

1937

Mechanical Engineering: Prospectus of Courses Session 1937-38

City of Dublin Vocational Education Committee

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City of Dublin
Vocational Education Committee

SCOILEANNA CEÁRD-OIDEACÁIS
City of Dublin Technical Schools

Seiríún
1937-38



Session
1937-38

MECHANICAL ENGINEERING
PROSPECTUS OF COURSES
BOLTON STREET AND RINGSEND

Local Sub-Committees—(Continued)

BOLTON STREET.

ALDERMAN C. BREATHNACH, LL.D., T.D., 384 Clontarf Road (ex-officio).
 MR. O. HYNES, 6 St. Kevin's Road, S.C.R.
 MR. R. MURPHY, Messrs. Hopkins and Hopkins, O'Connell Street
 MR. M. P. ROWAN, 52 Capel Street.
 MR. M. SOMERVILLE, 1 O'Curry Road, S.C.R.
 MR. W. J. WHELAN, 35 Lower Gardiner Street.
 MR. SEAN CAMPBELL, 35 Lower Gardiner Street.
 MR. GERALD DOYLE, 32 East Essex Street.
 MR. THOS. DARCY, 91 Ceannt Fort, Mount Brown.
 MR. J. G. WILSON, 13 Sackville Place.
 MR. T. A. CRAMPTON, Hammersmith Works, Ballsbridge.

PEMBROKE (Ballsbridge and Ringsend).

ALDERMAN C. BREATHNACH, LL.D., T.D., 384 Clontarf Road (ex-officio).
 COUNCILLOR MRS. M. WALSH, 16 Elgin Road.
 L. G. SHERLOCK, LL.D., 21 Parliament Street.
 REV. J. HOOKE, C.C., St. Mary's, Haddington Road.
 MR. J. J. BEGGAN, c/o. McEntagart Bros., Percy Place.
 PROFESSOR B. F. SHIELDS, 87 Pembroke Road.
 MR. WILLIAM HANLON, 29 Home Villas, Donnybrook.

KEVIN STREET.

ALDERMAN C. BREATHNACH, LL.D., T.D., 384 Clontarf Road (ex-officio).
 MR. O. HYNES, 6 St. Kevin's Road, S.C.R.
 MR. M. SOMERVILLE, 1 O'Curry Road, S.C.R.
 REV. M. GERAGHTY, C.C., The Presbytery, High Street.
 COUNCILLOR D. D. HEALY, P.C., 40 Usher's Quay.
 MR. M. P. ROWAN, 52 Capel Street.
 MR. J. W. KELLY, 16 St. Joseph's Parade, Nelson Street.
 MR. J. ANDREWS, B.SC., Messrs. A. Guinness, Son and Co., James's Street.

CHATHAM ROW (School of Music).

ALDERMAN C. BREATHNACH, LL.D., T.D., 384 Clontarf Road (ex-officio).
 COUNCILLOR MRS. M. WALSH, 16 Elgin Road.
 COUNCILLOR M. O'SULLIVAN, P.C., 74 Ballymun Road, Glasnevin.
 COUNCILLOR MRS. T. CLARKE, Baymount, 95 Clontarf Road.
 MADAME KATHLEEN RODDY, Broadcasting Station, Henry Street.
 MR. W. J. WHELAN, 35 Lower Gardiner Street.
 MR. M. P. ROWAN, 52 Capel Street.
 MR. J. T. DOYLE, Osborne Lodge, Mount Prospect Road, Dollymount.
 MR. THOS. MURPHY, 16 Cowper Road.
 MR. JOS. O'REILLY, 9 Lower Leeson Street.
 L. G. SHERLOCK, LL.D., 21 Parliament Street.
 MRS. MAUD AIKEN, Dungaoithe, Sandyford

ADVISORY COMMITTEES

MASTER JEWELLERS.

MR. G. THORNLEY.
 MR. R. MURPHY.
 MR. L. BEIRLEY.
 MR. J. SHEERIN.
 MR. SLEATOR.

MASTER TAILORS.

MR. W. O'CONNOR.
 MR. W. SCOTT.
 MR. R. BOYD.

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GENERAL NOTICES

ENTRANCE EXAMINATIONS, FEES, REGULATIONS.

Students, on enrolment, may be required, at the discretion of the Principal, to sit for an Entrance Examination. Introductory Courses are provided for those not sufficiently qualified to enter a full Technical Course.

Fees: per Session.

Courses in Mechanical Engineering and Motor Car Engineering	.....	7/6 for Course.
Introductory Course	.....	2/6 for Course.
Additional Course subjects	.....	2/6 each.
Single subjects	.....	7/6 each.

Technical students may take a class in Irish and in Physical Training for an additional fee of 2/6 per class.

Students who through obtaining employment are unable to continue in attendance at the Whole-time Day School Courses of the City of Dublin Vocational Education Committee will be admitted to approved Evening School Courses, without fees, up to the value of the Day School Fees paid.

The same concession may be extended to other students who have left the Day School Courses, if the reasons for their non-attendance at the Day School Classes are considered by the Principal to be adequate.

Applicants for admission to Courses or Classes must be at least fourteen years of age.

The Trade Classes are primarily intended for those engaged in the several trades. Others will not be admitted before November 8th, and then only if there be room, and on payment of a quadruple fee.

A Laboratory or Workshop Class can only be taken in conjunction with an approved Lecture or Drawing Class. No student will be allowed to continue in a Laboratory or Workshop Class if his attendance at the Lecture or Drawing Class is unsatisfactory.

A Class may be discontinued if an insufficient number of students join or attend; the number of evenings allotted weekly to a Class may be reduced if there be a falling off in the attendance. The right is reserved to close Classes for any other reason whatever.

Students must make good any damage done by them.

Strict order must be observed at all times within the precincts of the Schools.

A complete course of study in any section generally occupies from three to four years.

Where possible, separate Classes for journeymen will be arranged in Trade subjects.

The Courses in Mechanical Engineering, Engineering Workshop Practice, Metal Plate Work and Motor Car Engineering are arranged in connection with the Technical Examinations Syllabus of the Department of Education. They are not to be considered as arbitrary, and the subjects may be varied with the sanction of the Principal.

SCHOOL CHOIRS AND DRAMATIC CLASSES.

The Committee is prepared to facilitate the organisation of Choral and Dramatic Societies and similar activities. Students interested are invited to communicate with the Principal of the Institute in which they are enrolled.

**MECHANICAL ENGINEERING
DEPARTMENT**
TECHNICAL SCHOOL, BOLTON STREET

TEACHING STAFF.

ERNEST E. JOYNT, M.I.MECH.E.—*Principal.*

A. M. MacLOUGHLIN, B.A., A.R.C.S.C.I.	M. J. DOYLE.
	B. E. FEE.
W. D. PILE, A.M.I.M.E., M.I.A.E.	H. HOLOHAN, B.A.
H. C. CLIFTON, B.A.	J. J. HUGHES.
W. D. HORGAN, B.A.	R. B. CLARK.
M. NIALL, M.SC.	J. LENIHAN.
H. C. FITZGERALD.	J. KELLY.
R. BENT.	J. J. REDMOND.
P. CORMAC, D.SC., M.R.I.A.	E. J. KENNEDY.
R. J. DOWLING, A.M.I.M.E., A.M.I.C.E.I.	P. McGRAN.
	R. BRYAN.
B. J. DIXON, B.SC., A.M.I.E.E.	A. J. WARD.
W. J. N. O'BRIEN, DIP.ING.	W. MURTAGH.
W. A. COONEY.	J. DOOLEY.
G. MACKENZIE.	T. J. RYAN.
	F. RYAN.

