Technical Institute, Kevin Street: Prospectus, 1936-37

City of Dublin Vocational Education Committee
City of Dublin
Vocational Education Committee

Scoileanna Ceard-oideachais
City of Dublin Technical Schools

Session 1936-37

Electrical Engineering
Radiotelegraphy :: Physics :: Mathematics
Applied Chemistry and Pharmacy

PROSPECTUS OF COURSES

KEVIN STREET
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>SEPT. 7, MONDAY</td>
<td>Whole-time Day Schools open for enrolment. Day Apprentice School resumes work.</td>
</tr>
<tr>
<td>SEPT. 14, MONDAY</td>
<td>Whole-time Day Schools commence work and Part-time Day Classes open for enrolment.</td>
</tr>
<tr>
<td>SEPT. 21, MONDAY</td>
<td>Evening Classes open for enrolment and Part-time Day Classes commence work.</td>
</tr>
<tr>
<td>SEPT. 28, MONDAY</td>
<td>Evening Classes commence work.</td>
</tr>
<tr>
<td>NOV. 1, SUNDAY</td>
<td>Feast of Immaculate Conception. Whole-time Day Schools—excepting Day Apprentice School and Special Classes—closed.</td>
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<tr>
<td>DEC. 8, TUESDAY</td>
<td>Teaching work in Whole-time Day Schools ceases (excepting Day Apprentice School and Special Classes).</td>
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<tr>
<td>DEC. 12, SATURDAY</td>
<td>Term Examinations in Whole-time Day Schools commence.</td>
</tr>
<tr>
<td>DEC. 18, FRIDAY</td>
<td>Schools close for Christmas Vacation.</td>
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<tr>
<td>JAN. 4, MONDAY</td>
<td>All Classes resume work after Christmas Vacation.</td>
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<tr>
<td>JAN. 6, WEDNESDAY</td>
<td>Feast of Epiphany. Whole-time Day Schools—excepting Day Apprentice School and Special Classes—closed.</td>
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<tr>
<td>MAR. 5, FRIDAY</td>
<td>Land Surveying and Levelling Course begins.</td>
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<tr>
<td>MAR. 17, WEDNESDAY</td>
<td>St. Patrick’s Day. Schools closed.</td>
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<tr>
<td>MAR. 20, SATURDAY</td>
<td>Land Surveying Field Work begins. Motor Car Driving Lessons begin.</td>
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<tr>
<td>MAR. 23, TUESDAY</td>
<td>Last meeting of classes before Easter Vacation.</td>
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<tr>
<td>MAR. 31, WEDNESDAY</td>
<td>All classes resume work after Easter Vacation.</td>
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<tr>
<td>MAY 1, SATURDAY</td>
<td>Evening Classes close—excepting Special classes.</td>
</tr>
<tr>
<td>MAY 3, MONDAY</td>
<td>Evening Written Sessional Examinations commence (except for Special classes).</td>
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<tr>
<td>MAY 6, THURSDAY</td>
<td>Ascension Day. Whole-time Day Schools—excepting Day Apprentice School and Special Classes—closed.</td>
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<tr>
<td>MAY 17, MONDAY</td>
<td>Whit-Monday. Schools closed.</td>
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<tr>
<td>MAY 27, THURSDAY</td>
<td>Feast of Corpus Christi. Whole-time Day Schools—excepting Day Apprentice School and Special classes—closed.</td>
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<td>JUNE 26, SATURDAY</td>
<td>Teaching work ceases in Whole-time Day Schools—excepting Day Apprentice School and Special classes.</td>
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<tr>
<td>JUNE 28, MONDAY</td>
<td>Sessional Examinations commence in Whole-time Day Schools—excepting Day Apprentice School and Special classes.</td>
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<tr>
<td>JUNE 29, TUESDAY</td>
<td>Feast of Saints Peter and Paul. Whole-time Day Schools—excepting Day Apprentice School and Special classes—closed.</td>
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<tr>
<td>JULY 3, SATURDAY</td>
<td>Whole-time Day Schools and Part-time Domestic Economy classes close—excepting Day Apprentice School and Special classes.</td>
</tr>
<tr>
<td>JULY 17, SATURDAY</td>
<td>Day Apprentice School and Special classes close.</td>
</tr>
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</table>

Schools closed on all Bank Holidays not specified in above Calendar.
COMMITTEE

Alderman C. Breathnach, LL.D., T.D., 384 Clontarf Road.
Councillor Mrs. T. Clarke, Baymount, 95 Clontarf Road.
  D. D. Healy, 40 Usher's Quay.
  Mrs. M. Walsh, 16 Elgin Road.
  Mrs. M. Cosgrave, 17 Park Drive, Cowper Gardens.
  P. Belton, T.D., Belfield Park, Drumcondra.
  M. O'Sullivan, P.C., 74 Ballymun Road, Glasnevin.
Miss Helena Molony, 51 Larkfield Grove, Kimmage.
Michael O'Foghludha, 5 Cabra Road.
Mr. M. P. Rowan, 52 Capel Street.
Dr. Lorcan G. Sherlock, 21 Parliament Street.
Mr. Michael Somerville, 1 O'Curry Road, South Circular Road.
Mr. W. J. Whelan, 35 Lower Gardiner Street.

Offices:—

Technical Institute,
Bolton Street,
Dublin.

L. E. O'Carroll, B.A., B.L.,
Chief Executive Officer.

LOCAL SUB-COMMITTEES

For triennial period 1934-37.

RATHMINES.

Alderman C. Breathnach, LL.D., T.D., 384 Clontarf Road (ex-officio).
Mr. W. J. Whelan, 35 Lower Gardiner Street.
Dr. Conn Murphy, 10 Charleston Avenue, Rathmines.
Councillor Mrs. M. Cosgrave, 17 Park Drive, Cowper Gardens.
Mr. G. F. Klingner, A.C.A., 7 St. Helen's Road, Booterstown.
Mr. M. P. Rowan, 52 Capel Street.
Mr. W. Woods Hill, 5 Parliament Street.
Mr. M. J. O'Reilly, 31 Kenilworth Square.

PARNELL SQUARE.

Alderman C. Breathnach, LL.D., T.D., 384 Clontarf Road (ex-officio).
M. O'Foghludha, 5 Cabra Road.
Sean O'H-Uadhhaigh, 12 Dawson Street.
Liam O'Carbhail, 88 Manor Street.
Miss H. Chevenix, 48 Fleet Street.
Mr. J. W. Kelly, 16 St. Joseph's Parade, Nelson Street.
Mr. Bernard Moran, 7 Talbot Street.
Local Sub-Committees—(Continued)

BOLTON STREET.

Alderman C. Breathnach, LL.D., T.D., 384 Clontarí Road (ex-officio).
Mr. O. Hynes, 6 St. Kevin’s Road, S.C.R.
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 Ceann Fort, Mount Brown.
Mr. R. Murphy, Messrs. Hopkins and Hopkins, O’Connell Street.
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 Clontarí 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 Clontarí 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, 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 Clontarí Road (ex-officio).
Councillor Mrs. M. Walsh, 16 Elgin Road.
Councillor M. O’Sullivan, 74 Ballymun Road, Glasnevin.
Councillor Mrs. T. Clarke, Baymount, 95 Clontarí 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.

ADVISORY COMMITTEES

MASTER JEWELLERS.
Mr. G. Thornley.
Mr. R. Murphy.
Mr. L. Beirley.
Mr. J. Sheerin.
Mr. Sleator.

MASTER TAILORS.
Mr. E. J. McWilliam.
Mr. W. O’Connor.
Mr. W. Scott.
Mr. R. Boyd.
## CONTENTS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Regulations and Fees</td>
<td>4</td>
</tr>
<tr>
<td>Principal and Staff</td>
<td>7</td>
</tr>
<tr>
<td>List of Courses and Time Tables</td>
<td>8</td>
</tr>
<tr>
<td>Scholarships</td>
<td>14</td>
</tr>
<tr>
<td>Syllabuses of Courses in:</td>
<td></td>
</tr>
<tr>
<td>Introductory</td>
<td>16</td>
</tr>
<tr>
<td>Electrical Engineering Practice</td>
<td>18</td>
</tr>
<tr>
<td>Electrical Installation Work</td>
<td>26</td>
</tr>
<tr>
<td>Electrical Fitting</td>
<td>26</td>
</tr>
<tr>
<td>Cable Jointing and Electric Welding</td>
<td>28-29</td>
</tr>
<tr>
<td>Technical Telegraphy (P.O.)</td>
<td>29</td>
</tr>
<tr>
<td>Technical Telephony (P.O.)</td>
<td>32</td>
</tr>
<tr>
<td>Instrument Making and Glass Blowing</td>
<td>33-34</td>
</tr>
<tr>
<td>Wireless Telegraphy (Operators' Course)</td>
<td>35</td>
</tr>
<tr>
<td>Physics and Mathematics</td>
<td>41</td>
</tr>
<tr>
<td>Radio Communication and Radio Service</td>
<td>44</td>
</tr>
<tr>
<td>Applied Chemistry</td>
<td>47</td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>55</td>
</tr>
<tr>
<td>Industrial Chemistry and Bacteriology</td>
<td>55-61</td>
</tr>
<tr>
<td>Medical and Pharmaceutical Chemistry</td>
<td>67</td>
</tr>
<tr>
<td>Botany, Materia Medica and Pharmacy</td>
<td>71</td>
</tr>
<tr>
<td>Languages for Students of Technology</td>
<td>72</td>
</tr>
</tbody>
</table>
Entrance Examinations — Fees — Regulations

Entrance Examinations will be held at the Technical Institute, Kevin Street, every evening during the week commencing 21st September, and on such subsequent evenings as may be arranged. Students who produce satisfactory evidence of education may be exempted from examination. Introductory Courses are provided for those who fail to obtain sufficiently high marks in the examination.

FEES PER SESSION.

