. Common types of solid friction clutch, sliding engagement gearbox, bevel gear, final drive and differential, mechanical universal joints and propeller shaft. Independent frame construction, damped semi-elliptic springing, divided front axle with Ackermann linkage, common types of steering gear, mechanical internal expanding brakes, steel wheels and hubs, low pressure types.

71—MOTOR ENGINEERING (LECT.) II
The structural features of more advanced types of construction, including 6 and vee-8 cylinder designs, overhead valves, constant choke carburettors, controlled temperature cooling, fluid friction clutch, constant mesh gearbox, hypoid gear final drive, enclosed propeller shaft, transverse springing, triangular bracing, three-quarter and full-floating rear axle, improved steering gears, hydraulic brakes.

The functions and operating conditions of important components and the provision made to comply with these conditions. Maintenance of units in working order; setting adjustments; causes of wear; effects of incorrect adjustment and normal wear; detection and correction of simple faults.

72—MOTOR ENGINEERING (LECT.) III
Construction peculiar to heavy commercial and public service vehicles, including compression ignition engines, centrifugal clutches, heavy duty and multiple speed gearboxes, worn, final drive, spur gear differential, twin rear axle, construction, twin front axle construction, divided transmission shafts, power assisted steering gears, servo-assisted brake arrangements.

73—MOTOR ENGINEERING (LECT.) IV

74—MOTOR ENGINEERING (LECT.) V
Types of bearings, primary functions, application in individual units, particular duties, care installation, maintenance in service, causes of deterioration and effects thereof on the unit and on the vehicle, methods of repair or replacement, capacities and alternative sizes. Fluid tight joints: types, construction and application; jointing materials, causes and effects of deterioration, repair and replacement and adjustment. Restricted motion joints. Fixed joints: types, construction and application, methods of disconnection, effects of damage during manipulation, reconditioning and reconnecting, locking devices.

75—WATCHMAKING
THEORY:

PRACTICAL:
76—TECHNICAL DRAWING

Guiding principles. Lettering, sketching practice, geometrical definitions and figures, principles of projection, exercises on bolts and nuts, oil seals, springs, threads, etc.

77—TECHNICAL DRAWING

Application of matter of earlier syllabus in illustration of details in construction and arrangement of motor vehicle units by way of illustration of notes on Motor Engineering lectures.

78—MECHANICAL ENGINEERING THEORY AND DRAWING

1. INTERNAL COMBUSTION ENGINES:

Petrol; Paraffin; Gas; Diesel and Semi-Diesel, etc.

Constructional details and fitting of: Cylinders, cylinder heads, pistons, rings, valves, bearings and fuel pumps. Setting of exhaust, fuel and air valves.

Cycle of operations; timing diagrams, for 4- and 2-stroke engines. Pressures and temperatures at the more important positions. Lubrication. Fuel valves; mechanical and blast air types. Air compressors and Bottles. Dynamometer tests and Indicator Cards, Maintenance and annual survey.

2. STEAM ENGINE PLANT:

Steam Engine: Constructional details and fitting of: Cylinders, pistons, shaft and bearings.

Assembly and setting of valve and valve gears. Valves: Slide valve; piston valve, inside and outside steam. Effect of the variation of cut-off. Indicator Cards. Condensers, air and circulating pumps, etc.

Boilers: Constructional details of: Water and gas tube; Lancashire; Cornish and Vertical Cross-tube types, etc. Mountings and fittings. Adjustment of safety valves. Gauge glasses. Feed Pumps; reciprocating and centrifugal. Preparation for annual survey.

Steam Turbines; Refrigerating Plant, and Hydraulic Machinery.

79—VENTILATION AND AIR CONDITIONING

PHYSIOLOGICAL CONSIDERATIONS. Atmospheric pollution. Requirements for comfort and industrial processes. Standards of ventilation.


VENTILATION. Mechanical ventilation. Inlet and exhaust.


AIR DISTRIBUTING SYSTEMS. Design and sizing of ducts. Resistance of systems.

NOISE. Cause and prevention of noise and vibration.

PSYCHROMETRY. The use of psychrometric charts and hygroscopic tables.

REFRIGERATION. Refrigeration cycles. Types of refrigerators. Absorption, compressor and steam jet systems.

ANCILLARY EQUIPMENT. Including condenser water coolers, atmospheric and spray type; direct and indirect humidifiers.

INSULATION. Humidifiers and pipework and air-conditioning ductwork.

AIR CONDITIONING EQUIPMENT. Air-conditioners and unit coolers. Direct humidifying systems. Air washers and de-humidifiers.

CONTROLS. Automatic temperature and humidity controls; pneumatic, electric and hydraulic systems.

CALCULATIONS AND DRAWINGS. Complete calculations and drawings for a simple air-conditioning system, including plant chamber details.

DRAWING AND DESIGN.

(a) Installation of automatic controls, traps and reducing valves.
(b) Fan inlet and outlet connections.
(c) Supports and platforms for fan sets.
(d) Operating gear for large louvred dampers.
80—HEATING AND HOT WATER SERVICES


Heat Emission. Heat emission from pipes, radiators and convectors.

Insulation. Economics of the thermal insulation of buildings as affected by the initial cost of building and installation and annual fuel consumption. Thermal insulation of plant.

Heating Systems. Hot water heating systems; low pressure and high pressure. Steam heating systems; low pressure and vacuum. Unit heaters, radiators and convectors. Low temperature panel warming. General description of district heating systems.

Hot Water Supply. Hot water supply installations and estimations of storage and demand.


Design. Principles of design and calculations for gravity- and pump-circulated hot water heating systems, steam heating systems, and hot water supply installations.

Calculations. Complete calculations and set of drawings incorporating the layout and boiler-house details for (a) hot water and steam heating systems; (b) hot water supply installations.

(Note—Emphasis should be placed on the use and selection of appliances mentioned above rather than on constructional design.)

Drawing and Design.

(a) Isometric and planometric projection.
(b) Expansion joints and anchors.
(c) Supports for overhead piping systems.
(d) Supports for heavy pieces of apparatus.

81—MECHANICS OF FLUIDS

Hydrostatics. Measurements of pressure. Pressure gauges and manometers.


Air Compressors. General principles. Unloading valves. Oil and water separation.

82—BOILER-HOUSE PRACTICE

Fuels. Types; sampling and testing; proximate and ultimate analysis; estimation of calorific value; calorimeters; combustion.

Steam. Saturated and superheated steam. Sensible, latent and total heat; superheat; use of steam tables; dryness fraction; steam calorimetry.

Steam Generation. Types of boiler and mountings, settings, and economisers. Furnaces, grates, and fittings. Draught—natural, induced and forced systems; dampers and flues. Boiler feed pumps.

Boiler Operation and Maintenance. Stoking, blowing down, priming and foaming; boiler tests; preparation of boilers for inspection; smoke abatement.

Water Treatment. Causes of corrosion and scale formation. Electrolytic action. Feed-water treatment and water hardness tests.
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Watchmaking.
Oxy-Acetylene and Electric Welding.

ARCHITECTURAL AND BUILDING TRADES.
Architecture.
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1951-52

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