PROGRAMME and TIME TABLE

OF THE

Schools of Mechanical and Motor Car
Engineering and Allied Trades

AT

Technical Institutes: Bolton Street and
Ringsend

COURSES AND TIME TABLES

BOLTON STREET

No. of Course	SUBJECT	Day	Hour	Room	TEACHER	No. of Syllabus
INTRODUCTORY.						
1B	Arithmetic	Mon.	7.30-8.30	B 20	W. J. O'Brien	2
	English	Mon.	8.30-9.30	B 20	W. J. O'Brien	1
	Practical Drawing	Tues.	7.30-9.30	B 20	B. E. Fee	3
	Practical Drawing (Metal Plate Work)	Tues.	7.30-9.30	D 2	J. Dooley	35
MECHANICAL ENGINEERING COURSE.						
FIRST YEAR.						
3B	Machine Drawing—1.A. or ..	Mon.	7.30-9.30	A 5	H. C. FitzGerald	4
	Machine Drawing—1.B. ..	Wed.	7.30-9.30	A 5	B. E. Fee	4
	Geometry	Thurs.	7.30-9.30	B 27	R. J. Dowling	9
	Mathematics—I.	Fri.	7.30-9.30	B 18	J. J. Hughes	11
SECOND YEAR.						
4B	Machine Drawing—II. ..	Thurs.	7.30-9.30	A 5	B. E. Fee	5
	Engineering Science—1.A. ..	Tues.	7.30-9.30	B 1	R. J. Dowling	16A
	Mathematics II.	Wed.	7.30-9.30	C 22	H. Holohan	12
THIRD YEAR.						
5B	Machine Construction—III. ..	Tues.	7.30-9.30	A 5	E. E. Joynt, W. J. O'Brien	6
	Applied Mechanics—II. ..	Thurs.	7.30-9.30	C 8	A. M. MacLoughlin	17
	Mathematics III.	Wed.	7.30-9.30	C 7	H. C. Clifton	13
FOURTH YEAR.						
6B	Machine Construction—IV ..	Tues.	7.30-9.30	A 5	E. E. Joynt, W. J. O'Brien	7
	Applied Mechanics—III. ..	Wed.	7.30-9.30	C 8	A. M. MacLoughlin	18
	Heat Engines—II.	Fri.	7.30-9.30	A 8	R. J. Dowling	20
	Mathematics—IV	Mon.	7.30-9.30	C 7	H. C. Clifton	14
FIFTH YEAR.						
7B	Machine Design—V.	Tue.	7.30-10.0	B 27	B. J. Dixon	8
	Applied Mechanics—IV. ..	Wed.	7.30-9.30	C 8	A. M. MacLoughlin	19
	Heat Engines—III.	Thurs.	7.30-9.30	A 8	P. Cormack	21
	Mathematics—V.	Mon.	7.30-9.30	C 7	H. C. Clifton	15
MECHANICAL ENGINEERING TRADES COURSES.—ENGINEERING WORKSHOP PRACTICE.						
FIRST YEAR.						
10B	Engineering Workshop—I. ..	Wed., Th.	7.30-9.30	D 7	J. Kelly, J. J. Redmond	22
	Machine Drawing—1.A. or ..	Mon.	7.30-9.30	A 5	H. C. FitzGerald	4
	Machine Drawing—1.B.	Wed.	7.30-9.30	A 5	B. E. Fee	4
	Engineering Science—1.B. ..	Fri.	7.30-9.30	C 8	W. J. O'Brien	16B
SECOND YEAR.						
11B	Engineering Workshop—II. ..	Tues.	7.30-9.30	D 7	J. Kelly, J. J. Redmond	23
	Machine Drawing—II.	Thurs.	7.30-9.30	A 5	B. E. Fee	5
	Mathematics—I.	Fri.	7.30-9.30	B 18	J. J. Hughes	11
THIRD YEAR.						
12B	Engineering Workshop—III. ..	Fri.	7.30-9.30	D 7	J. Kelly, R. Bent	24
	Applied Mechanics—II. ..	Thurs.	7.30-9.30	C 8	A. MacLoughlin	17
	Mathematics—II.	Wed.	7.30-9.30	C 22	H. Holohan	12

No. of Course	SUBJECT	Day	Hour	Room	TEACHER	No. of Syllabus
FOURTH YEAR.						
13B	Engineering Workshop—IV. ..	Fri.	7.30-9.30	D 7	J. Kelly, R. Bent	25
	Machine Construction—IV. ..	Tues.	7.30-9.30	A 5	E. E. Joynt	6
	Mathematics—III.	Wed.	7.30-9.30	C 7	H. C. Clifton	13
PATTERNMAKING.						
FIRST YEAR.						
14B	Patternmaking—I.	Mon.	7.30-9.30	D 4	E. J. Kennedy	26
	Workshop Drawing and Calculations	Tues.	7.30-9.30	C 22	E. J. Kennedy	30
SECOND YEAR.						
15B	Patternmaking—II.	Fri.	7.30-9.30	D 4	E. J. Kennedy	27
	Machine Drawing—IB.	Wed.	7.30-9.30	A 5	B. E. Fee	4
THIRD YEAR.						
16B	Patternmaking—III.	Fri.	7.30-9.30	D 4	E. J. Kennedy	28
	Machine Drawing—II.	Thurs.	7.30-9.30	A 5	B. E. Fee	5
Students are recommended to add a suitable class in Mathematics.						
FOUNDRY WORK						
17B	Ironmoulding	Wed.	7.30-9.30	D 4	P. McGran	25A
	Workshop Drawing and Calculations	Tues.	7.30-9.30	C 22	E. J. Kennedy	30
BRASSFINISHING.						
22B	Brassfinishing, Practical ..	Mon. Fri.	7.30-9.30	D 5	W. Murtagh	31
	Engineering Science—IB. ..	Fri.	7.30-9.30	C 8	W. J. O'Brien	16
	Machine Drawing—IB.	Wed.	7.30-9.30	A 5	B. E. Fee	4
BOILERMAKING.						
26B	Boilermaking, Lectures and Drawing	Thurs.	7.30-9.30	B 1	R. Bryan	32
	Boilermaking, Practical ..	Mon.	7.30-9.30	D 9	R. Bryan	33
SMITHWORK.						
30B	Smithwork, Practical	Thurs.	7.30-9.30	D 9	A. J. Ward	29A
	Machine Drawing—1.A. or ..	Mon.	7.30-9.30	A 5	H. C. FitzGerald	4
	Machine Drawing—IB.	Wed.	7.30-9.30	A 5	B. E. Fee	4
ART IRONWORK.						
31B	Art Ironwork, Practical—I. ..	Fri.	7.30-9.30	D 9	A. J. Ward	29B
Students are recommended to add a class in Design.						
METAL PLATE WORK.						
FIRST YEAR.						
38B	Metal Plate Work, Lecture and Drawing—I.	Tues.	7.30-9.30	D 2	J. Dooley	35
	Metal Plate Work, Practical—I.	Thurs.	7.30-10.0	D 2	J. Dooley, T. J. Ryan	36
SECOND YEAR.						
39B	Metal Plate Work, Lecture and Drawing—II.	Mon.	7.30-9.30	D 2	J. Dooley	37
	Metal Plate Work, Practical—II.	Wed.	7.30-10.0	D 2	J. Dooley, T. J. Ryan	38