Introductory Courses ...... £0 2 6
Pharmaceutical Chemistry (Lectures) ...... 1 10 0
Do. do. (Practical) ...... 0 10 0.
Applied Chemistry ...... 0 15 0
Medical Chemistry ...... 1 10 0
Specialised Technical Analysis ...... 0 15 0
Practical Pharmacy (per term) ...... 0 15 0
Day and Evening Wireless Courses. (See page 35).
All other Courses ...... 7/6 for each year of Course.

For additional and single subjects the fee is the same as for a Course. Students of Technical Classes may take a Class in Irish at a fee of 2/6.

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

The Trade Classes are primarily intended for those engaged in the several trades. Others will not be admitted before November 2nd, 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 about three years.

Where possible, separate classes for journeymen will be arranged in trade subjects.

The Courses as set out are not to be considered as arbitrary, the subjects may, with the sanction of the Head of the Department, be varied.
Schools of Electrical Engineering, Wireless Telegraphy, Physics and Applied Chemistry.

PROGRAMME AND TIME TABLE

OF THE COURSES IN

Electrical Engineering Practice and Technology
Electrical Trades and Crafts
Instrument Making and Allied Crafts
Radiotelegraphy
Physics and Mathematics
Pure and Applied Chemistry
Industrial Chemistry — Specialised Courses
Bacteriology and Botany
Pharmacy and Allied Subjects
Languages for Students of Technology

TECHNICAL INSTITUTE, KEVIN STREET

Session 1936-37
Teaching Staff

E. MORTON, A.R.C.S.C.I. .... Principal and Head of the School of Physics, Electrical Engineering and Chemistry.

F. NOLAN, M.Sc.
HAROLD A. HODGENS.
WILLIAM FEGAN, A.M.I.E.E.
MICHAEL LAMBERT.
R. G. ALLEN, B.Sc., A.R.C.S.C.I.
GEO. RING, A.R.C.S.C.I., B.E.
W. P. COLLINS.

JAMES MORAN.
M. O'KEEFE.
J. O'TOOLE.
E. MOYNIHAN, A.R.C.S.C.I.
H. FLOOD, A.R.C.S.C.I.
M. HENDERSON, B.E.

M. J. GORMAN, A.R.C.S.C.I. ....

K. HANWAY, M.Sc.
W. O'BRIEN.
P. WHELAN, A.R.C.S.C.I.
G. A. WATSON, A.R.C.S.C.I.
JOHN SHEIL, M.D., B.L., PH.C.
W. J. LOOBY, B.Sc., A.R.C.S.C.I., H. DIP. IN ED.
F. J. BARRAGRY, M.P.S.I.
D. S. MACEOIN.

P. SULLIVAN.
P. J. O'CALLAGHAN, B.Sc., A.R.C.S.C.I.
H. J. BARRISCALE, B.E.
J. HONAN.
P. J. HURLEY, M.Sc.
H. D. THORNTON, B.Sc., A.R.C.S.C.I.
B. DIXON, A.R.C.S.C.I.

J. H. FERGUSON.
# Courses and Time Tables

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
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<tr>
<td></td>
<td>SPECIAL CLASSES IN IRISH.</td>
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<tr>
<td></td>
<td>Irish—I.D.</td>
<td>Fri.</td>
<td>7.30-9.30</td>
<td>13</td>
<td>D. S. MacEoin.</td>
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<td>PREPARATORY COURSES</td>
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<td>1K</td>
<td>English</td>
<td>Tues.</td>
<td>7.30-8.30</td>
<td>28</td>
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<td></td>
<td>Arithmetic</td>
<td>Tues.</td>
<td>8.35-9.35</td>
<td>28</td>
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<td>Drawing</td>
<td>Wed.</td>
<td>7.30-9.30</td>
<td>14</td>
<td>Miss M. Whelan.</td>
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<td>INTRODUCTORY COURSES</td>
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<td>English—F</td>
<td>Mon.</td>
<td>7.30-8.30</td>
<td>28</td>
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<td>Elementary Mathematics—F</td>
<td>Mon.</td>
<td>8.30-9.30</td>
<td>28</td>
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<tr>
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<td>Elementary Science—A</td>
<td>Fri.</td>
<td>7.30-9.30</td>
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<td>E. Moynihan</td>
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<td>5K</td>
<td>English—G</td>
<td>Thurs.</td>
<td>7.30-8.30</td>
<td>28</td>
<td>J. Gately</td>
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<td>Elementary Mathematics—G</td>
<td>Thurs.</td>
<td>8.30-9.30</td>
<td>28</td>
<td>J. Gately</td>
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<td>Drawing—F</td>
<td>Wed.</td>
<td>7.30-9.30</td>
<td>14</td>
<td>Miss M. Whelan.</td>
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<td>6K</td>
<td>Electrical Wiring—Pract. I</td>
<td>Mon. or Fri.</td>
<td>7.30-10.0</td>
<td>1</td>
<td>J. Moran, P. Collins,</td>
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<td>Electrical Installation—Lect. I</td>
<td>Wed.</td>
<td>7.30-8.30</td>
<td>5</td>
<td>W. Fegan.</td>
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<td>Electrical Laboratory—I.</td>
<td>Wed.</td>
<td>8.35-10.0</td>
<td>8</td>
<td>E. Moynihan, H. Flood,</td>
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<td></td>
<td>Physics for Electricians</td>
<td>Tues.</td>
<td>7.30-10.0</td>
<td>8</td>
<td>H. Flood, M. Henderson</td>
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<td>7K</td>
<td>Electrical Wiring—Pract. II.</td>
<td>Thurs.</td>
<td>7.30-10.0</td>
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<td>Electrical Installation—Lect. II.</td>
<td>Tues.</td>
<td>7.30-8.30</td>
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<td>W. Fegan.</td>
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<td>Electrical Engineering—II.</td>
<td>Mon.</td>
<td>7.30-10.0</td>
<td>6</td>
<td>G. Ring.</td>
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<td></td>
<td>SECOND YEAR.</td>
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<td>8K</td>
<td>Electrical Fitting—Pract.</td>
<td>Wed.</td>
<td>7.30-10.0</td>
<td>1</td>
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<td>Electrical Engineering—(D.C. and A.C.)</td>
<td>Thurs.</td>
<td>7.30-10.0</td>
<td>6</td>
<td>W. Fegan.</td>
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<td>Practical Drawing</td>
<td>Fri.</td>
<td>7.30-10.0</td>
<td>14</td>
<td>H. J. Barriscale</td>
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<tr>
<td>9K</td>
<td>Cable Jointing</td>
<td>Mon. &amp; Wed.</td>
<td>8.0-10.0</td>
<td>18</td>
<td>P. O'Keeffe</td>
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<td></td>
<td>THIRD YEAR.</td>
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<td>10K</td>
<td>Electric Welding</td>
<td>Mon. &amp; Thur.</td>
<td>8.0-10.0</td>
<td>5</td>
<td>J. O'Toole.</td>
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<tr>
<td>Course</td>
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<td>Hour</td>
<td>Room</td>
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<td>11K</td>
<td>Electrical Engineering—I.A.</td>
<td>Thurs.</td>
<td>7.30-10.0</td>
<td>12-10-8</td>
<td>H. Flood, E. Moynihan</td>
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<td></td>
<td>Physics for Electricians—I.A.</td>
<td>Mon.</td>
<td>7.30-10.0</td>
<td>8</td>
<td>H. Flood, M. Henderson</td>
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<td>12K</td>
<td>Electrical Engineering—I.B.</td>
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<td>7.30-10.0</td>
<td>12-10-8</td>
<td>E. Moynihan, H. Flood</td>
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<td>Tues.</td>
<td>7.30-10.0</td>
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<td>13K</td>
<td>Electrical Engineering—II.</td>
<td>Mon.</td>
<td>7.30-10.0</td>
<td>4-6</td>
<td>G. Ring, P. Brickell</td>
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<td>Mathematics—II. C.</td>
<td>Fri.</td>
<td>7.30-9.30</td>
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<td>H. C. Clifton</td>
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<td>Practical Drawing—II.</td>
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<td>7.30-10.0</td>
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<td>Electrical Engineering—III.</td>
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<td>7.30-10.0</td>
<td>4-6</td>
<td>G. Ring, W. Fegan</td>
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<td>Fri.</td>
<td>7.30-10.0</td>
<td>9</td>
<td>F. Nolan</td>
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### POST OFFICE ENGINEERING COURSES

#### TECHNICAL TELEGRAPHY

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### SPECIAL COURSES

- **SANITATION SCIENCE.**
- **ELECTRICITY FOR RADIOLOGISTS.**
- **PHYSICAL OPTICS.**
- **OPTICAL INSTRUMENTS.**

*The Special Courses listed above will be organised in the Session 1936-37. Intending students should consult the Principal.*

### MATHEMATICS

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### PURE AND APPLIED CHEMISTRY

#### APPLIED CHEMISTRY (GENERAL)

**FIRST YEAR.**

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<tr>
<td></td>
<td>BREWING SCIENCE AND CHEMISTRY OF FERMENTATION.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55K</td>
<td>Lecture and Laboratory .. ..</td>
<td></td>
<td></td>
<td>23</td>
<td>W. J. Looby; J. H. Fergus</td>
</tr>
<tr>
<td></td>
<td>INDUSTRIAL BACTERIOLOGY AND ENZYME CHEMISTRY.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56K</td>
<td>Lecture and Laboratory .. ..</td>
<td>Wed.</td>
<td>7.30–10.0</td>
<td>21</td>
<td>G. A. Watson</td>
</tr>
<tr>
<td>57K</td>
<td>Lecture and Laboratory .. ..</td>
<td>Thurs.</td>
<td>7.30–9.30</td>
<td>22</td>
<td>F. Nolan</td>
</tr>
<tr>
<td>58K</td>
<td>Lecture and Laboratory .. ..</td>
<td>Fri.</td>
<td>7.30–9.30</td>
<td>23</td>
<td>W. J. Looby</td>
</tr>
<tr>
<td></td>
<td>CHEMISTRY FOR PHOTOGRAPHY. PHOTO-MECHANICAL PROCESS WORK,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LITHOGRAPHY, ETC.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59K</td>
<td>Medical Chemistry—Lect. .. ..</td>
<td>Wed., Fri.</td>
<td>7.30–8.30</td>
<td>25</td>
<td>P. J. Hurley</td>
</tr>
<tr>
<td>60K</td>
<td>Medical Chemistry—Do. Lab. .. ..</td>
<td>Mon.</td>
<td>7.30–10.0</td>
<td>21</td>
<td>P. J. Hurley</td>
</tr>
<tr>
<td></td>
<td>CHEMISTRY AND BOTANY FOR SEEDSMEN.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MEDICAL CHEMISTRY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61K</td>
<td>Medical Chemistry—Do. Lab. .. ..</td>
<td>Fri.</td>
<td>8.30–10.0</td>
<td>21</td>
<td>P. J. Hurley</td>
</tr>
</tbody>
</table>
**COURSES FOR PHARMACEUTICAL CHEMISTS**

*LECTURE COURSE IN PHARMACEUTICAL CHEMISTRY.*

(September to May).

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>60K</td>
<td>Chemistry and Physics, Lecture</td>
<td>Mon. &amp; Fri.</td>
<td>7.30–8.30</td>
<td>25</td>
<td>P. J. Hurley</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lab. (Optional)</td>
<td>Mon. &amp; Fri.</td>
<td>8.30–10.0</td>
<td>21</td>
<td>P. J. Hurley</td>
<td></td>
</tr>
</tbody>
</table>

*POST-LECTURE COURSES IN PRACTICAL CHEMISTRY.*

(September to January; January to May; May to August).

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>61K</td>
<td>Chemical Laboratory</td>
<td>(120 hours)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Botany</td>
<td>Thurs.</td>
<td>7.0–8.30</td>
<td>23</td>
<td>W. J. Looby</td>
</tr>
</tbody>
</table>

*MATERIA MEDICA.*

(September to May).

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>63K</td>
<td>Materia Medica</td>
<td>Thurs.</td>
<td>8.30–9.30</td>
<td>23</td>
<td>Dr. J. Sheil</td>
</tr>
</tbody>
</table>

PRACTICAL PHARMACY.

(September to January; January to May; May to August)

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>64K</td>
<td>Lecture and Practical</td>
<td>Mon., Tues.</td>
<td>7.30–10.0</td>
<td>24</td>
<td>F. J. Barraray</td>
</tr>
</tbody>
</table>

LANGUAGE COURSES

**IRISH FOR STUDENTS OF SCIENCE AND TECHNOLOGY.**

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>65K</td>
<td>Irish</td>
<td>Wed.</td>
<td>8.0–10.0</td>
<td>25</td>
<td>W. J. Looby</td>
</tr>
</tbody>
</table>

**GERMAN FOR STUDENTS OF SCIENCE AND TECHNOLOGY.**

<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>66K</td>
<td>German</td>
<td>Mon.</td>
<td>8.0–10.0</td>
<td>23</td>
<td>W. O'Brien</td>
</tr>
</tbody>
</table>
Scholarships

THE FOY SCHOLARSHIPS IN APPLIED CHEMISTRY.

A former student of the City of Dublin Municipal Technical Schools, Mr. W. P. Armstrong, has established a Scholarship in Chemistry to be called the "Foy Scholarship." The annual value of the Scholarship is about £20, being the proceeds of an investment of £500 in Dublin Corporation Stock.

The Scholarship is awarded each Session on the result of an Examination in Chemistry, usually held in May. All students who have attended regularly during two Sessions in the Chemistry Department are eligible to compete, and the student to whom the Scholarship is awarded must pursue his studies in the Chemistry Department during the following Session.

THE DUBLIN MECHANICS' INSTITUTE SCHOLARSHIPS.

The Residuary Fund of the Dublin Mechanics' Institute has been made available for Industrial Scholarships under the management of the Technical Education Committee.

Three Scholarships will be awarded annually—one in the Mechanical Engineering Group, one in the Electrical Engineering and Physics Group, and one in the Building Trades Group. The Scholarships are tenable for three years, and are value about £3 each per year.

Candidates must be engaged in an Operative Trade as Apprentices or Learners. They must be between the ages of 16 and 19, and must have attended a Technical Course during the preceding School Session and made 80 per cent. of the possible attendances in two of the subjects of the Course in which they are entered.

MULLIGAN SCHOLARSHIPS.

As a result of a bequest by the late John Mulligan, Managing Director of the Hibernian Bank, and for many years Chairman of the City of Dublin Technical Education Committee, approximately 25 Scholarships of £1 each will be awarded annually.

The awards will be made on the results of the Second Year Course Examination of the Department of Education to successful students having the best record of attendance.
# School of Wireless Telegraphy

**DAY AND EVENING COURSES FOR THE TRAINING AND CERTIFICATION OF SEA-GOING WIRELESS OPERATORS.**

## DAY COURSE

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Radio Lecture—Section B.</td>
<td>Mon., Wed., Fri.</td>
<td>3.0–4.0</td>
<td>11</td>
<td>H. Hodgens.</td>
</tr>
<tr>
<td>Direction Finding Theory—Section A...</td>
<td>Mon, Thurs.</td>
<td>11.30–12.30</td>
<td>11</td>
<td>H. Hodgens.</td>
</tr>
<tr>
<td>Practical Radio* Instruction and Exercises—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section A.</td>
<td>Tues., Thurs.</td>
<td>3.0–4.0</td>
<td>11</td>
<td>H. Hodgens.</td>
</tr>
<tr>
<td>Section B.</td>
<td>Tues., Thurs.</td>
<td>2.0–3.0</td>
<td>11</td>
<td>H. Hodgens.</td>
</tr>
<tr>
<td>Electricity and Magnetism—Section B.</td>
<td>Mon., Thurs.</td>
<td>11.30–12.30</td>
<td>12</td>
<td>E. Morton.</td>
</tr>
<tr>
<td></td>
<td>Tues., Wed., Fri.</td>
<td>11.30–12.36</td>
<td>12</td>
<td>W. Fegan.</td>
</tr>
<tr>
<td>Rules and Regulations...</td>
<td>Tues., Thurs.</td>
<td>2.0–4.0</td>
<td>13</td>
<td>J. V. Honan.</td>
</tr>
<tr>
<td>Telegraphy and Traffic Practice</td>
<td>Daily</td>
<td>10.0–11.30 and 2.0–4.0</td>
<td>13</td>
<td>H. Hodgens and J. V. Honan.</td>
</tr>
</tbody>
</table>

*Fortnightly examination tests will be held in all subjects.*

*Practice in taking and working out bearings daily.*

## EVENING COURSE

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telegraphy Practice (including handling of radio-telegrams)</td>
<td>Mon.</td>
<td>7.30–9.30</td>
<td>13</td>
<td>J. V. Honan.</td>
</tr>
<tr>
<td></td>
<td>Wed.</td>
<td>7.30–9.30</td>
<td>13</td>
<td>J. V. Honan.</td>
</tr>
<tr>
<td></td>
<td>Thurs.</td>
<td>7.30–9.30</td>
<td>13</td>
<td>J. V. Honan.</td>
</tr>
<tr>
<td>Electricity and Magnetism</td>
<td>Fri.</td>
<td>7.30–9.30</td>
<td>8</td>
<td>P. O'Callaghan.</td>
</tr>
</tbody>
</table>

*Direction Finding Theory and Practice included in Course for 1st Class Certificate.*
Courses and Syllabuses

ELECTRICAL ENGINEERING, WIRELESS TELEGRAPHY, APPLIED PHYSICS AND CHEMISTRY.

INTRODUCTORY COURSE (ELECTRICAL).

Subjects:

ENGLISH.

WORKSHOP ARITHMETIC.

ELEMENTARY SCIENCE, or

PRACTICAL DRAWING.

ENGLISH.

Grammar—parts of speech—punctuation—letter and essay writing—notetaking—dictation and reading from technical journals—lectures on simple electrical apparatus and machinery.

WORKSHOP ARITHMETIC.

Signs and symbols—factors and powers—G.C.M. and L.C.M. fractions, simplification and conversion to decimals—decimals and metric system—percentages—ratio and proportion—units of length—mensuration of rectangles, parallelograms, triangles, circles, cylinders and cones—practical methods of calculating areas and volumes—units of weight and specific gravity—evaluation of simple formulae used in electrical engineering.

ELEMENTARY SCIENCE.


**Practical Drawing.**

Use and care of instruments—scales—lettering and simple geometrical exercises on lines and circles—projections of solids—freehand sketching and measurement of models—methods of making drawings of simple parts of machines and apparatus.

---

**First Year Course in Electrical Engineering Practice.**

**Subjects:**

Electrical Engineering.

Mathematics, Mechanics and Drawing.

(Physics for Electricians).

**Electrical Engineering.**

First Year.

Phenomena of electric charges and currents—lines of force—types of magnetic fields—electro-magnets, permanent magnets, and their applications—conductors and insulators—difference of potential—primary cells—volts, amperes, and ohms—Ohm's law—galvanometers—ammeters, and voltmeters—resistance and methods of measurement—specific resistance—temperature coefficient—thermal effects of currents—incandescent lamps; attainment of steady temperature—
simple photometry—fuses—heaters and radiators—Joule’s, Watt’s, and B.O.T. units—Coulombs—potential and other factors governing size of cables—description and grading of cables—electric arc-switches—chemical effects of a current—electro-deposition—secondary cells and batteries—internal resistance—divided circuits and currents—grouping of cells—electro-magnetic induction—spark coil—simple action of the dynamo.

**SCIENCE, MATHEMATICS, AND DRAWING.**

*(Physics for Electricians).*

perimeters, cross-sectional areas, surfaces, volumes, and weights of simple details of apparatus in metric and British systems. The triangle, rectangle, circle, cylinder, cone and frustrum. Square root. Percentage. Sine, cosine, and values for 0, 30, 45, 60 and 90 degrees. Use of tables. Drawing: Simple geometrical figures and hexagons, ellipses and polygons to scale from specified dimensions to illustrate distributing networks.