No. of Course	SUBJECT	Day	Hour	Room	TEACHER	No. of Syllabus
THIRD YEAR.						
40B	Metal Plate Work, Lecture and Drawing—III.	Mon.	7.30-9.30	D 2	J. Dooley	37
	Metal Plate Work, Practical—III.	Wed.	7.30-10.0	D 2	J. Dooley, T. J. Ryan	38
Students are recommended to add a class in Design.						
OXY-ACETYLENE WELDING.						
41B	Oxy - Acetylene Welding, Practical	Fri.	7.30-9.30	D 2	T. J. Ryan	39
MOTOR CAR ENGINEERING.						
INTRODUCTORY						
42B	Motor Car Lecture	Mon.	7.30-9.30	B 15	W. A. Cooney	40
	Practical Drawing	Tues.	7.30-9.30	B 20	B. E. Fee	3
Additional Subjects, Trade Students only—						
	Motor Workshop Practice, or Engineering Workshop ..	Wed.	7.30-9.30	D 8	G. Mackenzie	47
		Wed.	7.30-9.30	D 7	J. Kelly, J. J. Redmond	22
MOTOR CAR ENGINEERING COURSE.						
FIRST YEAR,						
43B	Motor Car Engineering—I. ..	Wed.	8.35-9.35	B 15	W. A. Cooney	43A
	Science—I.	Tues.	7.30-8.30	A 8	J. J. Hughes	58
	Mathematics—I.	Tues.	8.35-9.35	A 8	J. J. Hughes	11
	Electricity—I. or	Wed.	7.30-8.30	A 8	W. D. Horgan	53
	Motor Workshop Practice—I. or Engineering Workshop—1. ..	Thurs.	7.30-9.30	D 8	G. Mackenzie	47
		Thurs.	7.30-9.30	D 7	J. Kelly, J. J. Redmond	22
SECOND YEAR						
44B	Motor Car Engineering—II. ..	Thurs.	7.30-9.30	B 20	W. A. Cooney	44A
	Motor Car Mechanics—I. ..	Wed.	7.30-8.30	B 27	J. J. Hughes	60
	Science—II.	Wed.	8.35-9.35	A 8	W. D. Horgan	59
	Motor Car Electricity—II. or Motor Workshop Practice—II. ..	Tues.	7.30-9.30	B 18	W. D. Pile	54
		Fri.	7.30-9.30	D 8	G. Mackenzie	48
THIRD YEAR.						
45B	Motor Car Engineering—III. ..	Mon.	7.30-9.30	A 8	P. Cormac	45B
	Applied Mechanics—II. ..	Thurs.	7.30-9.30	C 8	A. MacLoughlin	17
	Motor Car Electricity—III., or Motor Workshop Practice—III.	Wed.	7.30-9.30	B 18	W. D. Pile	55
		Fri.	7.30-9.30	D 8	G. Mackenzie	49
COURSE FOR MOTOR CAR DRIVERS.						
47B	Motor Car Engineering ..	Fri.	7.30-9.30	B 15	W. A. Cooney	41

No. of Course	SUBJECT	Day	Hour	Room	TEACHER	No. of Syllabus
MOTOR CAR DRIVING.						
(Reserved for Students who have made satisfactory attendance at the Classes of either of the Motor Car Engineering Courses listed above).						
Fee, £2 0s. 0d. for Course of Eight Lessons.						
	Motor Car Driving	Sat.	*2.30-6.0	—	M. J. Doyle	—
*or other afternoons as may be arranged.						
GAS ENGINEERING.						
The Courses in Gas Engineering, Gas Supply, and Gas Fitting have been arranged in compliance with the requirements of the Institution of Gas Engineers for Students preparing for the Examinations prescribed by that Body.						
GAS ENGINEERING.						
FIRST YEAR.						
46K	Physics	Mon.	7.30-10.0	Kevin St.	P. O'Callaghan ..	62
	Inorganic Chemistry	Tue., Wed.	7.30-10.0	Kevin St.	.. ..	63
	Mathematics—I.	Fri.	7.30-9.30	B18	J. J. Hughes ..	11
GAS SUPPLY.						
FIRST YEAR.						
47K	Physics	Mon.	7.30-10.0	Kevin St.	P. O'Callaghan ..	62
	Inorganic Chemistry	Tue., Wed.	7.30-10.0	Kevin St.	.. ..	63
	Mathematics—I.	Fri.	7.30-9.30	B18	J. J. Hughes ..	11
GAS FITTING.						
FIRST YEAR.						
50B	Lectures and Calculations—I. ..	Thurs.	7.30-9.30	B15	R. B. Clark ..	65
	Gas Fitting, Practical—IA. ..	Mon.	7.30-9.30	B21	J. Lenihan ..	68
	Gas Fitting, Practical—IB. ..	Wed.	7.30-9.30	B21	J. Lenihan ..	68
SECOND YEAR						
51B	Lectures and Calculations—II. ..	Wed.	8.0-10.0	B20	R. B. Clark ..	66
	Gas Fitting, Practical—II. ..	Fri.	7.30-9.30	B21	J. Lenihan ..	69
THIRD YEAR						
52B	Lectures and Calculations—III. ..	Wed.	8.0-10.0	B20	R. B. Clark ..	67
	Gas Fitting, Practical—III. ..	Thurs.	8.0-10.0	B21	J. Lenihan ..	70
	Machine Drawing—IA. ..	Mon.	7.30-9.30	A5	H. C. FitzGerald ..	4
IRISH.						
	Irish—IA.	Mon.	7.30-9.30	C2	F. Ryan	71
	Irish—IB.	Thurs.	7.30-9.30	C2	F. Ryan	71

TECHNICAL SCHOOL, RINGSEND

TEACHING STAFF

MARTIN KEADY, B.E., B.SC., A.R.C.SC.I.—*Principal*,

THE PRINCIPAL.

S. O. EVANS.

D. R. HARTE, B.A., B.E., B.SC., A.R.C.SC.I.

D FLYNN.

I. LAMBERT, B.A. (HONS.), M.SC., H.DIP.ED.

B. DEVLIN, B.E., B.SC., A.R.C.SC.I.

P. J. O'HAGAN.

J. R. EVANS.

J. J. DOOLEY

P. V. HOBBS, A.S.A.E.

COURSES AND TIME TABLES

RINGSEND

MOTOR CAR ENGINEERING COURSES

TRADE CERTIFICATE COURSE

(Trade Apprentices and Mechanics)

JUNIOR STAGE

SUBJECT	Section	Day	Hour	TEACHER	Syllabus No.
FIRST YEAR.					
Garage Practice	B	Wednesday ..	7.30-10.0	D. Flynn ..	42 & 51
Workshop Practice	B	Tuesday ..	7.30-9.30	S. O. Evans ..	47
Electricity	B	Friday ..	7.30-9.30	D. R. Harte ..	53
SECOND YEAR.					
Garage Practice	D	Tuesday ..	7.30-10.0	D. Flynn ..	42 & 51
Workshop Practice	D	Wednesday ..	7.30-9.30	S. O. Evans ..	47
Electricity	D	Thursday ..	7.30-9.30	D. R. Harte ..	51

SENIOR STAGE

THIRD YEAR.					
Garage Practice	F	Friday ..	7.30-10.0	S. O. Evans and D. Flynn	45A & 52
Workshop Practice	F	Thursday ..	7.30-9.30	S. O. Evans ..	48
Electricity	F	Tuesday ..	7.30-9.30	P. V. Hobbs ..	57
FOURTH YEAR.					
Garage Practice	G	Friday ..	7.30-10.0	S. O. Evans and D. Flynn	45A & 52
Workshop Practice	G	Thursday ..	7.30-9.30	S. O. Evans ..	48
Electricity	G	Tuesday ..	7.30-9.30	P. V. Hobbs ..	57

Students who desire to present themselves for the written examination of the Trade Certificate Course, are advised to attend also for instruction in Machine Drawing and Practical Mathematics.