SECOND YEAR COURSE IN ELECTRICAL ENGINEERING PRACTICE.

Subjects:

ELECTRICAL ENGINEERING.

MATHEMATICS.

MACHINE DRAWING.

SECOND YEAR.

Practical units for current, voltage, resistance power and energy—Ohm's law—resistances in series and parallel—measurement of resistances—Wheatstone bridge—use of megger—ohm-meter and generator, and voltmeter for measuring insulation resistance—principles of commercial measuring instruments—electrical and mechanical properties of conductors and insulators—magnetic induction—simple theory of the dynamo—construction and functions of different parts of direct current dynamo—shunt series and compound windings—deduction of the formulae for generated volts—motors, general principles of action—starters and regulators—reversal rotation in series—shunt and compound wound motors—commonly occurring faults and wrong connections—secondary cells, installation and maintenance, direct current transmission and distribution circuits—simple calculations thereon—types of electric lamps—illumination tests and calculations—alternating currents—single phase—elementary theory of construction of alternator—frequency—effect of self-induction and capacity—lag and lead—choking coil—resistance and impedance—power in single-phase circuits, inductive and non-inductive—principle
of action of the transformer—A.C. motors—elementary treatment of
the production of a rotating magnetic field by two and three-phase
currents in order to explain the action of induction motors.

MATHEMATICS.

SECOND YEAR.

Logarithms and log-tables—cube root by logarithms—use of
logarithms in calculations of amount of electrical energy supplied to
motors and circuits, and weights and costs of machine parts—values
of Ax and Ebx—areas by squared paper and Simpson's rule—ratio
of area to perimeter and bearing on economy of copper wire—area
of a sine current half-wave and ratio of its average to its maximum
value—equations—examples involving simple equations—finding D
and L knowing D2L and D/L—determining X and Y knowing
1/X+1/Y, Y and XY, as required in testing the insulation resistance
of two-wire circuits—trigonometry—radian measure—relation be­
tween degrees and radians—angular velocity of current or voltage
vectors and their instantaneous values—meaning of the form I sinc
(at—g)—geometrical proofs for expanded forms of sin (A+B) and
cos (A+B) in terms of sines and cosines of A and B, and verification
from trigometrical tables—graphs of trigonometrical and exponential
functions, and of such algebraical functions as value of AX+BX
with respect to value of X. Mechanics: The lever, pulley-block,
screw-jack, hydraulic press—mechanical advantage—resultant pull of
field-magnet poles upon armature core—velocity and acceleration;
linear and angular—law connecting force, mass and acceleration­
work, energy, and power—calculation of brake-horse-power—
efficiency—friction—calculation of brush friction loss—energy of
rotating masses, as parts of a flywheel—centrifugal force—simple
balancing of rotating masses—general principles of fluid pressure.

MACHINE DRAWING.

SECOND YEAR.

Freehand diagrammatic sketches of electrical apparatus, and the
conventional drawing of circuits and connections, such as those asso­
ciated with measuring instruments, storage batteries, and direct
current machines. Freehand and scale drawings of bearings, shaft,
armature core, field-magnets, brush holders, switches, and other simple
parts of direct current machines.
THIRD YEAR COURSE IN ELECTRICAL ENGINEERING PRACTICE.

Subjects:

Electrical Engineering.

Applied Mechanics.

Power Plants and Producers.

Electrical Engineering.

Third Year.


APPLIED MECHANICS II.

Second Year.

See Syllabus under Third Year of Course in Mechanical Engineering.
MATHEMATICS III.

THIRD YEAR.


FOURTH AND HIGHER YEARS' COURSES IN ELECTRICAL ENGINEERING PRACTICE.

Subjects:

ELECTRICAL ENGINEERING.

MATHEMATICS.

POWER PLANTS AND PRODUCERS.

ELECTRICAL ENGINEERING.

FOURTH AND HIGHER YEARS.

General consideration of alternating E.M.F. and current—maximum R.M.S. and average values—inductance, reactance, and impedance—capacity and condensers—vectors and their application to
A.C. circuits—power and power factor—iron, properties and measurement of losses in iron—wave forms and harmonies—production of polyphase currents, three-phase circuits—power in polyphase circuits, methods of measurement of power—rotating fields—transformer; construction, types principles, performance, tests—auto-transformer; principle and uses—transformer connections, phase-transformations—alternators; construction, principles, performance and tests—armature windings, common types—synchronous motors, principles, performance and tests—methods of starting and synchronising—induction motor; construction, types, principles and performance—vector and circle diagrams, tests—rotary converter; principle, voltage, ratios, performance and uses—commutator motors; general principles of operation—repulsion motors; principles of operation—motor converters; principles of operation—transmission; voltage drop due to resistance capacity and inductance—comparison of efficiency of methods of transmission.

MATHEMATICS.

Fourth Year.

Simultaneous equations of three unknowns—simple cases of the binomial theorem—values of sin 2A and cos 2A in terms of sin A and cos A—value of tan (A ± B) in terms of tan A and tan B—values of sin A ± sin B and cos A ± cos B in terms of the sines and cosines of half the sum or difference of A and B—solution of triangles—sum of the series sin a+sin (a+d)+sin (a+2d) ... to n terms—calculation of hysteretic co-efficient from hysteresis curve of sample of iron—graph of \( I = Ae^{at} + \sin mt \); \( t \) being time and 1 current—measurement of slope at a point on sine and other curves such as those representing \( y = e^x \) and \( y = e^{ax} \)—simple differentiation with respect to \( x \), of forms such as \( ax^n \) and \( ax^n \); \( n \) being 1, 2, 3, or 4: \( a \sin x, a \cos x, a \tan x; a \sin bx, a \cos bx, a \tan bx \); \( \log x \)—simple integration of forms such as \( ax^n \) and \( ax^n \) in which \( n = 1, 2, 3, \) or 4; \( a \sin bx, a \cos bx, a \sin 2x, a \cos 2x \)—integration between limits such as is involved in determining area of a half sine wave, strength of the magnetic field outside a straight conductor carrying a current, insulation resistance of a cable, temperature rise in machine parts.
POWER PLANTS AND PRODUCERS.

FOURTH YEAR.

Steam: Fuels, solid and oil—calorific power—heat transmission in steam boilers; effects of deposits and incrustation—types of land boilers—choice of boiler to suit character of fuel, restrictions of space and required output—boiler mountings—superheaters, economisers, feed water-heaters, boiler feed pumps of different makes, injectors—hand stoking, mechanical stokers—natural and forced draught—testing, examination and upkeep of boilers—lay-out of a boiler house. Reciprocating Steam Engines: Description of present-day types—peculiarities of high-speed engines used in electrical plants—forced lubrication—valve gears and valve setting—governors; governing for special and fluctuating loads—fly-wheels—jet and surface condensers—air and circulating pumps—maintenance of vacuum—cooling towers—pipe lines, lagging, provision for expansion and drainage—water hammer—steam traps and separators—connection of boiler and engine house—lay-out of an electrical generating station—indicators, calculations, I.H.P. and B.H.P.—measurement of feed and condensing water—steam consumption per I.H.P., B.H.P., and kilowatt hour. Locomotive Engine: Conditions affecting the design of locomotives—train resistance on the level, on curves and on inclines—tractive power and draw-bar power—adhesion on dry and wet rails—distribution of weight, centre of gravity and wheel arrangements—balancing for revolving and reciprocating masses—valves and valve gears—locomotive boilers—superheaters and feed water-heaters—special valves, fittings, lubricators, etc.—vacuum and air brakes. Steam Turbines: Types, operation and care of steam turbines—lubrication, governing, etc. Internal Combustion Engines: Description, starting, operation and care of gas oil engines—indicator diagrams, calculations of power, gas and oil consumption per brake horse-power hour—calorific powers of oils and gases—Diesel engines—the Still and other special engine types. Water Turbines: Choice of a particular type—lay-out of hydro-electric plant.

Arrangements will be made at suitable times for visits to power-houses and important engineering works in the city and vicinity.
FIRST YEAR COURSE IN ELECTRICAL INSTALLATION WORK.

Subjects:
ELECTRICAL WIRING (Lectures).
ELECTRICAL WIRING (Practical Work).
ELECTRICAL ENGINEERING.
PHYSICS FOR ELECTRICIANS.

ELECTRICAL WIRING (LECTURES).

First Year.


ELECTRICAL WIRING (PRACTICAL WORK).

First Year.

Methods of handling wire and cable—soldering iron and blow lamp—methods of tinning and heating fluxes—sweating and preparing
thimbles and lugs—making the following joints:—Running, end to end, T and Y in 1/18, 3/22, 7/16, 19/16—connecting to ceiling roses, switches, sockets, and other accessories—methods of connecting flexibles—insulating joints—preparation of ends—looping in—cutting, screwing, and bending metal pipes and conduits—bending and connecting up metal-sheathed wires.

ELECTRICAL ENGINEERING AND PHYSICS FOR ELECTRICIANS.

FIRST YEAR.

See Syllabuses under First Year Course in Electrical Engineering.

SECOND AND THIRD YEAR COURSES IN ELECTRICAL INSTALLATION WORK.

Subjects:

Electrical Wiring (Lectures).

Electrical Wiring (Practical Work).

Electrical Engineering.

Machine Drawing.

ELECTRICAL WIRING (LECTURES).

SECOND AND THIRD YEARS.

In addition to the subjects of First Year the following will be dealt with: Wiring Rules of the Institution of Electrical Engineers and Regulations of the Home Office—insulation testing with ohm-meter and generator, or other testing instruments—location and repair of faults—details of cables, switches and cut-outs in general use and carrying capacities—rating of fuses—connecting-up motors and dynamos and methods of altering speed and rotation—three-wire system and lamp and power connections thereon—care and maintenance of secondary batteries—more extended knowledge of principles governing earthing of metal portions of installations—precautions to be taken against; unsuitable switches, fittings, etc.; insufficient earthing of iron
piping, motors, etc.; dampness in exposed cables or outside wiring—
vulcanising concentric and other special systems—drawing up wiring
schedule for small installation—erection and running of small isolated
plants, including oil or gas engine, dynamo, and secondary battery—
principles and connections of electrical cooking and heating apparatus,
signs and flashers, time switches, and small motor-driven appliances—
ergy consumed by electric cooking and heating apparatus and ad-
vantages or disadvantages compared with other means of heating and
cooking—wiring up and connecting simple telephones and inter-
communication systems. Drawing: Plans, elevations, sections and
dimensioned sketches roughly to scale.

ELECTRICAL WIRING (PRACTICAL WORK).

SECOND AND THIRD YEARS.

More advanced work on the matters included in the Syllabus for
the First Year, and in addition: Joints on cables up to \( \frac{1}{2} \) square inch
sectional area—jointing and connecting lead-covered cables, including
V.R., or paper insulated concentrics—making and installing fuses of
various capacities—wiring of more complex circuits—working and
connecting up of metal-sheathed wires, and cables—making of working
sketches from diagrams.

ELECTRICAL ENGINEERING.

SECOND YEAR.

See Syllabus under Second Year Course in Electrical Engineering.

CABLE JOINTING.

FIRST AND HIGHER YEARS.

Low tension, high tension and extra high tension cables. Con-
centric cables. Preparation of ends for jointing. Straight through
joints on L.T. single core, twin core, 3-core and 4-core cables. Tee-
joints on above. Making of sleeves for joints. Correct method of
filling sleeves with insulating compound. Joints on single core, twin
core, 3-core, and 4-core concentric cables. Joints on H.T. and
E.H.T. cables.
ELECTRIC WELDING.
FIRST AND HIGHER YEARS.
Details of equipment—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.

FIRST YEAR COURSE IN TECHNICAL TELEGRAPHY.
Subjects:
TECHNICAL TELEGRAPHY.
MAGNETISM AND ELECTRICITY.

TECHNICAL TELEGRAPHY.
FIRST YEAR.
Telegraph Instruments: Principles and construction of Wheatstone’s A B C, single needle, sounder (ordinary and polarised), keys, relays, and simple switches. Galvanometers: Astatic, differential, tangent, Thomson, and suspended coil—shunts and their use. Resistance Coils: Construction of, gauge and kind of wire for, methods of winding and insulating, effect of temperature variation. Condensers: Construction and testing of; uses in the simpler telegraph systems—inspection and testing of telegraph instruments. Telegraph Lines: Aerial, underground, and submarine; construction of, and relative advantages—testing instruments and methods of using in the simpler tests; apparatus employed by linemen—faults; their nature, general principles of localisation. Telegraph Systems: Simpler systems of manual telegraphy, including single and double current duplex, common battery systems and universal working; also simple methods of cable telegraphy. Miscellaneous: Earth currents; nature of, and methods of preventing disturbance therefrom—methods of protecting lines and apparatus from (a) lightning, (b) power circuit currents. Suitable illustrative diagrams will be systematically introduced.
MAGNETISM AND ELECTRICITY.

*Magnetism*: Magnets and magnetic substances—action of magnets on one another—north and south poles and magnetic axis of a magnet—magnetic meridian—magnetic field—lines of force; their delineation by iron filings or a small compass—magnetic induction—magnetic qualities of hard steel and soft iron—effects of the introduction of soft iron into a magnetic field—methods of magnetisation by permanent magnets—distribution of magnetism in magnets—effect of breaking or sub-dividing a magnet—effect of the keeper of a magnet on the distribution of the lines of force—terrestrial magnetism—mariners' compass; declination, dip: magnetic poles and equator—general explanation of the behaviour of compass and dip needle on the assumption that the earth is a magnet—direction of the earth's magnetic force at a place—horizontal and vertical components of the force—diurnal and secular variation. *Electrostatics*: Electrification by friction—positive and negative electrification—simultaneous development of positive and negative charges in equal quantities—attraction and repulsion—electric charge or electric quantity—the gold leaf electroscope—conductors—non-conductors—distribution of electricity on conductors—hollow conductors—points—difference of potential—analogies with temperature, level, and pressure—work done by or against electric forces—electric field—electrostatic induction—electrostatic capacity—Leyden jar and plate condenser—electrophorous—frictional electric machine—influence machines—electric discharge. *Electric Currents*: Simple voltaic cells—local action and polarisation—constant cells—general description of the chemical action taking place in the most common forms of cells—electrolysis—electromotive force (potential difference)—electric circuit, current, and resistance—connection of cells in series and in parallel—Ohm's law and its application to simple circuits—ampere, volt, ohm—magnetic field due to a current in a straight wire and in a circular coil—Hertz's experiment—galvanometer—forces acting on the needle of a galvanometer—advantages of an astatic pair of needles—suspended coil instruments—the heating effect of a current in a conductor—electro magnets—induction of electromotive forces by moving conductors in magnetic fields.
SECOND YEAR COURSE IN TECHNICAL TELEGRAPHY.

Subject:
TECHNICAL TELEGRAPHY.

Second Year.

FIRST YEAR COURSE IN TECHNICAL TELEPHONY.

Subject:
MAGNETISM AND ELECTRICITY.

TECHNICAL TELEPHONY.

First Year.

Telephone Instruments: Various transmitters and receivers in common use—construction and principles of transformers, keys, impedance coils, repeating coils, magneto and other bells, magneto generators, indicators, jacks, relays, condensers, and other minor apparatus. Telephone Lines: Aerial and underground, construction of—electrostatic and electromagnetic disturbances, methods of eliminating—advantages of metallic circuits—testing of metallic circuits, instruments employed and methods of using them in the simpler tests—apparatus employed by linemen—faults, their nature—general principles of localisation. Telephone Systems: The simpler systems of telephony, including the principles of common battery and trunk working—the simpler types of standard switchboards—magneto and central energy. Protective Devices: Methods of protecting lines and apparatus from (a) lighting, (b) power circuit currents. Suitable illustrative diagrams will be systematically introduced.

MAGNETISM AND ELECTRICITY.
(See Syllabus for First Year Technical Telegraphy).

SECOND YEAR COURSE IN TECHNICAL TELEPHONY.

Subject:
TECHNICAL TELEPHONY.

Second Year.

generally, methods of use and maintenance, various forms of transmitters and receivers, tests for efficiency, subscribers' sets. Telephone Systems: Manual Exchanges; magneto and common battery, complete multiple, partial multiple, divided multiple, transfer, method of ringing, engaged tests—lay-out of exchanges, equipment, including frames, racks, sections, desks, apparatus and power plant—automatic exchanges, general principles of—party line systems; circuits exchange equipment, subscribers' station equipment—private branch exchanges, "house" systems, pay stations, coin-collecting boxes—junction circuits; methods of working between local exchanges in same area and between trunk and local exchanges—trunk circuits; exchange equipment, circuits, methods of working, signalling, recording calls—super-imposed or multiplex circuits—simultaneous telegraphy and telephony on the same wires, practical systems and theory of. Telephonic Transmission: Limiting factors—attenuation and distortion—loading—Pupin's and other formulae—effects of leakage—conductance—comparative efficiencies of wires of various materials and gauges, open, underground, and submarine. Testing: Wheatstone bridge—tangent, ballistic and reflecting galvanometers—ammeters—voltmeters—theory, construction, and methods of use—localisation of earths, contacts, and disconnections on line wires—capacity, resistance, inductance, and insulation measurements—measurement of resistance and E.M.F. of batteries—Post Office Morning Test system (for long-distance lines). Miscellaneous: Kirchoff's and Maxwell's laws—electro-magnet coils, simple formulae for telephone repeaters. Suitable illustrative diagrams will be systematically introduced.

TELEGRAPHY—MORSE SOUNDER PRACTICE.

In this class instruction will be given in the manipulation of the Morse Sounder and the reception and transmission of messages, up to the speed required by the Post Office. Instruction will also be given in Post Office telegraphic regulations, signalling procedure, etc.

INSTRUMENT MAKING AND LABORATORY ARTS.

INSTRUMENT MAKING.

First and Higher Years.

Materials: Metals—alloys—woods—insulating materials—mechanical properties of each and suitability for different purposes.

GLASS BLOWING OF TECHNICAL APPARATUS.

Preliminary Considerations: Tools, Blowpipe, Files and Knives, Flame, Cleaning of Glass.

General Operations: Cutting Soft Glass, Cutting Hard Glass, Concentric Capillaries, Constricting a Tube, Rotation of the Tube, Flanging, Bending Glass.

Elementary Services: Joining Tubing End to End (Equal bore), Joining Two Tubes (Unequal bore), T-pieces and Angle joints, Bulb at End of Tube, Bulb in middle of Tube.


Special Operations: Condensers, Spirals, Cone-and-socket Joint, Cylindrical Dewar-vessels, Silvering of Glass, Simple manipulations with hard glass in the oxygen flame, Glass-to-metal Seals and Joints, Electrodes, Copper to Glass Joints.
NOTICE.

Students of the Electrical Engineering Classes are advised to read the regulations relating to the examination for the Associateship of the Institution of Electrical Engineers.

It may be pointed out here that Part II., *i.e.*, the professional section of the examination, is exempt to holders of the following Certificates:—

*City and Guilds of London Institute*—A Pass in the final grade in (a) Electrical Engineering, or (b) Telegraphy, or (c) Telephony.

Holders of the above Certificates desiring to sit for the examination have only to pass a qualifying examination in the following subjects: English or another language, Applied Mechanics, General Physics or Inorganic Chemistry, Electricity and Magnetism.

Copy of the Regulations may be seen on request to the Teacher.

**SCHOOL OF WIRELESS TELEGRAPHY**

**EQUIPMENT.**

The School is fully equipped with up-to-date Wireless Apparatus, including a standard 1½ K.W., 1929 Quenched Spark Transmitter, a 1½ K. W. I.C.W. and C.W. Transmitter, a ¼ K.W. Emergency Transmitter (lifeboat set), latest type valve receiver, and complete direction finding apparatus. Students have spacious rooms for Morse Practice and the use of fully-equipped Electrical and Physical Laboratories.