MOTOR VEHICLE ELECTRICIANS' COURSE

SUBJECT	Day	Hour	TEACHER	Syllabus No.
FIRST YEAR.				
Electricity	Friday ..	7.30-9.30	D. R. Harte ..	53
Electrical Testing & Adjustments	Thursday ..	7.30-9.30	P. V. Hobbs ..	57
SECOND YEAR.				
Electricity	Thursday ..	7.30-9.30	D. R. Harte ..	54
Electrical Testing & Adjustments	Tuesday ..	7.30-9.30	P. V. Hobbs ..	57

SPECIAL COURSE

Motor Owners, Drivers, etc.

SUBJECT	Section	Day	Hour	TEACHER	Syllabus No.
FIRST YEAR.					
Motor Car Engineering	A	Monday ..	7.30-9.30	S. O. Evans ..	42
Electricity	A	Wednesday ..	7.30-9.30	D. R. Harte ..	53
Motor Car Engineering	C	Thursday ..	7.30-10.0	D. Flynn ..	43 A & B
Electricity	C	Monday ..	7.30-9.30	D. R. Harte ..	43 A & B
SECOND YEAR.					
Motor Car Engineering	E	Friday ..	7.30-10.0	S. O. Evans & D. Flynn	44 A & B
Electricity	E	Thursday ..	7.30-9.30	D. R. Harte ..	54

Instruction in subsequent years as individually arranged

TECHNOLOGICAL CERTIFICATE COURSE SUBJECTS

FIRST YEAR.					
Engineering Science .. .. .	..	Wednesday ..	7.30-9.30	I. Lambert ..	58 & 60
Machine Drawing and Sketching .. .. .	..	Monday ..	7.30-9.30	B. Devlin ..	4
Practical Mathematics .. .. .	..	Thursday ..	7.30-9.30	P. J. O'Hagan ..	11
SECOND YEAR					
Engineering Science .. .. .	..	Tuesday ..	7.30-9.30	I. Lambert ..	59 & 61
Machine Drawing and Sketching .. .. .	..	Monday ..	7.30-9.30	B. Devlin ..	5
Practical Mathematics .. .. .	..	Friday ..	7.30-9.30	P. J. O'Hagan ..	12

MECHANICAL ENGINEERING COURSES

TRADE CERTIFICATE COURSE

(Trade Apprentices and Mechanics)

FITTER'S WORK AND TURNER'S WORK.

JUNIOR STAGE

Subject	Day	Hour	Teacher	Syllabus No.
FIRST YEAR				
Fitting and Turning	Tuesday	7.30-9.30	S. O. Evans ..	22
SECOND YEAR				
Fitting and Turning	Wednesday	7.30-9.30	S. O. Evans ..	23
THIRD YEAR				
Fitting and Turning	Thursday	7.30-9.30	S. O. Evans ..	24

Students who desire to present themselves for the written examination of the Trade Certificate Course are advised to attend also for instruction in Machine Drawing and Practical Mathematics.

TECHNOLOGICAL CERTIFICATE COURSE

FIRST YEAR				
Engineering Science	Wednesday	7.30-9.30	I. Lambert ..	58 & 60
Machine Drawing	Monday	7.30-9.30	B. Devlin ..	4
Practical Mathematics	Thursday	7.30-9.30	P. J. O'Hagan ..	11
SECOND YEAR				
Engineering Science	Tuesday	7.30-9.30	I. Lambert ..	59 & 61
Machine Drawing	Monday	7.30-9.30	B. Devlin ..	5
Practical Mathematics	Friday	7.30-9.30	P. J. O'Hagan ..	12

OXY-ACETYLENE WELDING

FIRST YEAR				
Oxy-Acetylene Welding	Thursday	7.30-9.30	J. J. Dooley ..	39
Practical Drawing and Sketching	Monday	7.30-9.30	B. Devlin ..	40
SECOND YEAR				
Oxy-Acetylene Welding	Friday	7.30-9.30	J. J. Dooley ..	39
Practical Drawing and Sketching	Monday	7.30-9.30	B. Devlin ..	40

SYLLABUSES

SUBJECTS.

1—ENGLISH.

Grammar, parts of speech, punctuation. Reading exercises from technical publications, dictation, letter and essay writing, notetaking. Lectures on simple machines, workshop appliances and engineering materials.

2—WORKSHOP ARITHMETIC.

Signs and symbols, factors, greatest common measure, least common multiple, fractions, decimals. Percentages, ratio and proportion, units of length, the foot rule and its sub-divisions; area, volume and weight. Simple mensuration.

3—PRACTICAL DRAWING.

Use of instruments, lettering, simple geometrical exercises, orthographic projection. Freehand sketches of models and machine parts. Scale drawings of nuts, bolts, screw threads, bearings, brackets, couplings and other simple machine details.

4—MACHINE DRAWING, I.

Use of drawing instruments and materials, precision exercises, orthographic projection. Use of sketch book, dimensioned freehand sketches of simple parts. Scale drawings of brackets, bearings, couplings, bolts, nuts, screws, simple engine details, valves and cocks. Explanation of features of importance in machine and engine parts, and of operations involved in their manufacture.

5—MACHINE DRAWING, II.

Bolts, studs, screw threads, nuts, cotttered connections, pins, knuckle joints. Simple journal and other bearings. Pedestals, brackets, hangers and wall boxes. Methods of lubrication. Couplings, keys and keyways. Pulleys and belt gearing. Steam and water pipes. Cylinders, covers, stuffing-boxes, pistons, piston rods, crossheads. slidebars, connecting rods, cranks, slide valves, eccentrics. Boiler construction, riveted connections, stays. Stop and safety valves, cocks. Simple details of lathes and other machine tools. Detailed and assembly drawings, dimensioning, lettering, etc.

6—MACHINE CONSTRUCTION, III.

Crank shaft, propeller shaft, dynamo and thrust bearings. Bearing metals, lubrication. Ball and roller bearings. Couplings, clutches, universal joints. Elements of toothed gearing. Pulleys and belt gearing. Slide and piston valves, eccentrics, connecting rods, crank shafts, governors. Cylinders, pistons, packing, crossheads. Internal-combustion engine details. Pumps, hydraulic fittings and details. Boiler types, shell connections, riveting, manholes, seatings, stays. Safety and stop valves, cocks, gauges. Details of lathes, planing, shaping and drilling machines; forms of tools, drills and milling cutters. Measuring instruments, limit gauges.

7—MACHINE CONSTRUCTION AND DESIGN, IV.

Advanced exercises in Machine Drawing, also problems involved in the design of the simpler details of machines and steam engines.

Drawing: Steam and internal-combustion engine and pump details and assemblies; valve gears, link motions, condensers, injectors, governors. Boiler arrangements, details and mountings. Toothed, belt and chain gearing. Workshop appliances, details of machine tools. Preparation of finished drawings, colouring. *Design*: Screwed connections, pins, cotttered and knuckle joints, shafts, couplings, spur gearing, simple stop valves, cams, levers. Preparation of tracings for photo prints.

8—MACHINE DESIGN, V.

The application of mechanical science and of empirical knowledge to practical problems in mechanical engineering design. The properties and preparation of materials used and their employment with special regard to modern methods of economic production. The subjects will include:—Boilers, cylinders to sustain internal pressure, valves and valve mechanisms, steam and internal combustion engine details, engine, dynamo and other important bearings, governors, pumps, tanks, cranes and winches, cams and link mechanisms, riveted and welded structures.

9—PRACTICAL GEOMETRY.

Use of instruments, setting out of angles, proportional parts; scales. Exercises on straight lines and curves. Construction of plane figures, areas of figures, and reduction of areas to equal squares,

properties of the triangle and parallelogram; application to link work. Construction of angles; circular measure and trigonometrical functions of angles. Proportionals, construction and use of scales. Location of points by rectangular co-ordinates, problems on lines and circles, construction of circles from specified data, tangents, angles in segment. The ellipse; cycloidal and involute curves. Triangles, polygons and curved figures. Vectors and vector quantities, problems on uniplanar forces. Projections and methods of defining positions of points and lines in space, horizontal and vertical traces. Views of solids in various positions, alterations of ground line, inclined and vertical planes. Elevations, plans and sections of prisms, pyramids, cylinders, and cone. Interpenetrations and developments.