**INSTRUCTION.**

The Course of Training is arranged to prepare students in the shortest possible time for the Examination of Proficiency in Radiotelegraphy. The instruction consists of Lectures and Practical Work in Technical Electricity, Technical Wireless Telegraphy, and Telephony and Direction Finding, with practice on the 1½ K.W. Sets and other apparatus specified above, Morse training (traffic practice), instruction in the Handbook for Wireless Operators (Rules and Regulations) and Typewriting.
COURSES.
Day and Evening Courses are provided. Students of the Day Course attend each day from 10—12.30 and 2—4. Students of the Evening Course attend each evening from 7.30—9.30, except Saturday evening.

FEES.
The Fees, which cover tuition in all subjects up to obtaining the P.M.G. Certificate of Proficiency, are payable in advance, and are as follows:

Day Course for 1st Class Certificate £12 0 0
Day Course for 2nd Class Certificate 10 0 0
Evening Course 4 0 0

Students may arrange to take, with the approval of the Principal, any special course in the Day or Evening programme.

ADMISSION.
Students are expected to have a good general education, with special attention to handwriting, spelling, geography, arithmetic up to square root, algebra up to quadratic equations.

SCHOOL SESSION.
The School of Wireless Telegraphy is conducted independently of the other classes in the Technical Schools, and is open all the year, with the usual holidays at Christmas, Easter and Summer. Students are admitted at all periods. The usual time taken to train for Examination is about 10—12 months in the Day School, and proportionately longer in the Evening Course.

SYLLABUS OF EXAMINATION FOR CERTIFICATES OF PROFICIENCY IN RADIOTELEGRAPHY.

INTERNATIONAL TELECOMMUNICATION CONVENTION.
(1) It is necessary for persons operating wireless telegraph apparatus on board ships registered in An Saorstát which are subject to the provisions of the Merchant Shipping (Wireless Telegraphy) Act, 1919, and the Merchant Shipping (Safety and Load Line Conventions) Act, 1933, to hold either a 1st or 2nd Class Certificate of proficiency.
issued by the Minister for Posts and Telegraphs in accordance with Article 10 of the General Radiocommunication Regulations annexed to the International Telecommunication Convention, 1932.

The First Class Certificates states that the holder possesses the following qualifications:—

(a) Knowledge of the general principles of electricity, of the theory of radiotelegraphy and radiotelephony, and of the practical adjustment and operation of all apparatus (spark C.W., I.C.W., and D.F.) and accessory apparatus used in the ship service.

(b) Transmitting and receiving by ear, messages in plain language at a speed of 25 words a minute, and in code groups at a speed of 20 groups a minute.

(c) Sending and Receiving spoken messages clearly by telephone apparatus.

(d) A detailed knowledge of the Regulations applying to the exchange of radiotelegraph traffic, of the documents relative to the charges for radiotelegrams, and of the radiotelegraph part of the Regulations for the Safety of Life at Sea.

(e) A knowledge of the principal maritime navigation routes and of the most important wire and wireless routes of the world.

(2) In order to qualify, candidates will be required:—

(a) To send for each test on an ordinary Morse key for three consecutive minutes at not less than the prescribed speed five letters or characters counting as one word or group. The accuracy of signalling, the correct formation of the characters, and the correctness of spacing will be taken into account.

(b) To receive Morse signals for three consecutive minutes at the prescribed speeds from a double headgear telephone receiver ordinarily used for radio-telegraph reception, and to transcribe them legibly.

(c) To send and receive traffic by means of telephone apparatus.

(d) To have a theoretical and practical knowledge of the operation, adjustment and maintenance of spark C.W., I.C.W., and D.F. apparatus.

(e) To have a theoretical and practical knowledge of the operation, adjustment and maintenance of the accessory apparatus, such as motor-generator sets, storage batteries, etc.
(f) To have the necessary knowledge to make, with the means that would be available on board a ship, the repairs of damaged apparatus.

(g) To know the principal wire and wireless routes of the world, as indicated in the relative publications issued by the International Office of the Telegraph Union, Berne, and the principal maritime navigation routes of the world.

(3) The practical examination on the apparatus specified in Section 2 (d) above will include:

(a) Connecting-up apparatus.
(b) Regulating and adjusting apparatus.
(c) Tracing and clearing faults.
(d) Repairing defective apparatus.
(e) Using D.F. apparatus to obtain bearings.
(f) Operating (sending and receiving).
(g) A test on commercial working, exchanging traffic as between a ship and other ship stations, and between a ship and a shore station.

(4) The theoretical examination will consist of two papers. Two hours will be allowed for the first, and three hours for the second paper. These papers will consist of comprehensive questions under the following headings:


The standard of theoretical knowledge required from a candidate for a First Class Certificate calls for a sound grasp of the theoretical principles and of the practical methods of application thereof. The candidate's mathematical knowledge should include algebra up to
simple equations, elementary graphs and the elements of trigonometry. Questions in the written tests dealing with the practical application of general principles will have reference to one or other of the commercial sets fitted in merchant ships.

(5) The examination in the Radiocommunication Regulations will be based upon the rules contained in the "Handbook for Wireless Telegraph Operators," which can be obtained through any bookseller or direct from the Stationery Office, London. These rules, subject to suitable verbal alteration where necessary, e.g., Minister for Posts and Telegraphs for Postmaster-General; The Secretary, Department of Posts and Telegraphs, Dublin, for The Secretary, General Post Office, London; Accountant, Department of Posts and Telegraphs, Dublin, for Comptroller and Accountant General, London; Irish Free State for Great Britain and Northern Ireland or United Kingdom; Irish for British, etc., will apply for the time being, in the case of ships' radiotelegraph installations licensed by the Minister for Posts and Telegraphs of the Irish Free State.

The commercial working test will include the preparation of messages for transmission; insertion of preambles, charges, routes; order of transmission; transmission and reception of messages at the prescribed speeds; log keeping; procedure signals.

(6) The Second Class Certificate states that the holder possesses the following qualifications:—

(a) An elementary theoretical and practical knowledge of electricity and radiotelegraphy, as well as knowledge of the practical adjustment and operation of spark, C.W., and I.C.W. apparatus and accessory apparatus used in the ship service.

(b) Transmitting, and receiving by ear, messages in plain language at a speed of 20 words a minute, and code groups at a speed of 16 groups a minute.

(c) A knowledge of the Regulations applying to the exchange of radiotelegraph traffic, of the documents relative to the charges for radiotelegrams, and of the radiotelegraph part of the Regulations for the Safety of Life at Sea.

(d) A knowledge of the principal maritime navigation routes and of the most important wire and wireless routes of the world.
(7) In order to qualify, candidates will be required:—

(a) To send for each test on an ordinary Morse key for three consecutive minutes at not less than the prescribed speeds, five letters or characters counting as one word or group. The accuracy of signalling, the correct formation of the characters, and the correctness of spacing will be taken into account.

(b) To receive Morse signals for three consecutive minutes at the prescribed speeds from a double head-gear telephone receiver ordinarily used for radiotelegraph reception, and to transcribe them legibly.

(c) To have an elementary theoretical and practical knowledge of the operation adjustment, and maintenance of spark C.W., and I.C.W. installations, and their accessory apparatus, such as motor-generator sets, storage batteries, etc.

(d) To have practical knowledge sufficient for making small repairs in case of damage to the apparatus.

(e) To know the principal wire and wireless routes of the world, as indicated in the relative publications issued by the International Office of the Telegraph Union, Berne, and the principal maritime navigation routes of the world.

(8) The practical examination will include:—

(a) Operating (sending and receiving).

(b) A test in commercial working, exchanging traffic as between two stations in the mobile service.

(c) Connecting-up apparatus.

(d) Regulating and adjusting apparatus.

(e) Tracing and clearing faults.

(9) The theoretical examination will consist of one paper, for which three hours will be allowed. This paper will consist of comprehensive questions under the following headings:—


The standard of theoretical knowledge required from a candidate for a Second Class Certificate calls for a sound grasp of the theoretical principles and of the practical methods of application thereof. The candidate's mathematical knowledge should include algebra up to simple equations, elementary graphs and the elements of trigonometry. Questions in the written tests dealing with the practical application of general principles will have reference to one or other of the commercial sets fitted in merchant ships.

PHYSICS AND MATHEMATICS
FIRST YEAR COURSE IN GENERAL PHYSICS.

Subjects:
GENERAL PHYSICS.
MATHEMATICS.

GENERAL PHYSICS.

First Year.
PURE MATHEMATICS.

First Year.


SECOND AND HIGHER YEARS' COURSES IN GENERAL PHYSICS.

Subjects:

General Physics.
Mathematics.

General Physics.

Second and Higher Years.

The courses will consist for the main part of laboratory work, with frequent occasional lectures on special subjects. Each student will do a special course of experiments assigned to him in accordance with his capabilities and his own special requirements.

PURE MATHEMATICS.

Second Year.

Geometry: Ratio and proportion with applications to geometry, so far as the subject is treated in the definitions of Euclid's 5th Book, and in his 6th Book. Algebra: Permutations and combinations—progressions—complete theory of indices—the Binomial theorem. Plane Trigonometry: Formulae for finding the sine, cosine, etc., of the sum and difference of two angles, and of the multiples and submultiples of an angle—diameters of circles inscribed in and circumscribed about a given circle—area of a circle—description and use of the vernier, theodolite, and sextant. Graphics: Plotting of observations on squared paper—interpolation—errors of observation—
average value, etc.—the plotting of functions—maximum and minimum values—calculations and determinations by graphical methods.

PURE MATHEMATICS.

THIRD AND HIGHER YEARS.