11—PRACTICAL MATHEMATICS, I.

Arithmetic: Simple and compound rules, calculations of prices and costs, fractions, decimals, contracted methods, percentages, ratio and proportion, square root. *Mensuration*: Square, rectangle, triangle and circle, areas, volumes; applications of geometry to problems. *Algebra*: Symbols, the four simple rules, simple equations, evaluation and transformation of formulae, factors. Elementary graphs.

12—PRACTICAL MATHEMATICS, II.

Arithmetic: Multiplication and division of decimals, square and cube root, ratio and variation. *Mensuration*: Areas of plane figures, Simpson's rules, area and volume of cone, cylinder and sphere. *Algebra*: Fractions and partial fractions; simple, simultaneous and quadratic equations; indices, logarithms, use of slide rule. The straight line and other simple graphs. *Trigonometry*: Radian measurement, functions of angles, simple formulae, use of tables, solution of triangles, vectors. *General*: Mass, weight, centre of gravity, work, power, velocity and acceleration.

13—PRACTICAL MATHEMATICS, III.

Simultaneous and quadratic equations, graphical solution of equations of degree higher than the second; maximum and minimum values of quadratic and cubic expressions, logarithmic solution of equations. Applications of Simpson's trapezoidal rules. Work done by a variable force or expanding gas. General solution of triangles,

formulae for sine, cosine and tangent of sum or difference of two angles, formulae for sum or difference of sines or cosines of two angles; application of the formulae for compound angles to problems on valve displacement, etc. Formulae for the functions of $\frac{1}{2}A$ and $2A$ in terms of A . Linear graph law and the reduction thereto of other laws, graphs of the form $y = ax^n$. Trigonometrical and logarithmic functions. Slope of a curve at a point and its interpretation, rate of increase, velocity and acceleration, area of a curve and its interpretation, area of $y = \sin^2 x$ and $y = \sin x$. The "root mean square" value of the ordinate.

14—PRACTICAL MATHEMATICS, IV.

Binominal expansions and approximations. Exponential and logarithmic theorems. Calculations of logarithms to the exponential base and their transformation to a decimal or other base. Tabular study of the rate of increase and graphical study of the slope of curve of simple functions of a varying quantity, *i.e.*, powers, trigonometrical, logarithmic and exponential functions. Differentials of such simple functions; of their sum, difference of product, and the function of a function. Successive differentiation and determination of the maximum and minimum values of a function. Integration as a process of summation, and as the inverse of differentiation. Further study of curves: conics, cycloids, trochoids, catenary. Discussion of the properties of curves from their cartesian equations. Simple harmonic motion.

15—PRACTICAL MATHEMATICS, V.

Definite integrals. Application of the calculus and of approximate methods to the determination of centres of gravity. Surfaces and volumes of solids. Guldinus' Theorems. Moments of inertia, bending moments and deflection of beams. Energy of a rotating mass, centre of pressure. Integration by partial fractions and integration by parts. Fourier series, harmonic analysis. Important differential equations. Applications to beams and struts, to the pendulum, to simple and damped vibrations. Symbolic use of $\sqrt{-1}$ in connection with rotating vectors, and in the solution of differential equations.

16A—ENGINEERING SCIENCE, IA.

Force: its effects and measurement, simple stress and ultimate strength. Turning effect of a force; moments; levers. Speed;

velocity ratio of wheel trains, of belt and pulley gearing and of simple lifting machines. Work, work diagrams, power, horse power. Resultant force; equilibrium of three forces, the triangle of forces.

Heat and work: temperature, quantity of heat, mechanical equivalent of heat. Descriptive treatment of the simple steam engine and gas engine.

16b—ENGINEERING SCIENCE, IB.

Systems of linear, superficial and volumetric measurement. Fractions, decimals, contracted methods. Measuring instruments; the foot rule; the micrometer and its use. Fits, limits and gauges. Simple mensuration applied to workshop problems. Engineering materials; properties, applications, production, commercial forms, methods of working.

Machine tools; types and uses. Power transmission; pulley and belt gearing, toothed gearing, wheels in train, screws, use of change wheels in screw-cutting. Force, work, power.

17—APPLIED MECHANICS, II.

Force measured by its straining action; stretching of wires and springs. Stress, strain, elasticity. Moments of forces, couples, centre of gravity. Work, energy; diagrams of work. Power, horse power. Friction. Simple machines, velocity ratio and efficiency. Composition, resolution and equilibrium of forces. Velocity and acceleration. Elementary hydrostatics.

18—APPLIED MECHANICS, III.

Engineering materials, their manufacture, properties and testing. Elasticity, strain, energy, resilience. Co-planar forces, stresses in framed structures. Bending moment and shearing force; moment of resistance of a beam. Strength of shafts. Friction on an incline, screw friction, mechanical efficiency. Linear and angular accelerations, their relations to mass, force and torque. Kinetic energy, flywheels. Centrifugal force, governors. Simple harmonic motion. Simple mechanisms.

19—APPLIED MECHANICS, IV.

Further treatment of testing of materials; alloy steels, heat treatment; fatigue of metals. Principal stresses. Strength and deflection of beams, distribution of shear stress. Strength and stiffness of

shafts. Combined bending and twisting. Flat and coiled springs. Struts. Coil friction. Crank effort diagrams and design of fly-wheels. Balancing of engines. Governors

20—HEAT ENGINES, II.

The steam engine cylinder, steam distribution, mean effective pressure, calculation of indicated, and of brake horse power. Problems on the simple slide valve. Work done per cubic foot of steam, superheating. Steam boilers; types, heating surface. Mechanical stokers, economisers, feed-water heaters, feed pumps and injectors, boiler efficiency. Fuels, calorific value, air supply per pound of fuel, products of combustion. Transmission of heat from furnace to water, evaporation, air supply to furnace, natural and forced draught. Descriptive treatment of gas, oil and Diesel engines.

21—HEAT ENGINES, III.

Fuels: Gas, oil and coal. Oil burners, stokers, pulverised fuel. Combustion; calorific value of fuels, composition of flue gases. Boilers and auxiliaries; condensers. Treatment of feed water. Laws of thermodynamics; thermal efficiency. Carnot and Rankine cycles. Effect of compounding, superheating and feed water preheating. Heat balance. *Reciprocating Engines*: Steam, gas, oil, Diesel and petrol. Tests and adjustments for maximum economy and efficiency. *Steam Turbines*: Modern types, principles of action. Layout of power stations. Air compressors; refrigerators.

22—ENGINEERING WORKSHOP, I.

Fitting: Use of the hammer, chisel and file in preparation of flat surfaces. Making of templets and keys, cutting keyways. Use of compass, surface gauge and try-square in marking out work. Use of stocks and dies, and taps. Preparation of plane surfaces by use of scraper. *Turning and Machine Work*: Simple exercises in turning of pins, bolts and spindles; use of chucks and face-plates. Operations in drilling, shaping, planing and slotting machines. Forms, use and grinding of drills and cutting tools. Use of calipers, micrometer and gauges in working to precise dimensions. *Smithwork*: Simple exercises in preparing, dressing and tempering chisels and other small tools.

All work will be done to drawings prepared in connection with the classes in Machine Construction and Design. Patterns and castings made in the Institute will be utilised as far as possible.

23—ENGINEERING WORKSHOP, II.

Fitting: Angle and bevel gauges, squares, calipers, clamps and other bench tools. Fitting and assembling of simple machine parts. *Lathe and Machine Work*: Advanced exercises in screw-cutting; turning of bushes, brasses, engine and machine parts. Operations in milling, planing, shaping, and drilling machines. Simple exercises in grinding to fine dimensions.

24—ENGINEERING WORKSHOP, III.

Lathe Work: Advanced exercises in turning, boring and screw-cutting involving the assembly of component and interchangeable parts. *Machine Work*: Planing, milling and grinding operations on cylinders, pumps, connecting rods, links and various machine details. *Fitting*: Assembly of engine and machine parts. Disassembly and re-assembly of engine motion and of boiler mountings.

25—ENGINEERING WORKSHOP, IV.

Advanced work on Syllabus of earlier years, involving the complete turning, machine, fitting and assembly of machine and engine details requiring a high degree of accuracy and finish; tool making. The application and use of modern high-grade measuring instruments and gauges. Fine grinding operations on hardened surfaces. Production of spur and ratchet wheels; tapered work; cottered connections, screw jacks and other workshop accessories.

26—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. Corebox making; use of core prints.

27—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.

28—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.

29A—IRON MOULDING.

Foundry sands, loam and graphite. Appliances, moulding boxes and tools. Characteristics, properties and grades of cast iron; chemical and other impurities. Arrangement and management of cupolas. Miscellaneous exercises in moulding and casting from patterns of a simple type. The preparation and use of cores; venting, the use of chills and strickles.

29B—BRASS MOULDING.

Sands used in brass moulding. Moulding boxes, appliances and tools. Composition of different grades of gunmetal and soft brass. Crucibles and melting arrangements. Miscellaneous exercises in moulding articles in gunmetal. The moulding and casting of articles of ornamental design in soft brass. Casting other non-ferrous metals.

30—WORKSHOP DRAWING AND CALCULATIONS.

Orthographic projection. Simple exercises in drawing as applied to patternmaking and foundry work. Interpretation of prints and drawings of castings. Elementary calculations required for foundry work.

31—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 brass-work requiring a high degree of finish. Chasing, knurling, spinning, brazing, polishing and lacquering operations.

32—BOILERMAKING, DRAWING.

Lectures: Elementary details of boiler construction; rivets and riveted joints; methods of closing rivets; steam tight seams; caulking and fullering. Boiler domes and manholes; furnace tubes; dished plates. Boilermaking materials. *Drawing*: Simple drawing and precision exercises. Developments of cylindrical and coned shells, riveted seams and boiler shell connections. Spacing of holes for flue tubes, stays, manholes.

33—BOILERMAKING, PRACTICAL.

Marking out, cutting and bending to required shape and dimensions of cylindrical and coned riveted bodies. Preparation of plates for boiler-construction, levelling, squaring, cutting and drilling. Simple riveted joints, caulking and fullering. Riveted tank work, watertight 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 boilermakers' work.

34A—SMITHWORK.

Making up and care of fire, varieties and qualities of fuels, smiths' tools and appliances. Forging in wrought iron, mild steel and tool steel. Welding. Forging of pins, bolts, keys, hooks, cotters, spanners, shackles, links, tongs, pincers, levers. Forging, dressing and tempering of chisels, centre punches and lathe tools. Thin, flattened and pointed forgings.

34B—ART IRONWORK.

Iron, its nature and properties, various kinds of iron used by art ironworkers; tools, their application and uses. Treatment and manipulation of wrought-iron; forging, welding, jumping, bending and embossing. Methods of joining ironwork, operations in art-smithing; riveting, intersecting, slitting, tenoning, shrinking on collars. Twisting scrolls and volutes.

35—METAL PLATE WORK, DRAWING AND THEORY, I.

Lectures : Fuels used in metal plate work. Metals : characteristics and applications of tinfoil, 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 roofwork details. Principal joints used in metal plate work practice.

36—METAL PLATE WORK, PRACTICAL, I.

Use of hand tools, cutting and bending appliances. Cutting, rolling, hammering, bending and flattening operations. Preparation of notches, allowances for lap, wiring and joining of seams and intersecting parts. Jointing, soldering, brazing, riveting and grooving processes. Brazing in iron, copper and brass. Annealing, stretching, raising and planishing. Tinning and retinning methods. Preparation of flue and ventilating pipes and branches, hoods, ventilators, T and Y pipes, household utensils, toilet ware, baking pans and cake tins. Preparation of roof flashings, mouldings, chimney pipes and cowls, ventilators and tallboys. Plain and ornamental lamps, vases, boxes and caskets.

37—METAL PLATE WORK, DRAWING AND THEORY, II., III.

The subjects listed for the First Year will be dealt with in their advanced stages. The following will be the principal :—

Metals and alloys : their physical and chemical properties. Special uses of tinfoil, galvanised and lead-coated iron. Fuels, solid and gaseous; their methods of application. Oxy-acetylene processes. Development of patterns of an advanced type involving triangulation methods. Development of complex patterns and mouldings, and of those required for articles to be welded, brazed, and specially treated.

38—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 proper use of blowpipes, welding rods and fluxes. Oxy-acetylene methods in the treatment of sheet copper, aluminium, brass, and stainless steel. Sifbronze welding. Welding, bending and treatment of light panels. Preparation and repair of motor car wings, bonnets and radiators. Domes, finials, ships' ventilators. Lamps, vases, caskets and other ornamental work involving a high degree of finish. Flashings for domes, spires and special roof forms. Kettles, urns, boilerettes, mirrors and other domestic articles of importance.

39—OXY-ACETYLENE WELDING.

Low pressure acetylene generator : precautions to be observed in the preparation and use of the gas. Storage and preservation of calcium carbide. Dissolved acetylene; care of high pressure acetylene and oxygen cylinders, valves, gauges and other fittings. Choice and use of blow-pipes for various purposes. Cutting and welding processes. Practical exercises in cutting and welding plates, angle and other sectional bars. Welding of framed structures of different designs. Oxy-acetylene methods applied to cast iron, aluminium alloys, brasses; bronzes and copper. Use of welding rods and fluxes for different metals.

40—MOTOR CAR LECTURE (INTRODUCTORY) :

Simple descriptive lectures designed to familiarise students with note-taking and the expression of their ideas in writing. The lessons will be illustrated by suitable sketches and will include :—The engine, transmission system, differential, back and front axles, steering and brake mechanisms, carburettors, springs, the names and functions of the principal parts and details. Simple calculations in length, area and volume relating to motor car problems.

41—MOTOR CAR ENGINEERING (LECTURE).

Chassis arrangement. Simple petrol engine, construction and operation; the power system, valve mechanism, engine types. Cooling and lubrication systems. Principles and operation of carburettor;

description of typical carburettors. Gravity and vacuum petrol feeds. Motor Diesel engines. Transmission arrangements; clutches, change speed mechanisms, propeller shafts, universal joints. The final drive; differential, back axles. The front axle; steering action, principles and mechanism. Brakes, types and methods of operation. Springs, types, and method of action. Torque reaction; thrust systems, chassis lubrication, care of tyres. Elementary electrical principles; battery and coil ignition, magnetos. Construction and upkeep of secondary batteries.

42—MOTOR CAR ENGINEERING (LECTURE).