Algebra : Theory of indices—summation of series—tests of the convergence and divergence of series—binomial, exponential, and logarithmic series—partial fractions—elementary determinants—imaginary and complex quantities—De Moivre's theorem. Solid Geometry : Properties of straight lines and planes; their intersections, inclinations, parallelism, perpendicularity—properties of the sphere, and of cylinders and cones. Spherical Trigonometry : Definitions of great and small circles, angles and sides of supplemental triangles—fundamental relations between trigonometrical ratios of the sides and angles of spherical triangles. Geometrical Conics : Properties of the parabola, ellipse, and hyperbola deduced by pure geometry from definition in plano. Co-ordinate Geometry : Co-ordinates of a point; rectangular, oblique, and polar—transformation of co-ordinates—equations of straight lines, and treatment of questions relative to intersection, concurrence, inclination, parallelism, perpendicularity, etc.—equations of circles, their tangents and normals: properties of their diameters, axes, foci, conjugate diameters, asymptotes, poles and polars and determination of circles satisfying given conditions of their tangents and normals—discussion of the general equation of the second degree. Differential Calculus : Definitions, limits, differential co-efficients—differentiation of simple and inverse functions—successive differentiation of functions of one variable—Taylor's and Maclaurin's theorems and their simpler applications—determination of values of functions when intermediate in form—differentiation of a function and of implicit functions—maxima and minima of functions of one independent variable—differentiation of functions of two or more independent variables—applications of the preceding to the geometry of the plane curves referred to rectangular or to polar co-ordinates—tangents, normals, sub-tangents, subnormals, asymptotes—singular points—contact and curvature—tracing of curves—differential co-efficients of arcs and areas of plane curves, and of the surfaces and volumes of solids of revolution. Integral Calculus : Meaning of definite and of indefinite integrals—integration of the more frequently occurring functions—integration
by parts—rational functions—formulae of reduction—applications to areas and lengths of curves, to volumes and areas of surfaces of revolution, to centres of gravity, and moments of inertia. *Elementary Differential Equations*: Integration of differential equations of the second and higher orders with constant co-efficients.

**FIRST YEAR COURSE IN RADIO COMMUNICATION.**

**Subjects:**

Radio Communication.—1.

Electrical Engineering.—1.

**RADIO COMMUNICATION.**

**First Year.**

2. Capacity, charge as proportional to voltage, units—construction of fixed and variable condensers for low voltage—fixed condensers for high voltage.
4. The nature of eddy current losses in conductors carrying high-frequency currents, of skin effects and of dielectric losses in condensers, treated qualitatively—working ideas of damping of circuit and effect on resonance.
5. Construction of thermionic valves, two electrode and three electrode—working ideas of action, characteristic curves.
6. The fundamental principles of action of alternators and transformers.
7. Essential components of spark transmitter, including description of some actual instruments.
8. The production of oscillations in a valve circuit—essential components of the valve transmitter, and of the Poulten arc generator—principle of smoothing devices for rectified alternating-current high-tension supply.
10. Component parts of receiving circuits—use of “stand by” and “selective” adjustments.
11. Heterodyne reception, general principles and how used.
12. Thermionic valve amplifiers.
and note magnifiers, construction and essential principles of action.

ELECTRICAL ENGINEERING.—I.

(See Syllabus for First Year Electrical Engineering).

SECOND YEAR COURSE IN RADIO COMMUNICATION.

Subjects:

Radio Communication.—II.

Electrical Engineering.—(A.C.)

Radio Communication.

Second Year,  
(Subjects above).


ELECTRICAL ENGINEERING.—(A.C.)

(See Syllabus for Fourth Year Course in Electrical Engineering).

RADIO SERVICE.

First and Second Years.

FIRST YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:
Inorganic Chemistry.
Physics for Chemistry.

INORGANIC CHEMISTRY.

First Year.

Chemical and physical changes; elements, compounds and mixtures. General properties of solids, liquids and gases. Application of Boyle’s Law and Charles’s Law.

Hydrogen, Oxygen; basic and acid forming oxides. Water; gravimetric and volumetric composition; solvent properties, crystallization.


Chlorine, hydrochloric acid.

Nitrogen, ammonia, nitric acid, nitrates, nitric oxide, nitrous oxide, nitrogen peroxide. Nitrous acid, nitrates.

Sulphur; allotropy; sulphuretted hydrogen; sulphur dioxide and trioxide; sulphurous acid and sulphites. Simple consideration of the contact and chamber processes for the production of sulphuric acid.

Carbon; allotropes. Carbon monoxide and dioxide. General properties of the carbonates.

Combustion; flame; Bunsen burners; oxidation and reduction. Acids, bases, salts.

Practical Work: Glass-working, cork boring and fitting up apparatus—action of heat, water, on substances and mixtures—solubility—preparation and properties of hydrogen, oxygen, chlorine, hydrochloric acid, nitric acid, ammonia, nitric oxide, sulphurdioxide, 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

PHYSICS FOR CHEMISTRY.

Physics—First Year.

Units of length, area and volume. Units of mass. Use of metre stick, vernier calipers and micrometer screw gauge. Use and limitations of graduated cylinder, pipette and burette.


Boyle’s Law. Exhaust pump.


SECOND YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:

- Inorganic Chemistry.
- Chemical Analysis.
- Physics.

INORGANIC CHEMISTRY.

SECOND YEAR.


Technical methods of softening water for industrial use, such as the lime and sodium carbonate process and the permutit process.

Technical methods of filtration.


Hydrogen peroxide; preparation and uses. Ozone.

Diffusion of gases.

The halogens. Commercial preparation and uses of these elements and their hydracids. Bleaching powder, sodium hypochlorite, potassium chlorate. General comparison of properties of halogen group.


Detailed study of the atmosphere.


Arsenic, antimony and bismuth. Their occurrence, preparation, properties and uses. The compounds they form with hydrogen, oxygen and chlorine, studied comparatively with those of nitrogen and phosphorus.


Dialysis. Colloids.

CHEMICAL ANALYSIS.

SECOND YEAR.

Detection of the following metals in the pure state, in salts, simple mixtures of salt or alloys: Silver, lead, mercury, bismuth, copper, cadmium, arsenic, antimony, tin, iron, aluminium, chromium, manganese, zinc, nickel, cobalt, calcium, strontium, barium, magnesium, potassium, sodium and ammonium—qualitative recognition of chlorides, bromides, iodides, hypochlorites, chlorates, fluorides, intrites, nitrates, phosphates, sulphates, sulphites, sulphides, thiosulphates, carbonates, bicarbonates, borates, silicates, arsenites and arsenates—use and care of instruments employed in volumetric analysis, including the
standardisation of pipette and burette—use of standard alkali, alkali carbonate and acids, together with exercises arising from their use—preparation and use of standard silver-nitrate solution—use of standard thiocyanate solution—standard iodine, sodium thiosulphate and sodium arsenite solutions and exercises on their use—preparation of salts and common substances in a state of purity.

**PHYSICS FOR CHEMISTRY.**

**PHYSICS—SECOND YEAR.**


Elementary treatment of conduction through gases.
THIRD YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:
- INORGANIC CHEMISTRY.
- CHEMICAL ANALYSIS.

INORGANIC CHEMISTRY.

THIRD YEAR.

Metals and the chief sources from which they are obtained. General methods used in the extraction of metals from their more important ores.

Preparation of alloys and their general properties. Freezing point curves and cooling curves.

Classification of the elements of the Periodic system. Law of Isomorphism. X-ray spectra and atomic numbers.

The more important compounds of the following metals:

(a) Sodium and potassium.
(b) Copper and silver.
(c) Calcium, strontium and barium.
(d) Magnesium, zinc, cadmium and mercury.
(e) Aluminium.
(f) Tin and lead.
(g) Chromium and manganese.
(h) Iron, cobalt and nickel.


Technical production and uses of sodium peroxide, hydroxide, carbonate and bicarbonate; potassium chloride and nitrate; potash fertilisers; lime, mortar; plaster of Paris; Portland cement; magnesium sulphate; zinc oxide and sulphide; Lithophone alums; thermit; red lead; white lead, potassium chromate, dichromate and permanganate; ferrous sulphate.

Solutions—lowering of vapour pressure, osmotic pressure, determination of molecular weight by cryoscopic and ebullioscopic methods. Limitations of the methods. Equivalent conductivity. Degree of dissociation as found by conductivity compared with Van't Hoff's coefficient.


CHEMICAL ANALYSIS.

Third Year.

Ordinary methods of gravimetric analysis, including the estimation of silver, lead, copper, tin, arsenic, antimony, iron, aluminium, zinc, nickel, calcium, barium, magnesium, sodium, potassium, and ammonium, hydrochloric, sulphuric, phosphoric and carbonic acids—application of above, and also of volumetric methods to determination of the composition of simple alloys, and of simple mixtures—preparation of typical metals, oxides and salts, in a state of purity—analytical control of purity—revision of the volumetric work of the second year course—more extended use of standard iodine and thiosulphate—use of standard permanganate and dichromate solutions.

FOURTH AND FIFTH YEAR COURSES IN APPLIED CHEMISTRY.

Subjects:

ORGANIC CHEMISTRY.

TECHNICAL ANALYSIS.

ORGANIC CHEMISTRY.

Fourth Year.


Calculation of percentage composition from the results of analysis and deduction of empirical formulae. Molecular and constitutional formulae.

Ethylene and acetylene considered as typical unsaturated substances. Ethylene dibromide.


The oxidation products of alcohols. Formaldehyde, acetaldehyde and acetone. Formic and acetic acids. The chlorocetic acids as examples of substitution. Acetic anhydride and acetyl chloride and their use as reagents.

Ethyl acetate—its preparation, properties and saponification.

Nature of common oils, fats and waxes; their saponification.

Soap and Candles. Palmitic, stearic and oleic acids.

Acetamide.

Amines—primary, secondary and tertiary amines.


Keto-enolic desmotropy.

Maleic and fumaric acids and geometrical isomerism.

Glycol.

Glycerol. Its manufacture and conversion into nitro-glycerine.