The chassis and its parts. The engine; single and multi-cylinder engines; general consideration of their construction and operation. Fuel supply systems; the carburettor; carburettors of different types; the exhaust system. Radiators; circulation pumps; fans. Power transmission; simple treatment of clutches and change speed gears of various types. Rear axle; rear axle casing; propeller shaft and universal joints; drive shafts; attachment to hub, construction of hub and its attachment to road wheels. Brake operating mechanisms; brakes and brake linings; wheels; tyres; tubes; valves. The steering mechanism; front axle beam; steering swivel head; swivel pins; front wheel hubs and bearings. Chassis frame; mounting and attachment of various units; springs and spring accessories; torque bracing. Lubrication of engine and chassis main units. Properties and treatment of the following materials:—Cast iron; mild, tool and special steels; cast steel; aluminium and its alloys; bronzes; bearing metals; rubber; celluloid; asbestos; copper; vulcanised fibre; mica. Use and care of the ordinary garage equipment.

43A—MOTOR CAR ENGINEERING.

Chassis arrangement, the internal combustion engine in its simplest form, construction of the power system, the Otto Cycle. Valves and valve operating mechanism, valve timing. Petrol feed systems; the carburettor; description of popular carburettors. Ignition systems. Simple lubricating systems. Cooling. Construction of common types of clutch; change speed mechanisms. The rear axle; chassis suspension. Brakes. Steering mechanisms and front axles.

43B.

Preparation of engine for starting, preparation of car for starting, car manœuvring. Simple maintenance work, including chassis lubrication, brake adjustment, detachable wheel work and tyre manipulation. Exercises worked by students on the four-stroke cycle, four-stroke engine and exercises to make clear the principles of operation of clutch, gears, etc.

44A—MOTOR CAR ENGINEERING, 2ND YEAR.

Four and six cylinder engines, general description, construction and operation of the various forms of clutches and change speed gears in common use, the steering mechanism, brakes and braking, universal joints and transmission to road driving wheels, fuel and ignition systems, operation, maintenance and location of simple faults in the complete power unit, car manœuvring.

44B.

General maintenance work such as outlined in car makers' instruction books. Lubrication of complete chassis. Checking of units and parts for loose assemblies, rigging, etc. Study of the behaviour of the running engine under various conditions. Systematic location of simple engine faults.

45A—MOTOR CAR ENGINEERING (LECTURE).

Carburettors and fuel feed systems, different types in common use and their adjustment in detail.

Radiators; air and water cooling; various devices associated with water circulation.

Engines; valves and valve mechanism; gudgeon pins; pistons; connecting rods and crank shafts of the different types in common use in the modern car; comparison of differences and discussion of reasons for variation; engine efficiency and fuel consumption; efficient and wasteful mixtures; super-charging.

Lubrication of cylinder, and of connecting rod ends and other moving parts, detailed consideration of bearings of all types used in car from point of view of adjustment, repair and replacement.

Clutches of standard and special types; adjustment, repair and replacement of clutches.

Gear mechanism and ratios; spur and bevel gearing, worm and helical gearing; epicyclic gearing; chain drives; change speed gears and differential gears of standard and special types. Constructional arrangements for dealing with torque and tractive force reactions.

45B—MOTOR CAR ENGINEERING (LECTURE), 3RD YEAR.

More advanced treatment of the subject matter of the Second Year of the Course.

Petrol; commercial tests, comparison with other fuels, carburation, weak and rich mixtures, maximum power and maximum economy mixtures. Carburettors and petrol feed systems. Otto and Diesel cycles. Torque-speed and power-speed curves. Engines, stresses in parts, balance, vibration. Gears and gear-cutting. Transmission and control systems, calculation of stress. Lubricants: viscosity, determination of flash point.

46—MOTOR CAR ENGINEERING, 4TH YEAR.

The subject matter of the earlier Years of the Course will be dealt with in its higher stages, with particular reference to advanced maintenance work and the systematic location of the more obscure engine faults.

47—MOTOR WORKSHOP PRACTICE, 1ST YEAR.

Vicework and simple fitting work involving the use of hand and bench tools and including filing, chipping, marking out, use of tools for measuring and testing, drilling, reaming, scraping, tapping and screwing, punching, drifting, riveting, grinding, soldering, brazing, simple pipework in copper and the working of sheet metal by hand methods. Making of simple hand tools and appliances for use in the garage.

48—MOTOR WORKSHOP PRACTICE, 2ND YEAR.

More advanced bench and fitting work. Simple forging operations, including drawing out, bending, straightening and truing of bent and deformed parts. Simple exercises involving the use of the lathe and drilling machine. Pipework in copper and steel. Spring making and wire working. Annealing, hardening, tempering and case-hardening.

49—MOTOR WORKSHOP AND GARAGE PRACTICE, 3RD YEAR.

Forging, bench and vicework, lathework, including screw-cutting, boring and taper turning, drilling, planing, milling. Treatment of problems requiring special tools, materials and equipment. More advanced operations in decarbonising and valve re-seating. Fitting of gudgeon pins, piston-rings, and big end bearings. Bushing and reaming. Installation of ball and roller bearings. Re-lining brakes and clutches.

50—MOTOR WORKSHOP AND GARAGE PRACTICE, 4TH YEAR.

Various practical forging, fitting, turning, drilling and other machine tools operations. Toolmaking; oxy-acetylene processes. Advanced engine fitting work including re-metalling bearings, aligning and bedding in crankshaft, lapping and grinding operations, scraping, taper and parallel reaming. Chassis frame and unit alignment and setting. Axle straightening. Spring setting.

51—GARAGE PRACTICE.

Common garage operations, such as:—De-carbonising; valve grinding; packing water pump gland; making joints for oil, petrol, and water systems; mending punctures; outer cover repairs, tightening parts of steering and suspension systems; cleaning of plugs; diagnosis of simple engine faults; simple cases of dismantling and re-assembling.

Removal and replacement of defective parts, such as:—Bolts; nuts; studs; pins; clips; springs; cotters; keys; valves; shackle pins; bushings; flexible couplings; jointings and washers; oil and petrol pipes; ball and socket joint parts; spring leaves; tyres and tubes; wires; cables; terminals, and lamp bulbs.

Adjustments to parts such as:—Tappets, control rods; driving belts; ignition and plug points; brakes; clutches.

Maintenance work such as:—Greasing; oiling; flushing out and renewal of lubricants; cleaning out fuel feed lines and oil and water systems; removal and replacement of road wheels; preparation of car for long journey; car manoeuvring and rudiments of driving.

52—GARAGE PRACTICE.

Exercises of a more advanced type involving the processes specified in the Junior Stage and, in addition, the use of the acetylene welding blow pipe, lathe and machine drill for the simpler operations involved in repair of engine and chassis mechanism.

Dismantling and re-assembling operations of a difficult character with particular reference to procedure necessitated by differences of lay out and design.

Examination and report on condition of car as a whole or any part of the car with particular reference to any reconditioning or repair which may be necessary.

Diagnosis and treatment of mechanical and electrical faults.

Renewing timing chain and gears; renewing gudgeon pins and bushes; fitting new piston rings; replacing broken or defective valve; remetalling engine bearings; refitting engine bearings; installation of members of change speed gear and rear axle drive; installation and adjustment of road wheel, load and thrust bearings; relining of brakes and clutches; rewiring; tuning of engine and testing for satisfactory road performance.

53—MOTOR CAR ELECTRICITY, I.

General effects of the electric current. Applications of these effects. Control of the current. General circuit considerations. Idea of resistance. Series and parallel circuits. Switches and switching devices. Current strength and unit. Electrical pressure. Ohm's law. Power and power measurement. Sources of electrical energy. Primary cells. Principles and action of lead accumulator. Battery charging. Magnetism; electro-magnetism; electro-magnets; factors governing their strength. Applications of the electro-

magnet. Electromagnetic induction. Simple qualitative treatment of the dynamo. The car charging circuit.

54—MOTOR CAR ELECTRICITY, II.

Revision of electromagnetic induction. The induction coil, simple and multicylinder ignition. Multi-trembler, master trembler, synchronised trembler; coil ignition. Modern form of battery and coil ignition for four and six cylinder engines. Principle and use of condenser. Ignition timing. Automatic advance and retard mechanism.

Practical care, maintenance and testing of car batteries. Principle and action of the magneto. L.T. and H.T. magneto. Rotating armature, rotating magnet and polar inductor magnetos. Practical dismantling and re-assembling of magnetos.

Principle and action of dynamo. Study of the shunt machine characteristics. Battery charging circuit on car. Necessity for the "cut out." Examination of various types of "cut out." Third brush regulation.

Principle of the electric motor. Motor starters. The Bendix drive.

55—MOTOR CAR ELECTRICITY, III.

More detailed study of the dynamo. Practical determination. Dynamo characteristics for separately excited, series, shunt and compound wound machines. Practical examination of behaviour of the third brush dynamo. Other methods of car dynamo voltage and output regulation. Constant current, constant potential vibrating regulators. Thermostatic control. Reversed series control. Armature reaction control methods. Further work on "cut-outs." Cases where "cut out" may be dispensed with. Freewheel dynamo drives. Examination of car switchboards. Practical wiring of complete lighting and charging circuits for typical car equipments, *e.g.*, Lucas, Rotax, C.A.V., etc.

Car starter types and circuits. The dynamotor.

metry, formation of images by reflection and refraction; prisms, lenses, dispersion. Optical systems, telescope and microscope. Spectrum analysis, theory of colours, wave motion, interference, diffraction, polarisation. Sound, velocity, vibration of strings, air columns and rods, resonance.

63—INORGANIC CHEMISTRY (GAS ENGINEERING).

Lectures: General properties of matter, elements and compounds, chemical and physical changes, conservation of matter. Water, quantitative composition. Metals, electrolysis, hydrogen, solubility in water, other solvents. Crystallization, oxygen, acid and basic forming oxides. Atmosphere, Boyle's and Charles's Law. Equivalent weight, laws of chemical combination. Gay Lussac's Law. Avogadro's multiple proportions, allotropy. Sulphur, phosphorus and carbon; sulphuretted hydrogen, preparation and properties, sulphides; systems hypothesis, atomic theory. Chlorine, hydrochloric acid, chlorides. Molecular weights, acids, bases, and salts. Nitric acid; fixation of atmospheric nitrogen; nitrates, oxides of nitrogen. Law of analysis of salts. Oxides of sulphur; sulphites and sulphates; sulphuric acid. Carbon monoxide, carbon dioxide, carbonates. Combustion, flame, gas, burners. General properties of common metals. *Practical Work*: Glass-working, cork boring and fitting up apparatus; action of heat and water on substances and mixtures. Solubility; preparation and properties of hydrogen, oxygen, chlorine, hydrochloric acid, nitric acid, ammonia, nitric oxide, sulphur dioxide, sulphuretted hydrogen and carbon dioxide. Action of acids on metals; measurement of volumes and density of gases, and reduction of N.T.P. Alkalies; properties and reactions with acids. Preparation and crystallisation of simple salts, simple determinations of equivalents. Recognition of chlorides, sulphates, sulphites, sulphides, carbonates, nitrates and nitrites.

65—GAS FITTING, LECTURES AND CALCULATIONS, I.

Gas fitting tools, design, use and maintenance. Gas piping; pipe fitting materials and their applications. Joints, jointing materials, solders and fluxes. Gas fitting screw threads. Meters, description;

use and fixing. Gas burners, cookers, grillers, radiators, boilers and other gas-fired familiar domestic appliances.

Simple calculations of areas and volumes; cubic contents of tanks, vessels, apartments, etc. Meter reading; units employed in gas measurements; elementary treatment of pressure gauges and recorders.

66—GAS FITTING LECTURES, II.

Blown, screwed and flanged joints; testing and precautions against accidents. Meters; types, connections, reading of indices. Gauges; burners for lighting, heating and cooking appliances; burner governors. Description and fixing of domestic cookers, grillers, gas fires, radiators, geysers, etc.

Physical properties of materials used for gas pipes and fittings; their reaction to stretching, compression, bending and twisting; effects of heat on materials.

Gauges; gauge pressures; pressure required for various gas appliances. Volumetric and pressure governors.

67—GAS FITTING LECTURES III.

Internal gas pipes and fittings: joints, pipe laying, lighting fittings; testing for soundness; detection and correction of faults. Relation between loss of pressure, bore and length of pipe and capacity; other circumstances affecting pressure. More advanced treatment of meters, governors and gauges. Illumination; lighting schemes; burners; shades; reflectors and chimneys. Domestic cookers and heaters; water heating: principles of hot water circulation; appliances and fittings; thermostats. Principles of ventilation. Physical effects of heat: temperature, British Thermal Unit. Precautions to be observed in working with gas; method of dealing with gassing.

68—GAS FITTING, PRACTICAL, I.

Gas fitting tools, use, care and upkeep. Cutting and screwing iron, brass and copper tubing. Formation of parallel and taper

GENERAL CURRICULUM OF THE SCHOOLS

UNDER THE CONTROL OF

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BOLTON STREET TECHNICAL SCHOOL

Mechanical Engineering.	Building Science.
Motor Car Engineering.	Building and Allied Trades.
Gas Engineering.	Printing and Book Production.
Metal Plate Work.	Watchmaking.
Brass Finishing.	Art and Art Crafts.
Day Apprentices and specialised Daytime Technical Courses.	
Day Junior Technical School.	

KEVIN STREET TECHNICAL INSTITUTE

Pure and Applied Mathematics.	Radio-Telegraphy.
Pure and Applied Physics.	Art and Art Crafts.
Pure and Applied Chemistry.	Domestic Science and Housecraft.
Bacteriology.	Bakery Science and Practice.
Pharmacy.	Bootmaking.
Electrical Engineering and Allied Trades.	Hairdressing.
	Tailoring.

PARNELL SQUARE TECHNICAL INSTITUTE

General Commercial Subjects.	Transport.
Accountancy and Allied Subjects.	Day Trade Classes:—
Local Government.	Dressmaking.
Domestic Science and Housecraft.	Shirtmaking (Power).
Languages.	Clothing Manufacture (Power)
Retail Distribution.	Chefs' Training Course.

Day School of Commerce.

Pre-Employment Day Courses for Girls.

GENERAL CURRICULUM OF THE SCHOOLS

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PEMBROKE TECHNICAL INSTITUTE (Ringsend and Ballsbridge)

General Commercial Subjects.	Mechanical Engineering.
Retail Distribution.	Motor Car Engineering.
Languages.	Oxy-Acetylene Welding.
Domestic Science and Housecraft.	Building Trades.
Art and Art Crafts.	

Day School of Commerce.
Day Junior Technical School.

RATHMINES TECHNICAL INSTITUTE

General Commercial Subjects.	Banking, Finance and Foreign Exchange.
Accountancy, Auditing and Allied Subjects.	Company Secretaries.
Insurance.	Government Accountancy & Finance.
Advertising and Publicity.	Languages.

Domestic Science and Housecraft.
Day School of Commerce.
Pre-Employment Day Courses for Girls.

MARINO TECHNICAL INSTITUTE

General Commercial Subjects.	Metalwork.
Languages.	Science.
Domestic Science and Housecraft.	Woodwork.

Day Junior Technical School.
Day School of Commerce.
Pre-Employment Day Courses for Girls.

CHATHAM ROW SCHOOL OF MUSIC (Day and Evening Classes)

Pianoforte.	Wind Instruments (Wood & Brass).
Violoncello.	Fifes.
Uilleann and Irish War Pipes.	Viola.
Elocution.	Orchestra.
Violin.	Drums and Flute.
Singing and Choir.	Traditional Music.
Organ.	Irish Harp.