Mannitol and the carbohydrates. Sucrose and its technical production, dextrose, laevulose, maltose and lactose—their occurrence, preparation, properties, and distinctive tests. Use of polarimeter.

Starch and the dextrines. Cellulose, nitrocelluloses, cellulose acetate and gun-cotton.


Organo-metallic compounds of zinc and magnesium.

FIFTH YEAR.

Benzene, toluene and their halogen derivatives.

Nitrobenzenes; aniline; mono and di-methylanilines; toluidines, Diazo-benzene. Phenol. Dihydroxybenzenes.
Tannic acid, mordants, tanning. Benzoic and salicylic acids.


Brief consideration of the dyes of the di-phenylmethane and tri-phenylmethane series.

Technically important organic compounds of arsenic.

ANALYSIS.

FOURTH AND FIFTH YEARS.

Students will be allowed to follow a course of chemical analysis of an advanced character, or to select for investigation certain industrial products, such as soaps, oils, fats and waxes, painters' oils, colours and varnishes, fertilisers.

PHYSICAL CHEMISTRY, SPECIAL COURSE.

The Lectures will deal with the fundamental principles of Physical Chemistry and their bearing on, and application to, Systematic Chemical Analysis and Applied Chemistry generally.

The course of experimental work, arranged as far as possible to illustrate the Lectures, will include the determination of molecular weights by various methods: Victor Meyer, Hofmann, Beckman, Silver Salts, etc. Inversion Points, Rate of Inversion and Polari­metry, Pulfrich Refractometer, Spectroscope, Calorimetry, Heats of Solution and Neutralization, Flash Point, Bomb Calorimeter, Freezing and Boiling Points of Pure and Mixed Substances, Electro­lysis, Rate of Migration, Conductivity of Solutions, Ph. Values.

INDUSTRIAL CHEMISTRY

ANALYSIS OF FOOD, DRUGS, AND WATER.

SALE OF FOOD AND DRUGS ACT.

Short history of adulteration and early legislation in regard to pure food. The present laws relative to food and drugs adulteration. Sections of the Acts that intimately concern the Public Analyst.
Form of Analyst's certificate. Certificates as *prima facie* evidence, and conditions governing the institution of proceedings. Regulations regarding standards of purity.

**FOOD.**


**DRUGS.**

Standards of the British Pharmacopoeia and the Department of Local Government—methods of analysis of extracts, liquors, liniments, mixtures, powders, syrups, tinctures and ointments.
WATER AND WATER ANALYSIS.

Natural waters and source of impurities—rain water—surface water—river water—wells and springs—waters used in brewing, distilling, and mineral water industries—boiler-feed waters—sources storage and distribution of waters used for drinking supply—water treatment—chemical analysis of water and interpretation of results.

THE CHEMISTRY OF OILS, FATS AND WAXES.

INTRODUCTION.


TESTING AND ANALYSIS.

Physical methods. Specific gravity; viscosity; flash point; refractive power; melting point; titer test.

Chemical methods. Bromine thermal value; saponification value; Reichert-Wollny value; Polenske value; Acetyl value; Avic value; Unsaponifiable value.

CLASSIFICATION.

Marine oils, including Menhaden; cod-liver; whale.

Vegetable drying oils, including Linseed.

Vegetable semi-drying oils, including maize; cottonseed; and sesame.

Vegetable non-drying oils, including rape; olive and castor.

Animal oils, including Neatsfoot.

Vegetable fats, including cocoa-butter; palm and cocoanout.

Animal fats, including tallow; butter-fat and lard.
THE WAXES.

Occurrence and properties of sperm oil; carnauba wax; bees-wax; wool wax.

MINERAL OILS.

Occurrence and properties of petroleum; shale oil; coal-tar oil and lignite oil; paraffin; vaseline and ozokerite.

HARDENED FATS.—PRACTICAL COURSE.

INTRODUCTION.

Sampling and preliminary tests. Practical method for determining specific gravity; melting point; solidifying point of mixed fatty acids; refractive index; viscosity; solubility; iodine value; saponification value; Reichert-Wollny value; acetyl value, etc.

Specific tests for certain oils and fats.
Testing and analysis of mineral oils and waxes.
Interpretation of results.
Scheme for identification of an oil fat or wax.

TECHNICAL ANALYSIS—GAS MANUFACTURE.

(1) Coal (Approximate Analysis).
   (a) Moisture.
   (b) Organic Volatile Matter.
   (c) Ash.
   (d) Fixed Carbon, by difference.
   (e) Sulphur.
   (f) Calorific Value.
   (g) Evaporative Power from f.

(2) Gas (Partial and Complete).
   Partial (a) Carbon-dioxide.
   (b) Oxygen.
   (c) Olefines.
   (d) Carbon-monoxide.

   Complete. As above, and
   (e) Methane and Hydrogen by explosion.
   (f) Nitrogen, by difference.
Sulphuretted Hydrogen tested for by lead acetate paper, also estimated as grains per 100 cubic feet by Iodine solution. Total Sulphur in Gas. Test for cyanogen compounds and for Benzole vapour.

(3) Sulphate of Ammonia.
   (a) Moisture.
   (b) Free acid or ammonia.
   (c) Total ammonia.
   (d) Sulphuric acid from fixed ammonia by calculation.
   (e) Insoluble Matter.
   (f) Residue.
   (g) Nitrogen calculated from (c).

Colormetric test for copper, and test for lead. Examination of B.Ov. for nitrates by Lunge Nitrometer.

(4) Bog-Iron Oxide.
   (a) Moisture.
   (b) Fe₂O₃.
   (c) Fe₂(OH)₆.

(5) Spent Oxide.
   (a) Moisture.
   (b) Pure Sulphur.
   (c) Tar.
   Test for Cyanogen Compounds.

(6) Liquor.
   Ammonia content, free and fixed,
   Tests for Sulphur compounds, cyanogen and amount of gas given off on acidification.

(7) Tar.
   (a) Water content.
   (b) Specific gravity.
   (c) Distillation test.
   (d) Estimate of Tar Acids.
   (e) Estimation of basic compound.

(8) Oils.
   Specific Gravities, viscosity, flash point and distillation test.
SPECIAL COURSE FOR DIPLOMA OF VETERINARY STATE MEDICINE.


Air: Estimation of CO.

Milk: Specific gravity; total solids; fat; solids not fat; ash; preservatives.

Feeding Stuffs: Moisture; oil; albuminoids, fibres; starch; ash; sand in ash; food unit value; albuminoids ratio.

Disinfectants: Chemical valuation of bleaching powder; permanganate of potash, formaldehyde; sulphurous acid; carabolic acid.

Tests for Common poisons; mineral acids and alkalis; arsenic; antimony; mercury; lead; barium; cyanides; phosphorus; alkaloids, including strychnine, morphia.

BREWING SCIENCE AND CHEMISTRY OF FERMENTATION.

First and Higher Years.

Preparation and properties of cellulose, starch from various sources, soluble starch, dextrose, cane and invert-sugar, and the products of the hydrolysis of starch.

The examination and valuation of barleys. Kiln-drying barleys, storing and screening.

Malting. The process of malting, including the so-called atmospheric systems. Conditions necessary for healthy germination.

The examination and comparative valuation of malts. Estimation of extract, proteins, ash constituents, etc.

Water. Analytical examination and test of fitness for brewing ales and stouts. Artificial softening and purification.

Mashing. Various methods of making the mash. Use of raw grain and other starch-containing material. Chemical changes effected during the mashing process, especially those attending the hydrolysis of starch. Influence of time and temperature on the result.

Use of sugar as a brewing material.

Cooling. Influence of aeration on the cooling worts.

The various forms of the saccharometer, and the relation of their readings to each other and to specific gravity as ordinarily indicated.

Fermentation. The various systems of fermentation employed in the United Kingdom. The yeast organisms. Microscopical examinations of ferments, their modes of growth and reproduction. The chemical function of the ferments. Theories of fermentation.

Analysis of beer and worts. Determination of "original gravity." The "forcing tray" process as a test of the stability of a beer.

Preservative agents, and how applied to beer. The preparation and use of finings and caramel.

BACTERIOLOGY AND ENZYME CHEMISTRY.

Examination of plant cells as an introduction to the use of the microscope.

Preparation of culture media.

Study of the life histories of typical yeasts, bacteria and moulds, including their special cultural treatment in the laboratory. Experiments on enzyme chemistry.

Bacterial analysis of water, milks, etc.

Preservation of foods by sterilization, drying, salting, cold storage, etc.

MILK PROCESSING AND MILK PRODUCTS
MANUFACTURE.

SCIENCE.

Chemistry.—Elements, compounds, mixtures, acids, bases, salts, quantitative estimation of acidity, alkalinity. The Atmosphere; water; hydrogen; oxygen; carbon; nitrogen; phosphorus; sulphur; common metals; elementary chemistry of the sugars; alcohols; formaldehyde; acetic acid; butyric acid; lactic acid; fats; proteins.


**Milk Processing and Milk Products Manufacture:**

(Pasteurization, Sterilization, Ice Cream, Condensed and Dried Milk Products.)


Manufacture of Condensed and Dried Milk Products.—Raw materials. Legal standards.

Condensed milk; types of equipment; sugar addition; viscosities; cooling; canning, storage. Dried milk and dried whey; types of equipment, including spray, roller, vacuum band methods; grinding, packing, types of package, vacuum packing.

Keeping qualities of the above products; faults, their detection and remedy.

CEREAL CHEMISTRY AND FLOUR MILLING TECHNOLOGY.

Cereal Science:
Elementary chemistry; constituents of air; combustion in air; oxides; combustion of coal and producer gas; constituents of water; hard and soft water; formation of rust; chalk and lime; carbon dioxide and monoxide; simple ideas of elements and compounds, of acids, bases and salts, and of metals and non-metals.

Sources of power; measurement of heat in B.Th.U.; specific and latent heat; hygrometry; properties of saturated and superheated steam; special applications to milling—e.g., moisture tests of wheat, wheat-feed and flour; effect on milling of moisture in wheat, in stocks and in the air.

Knowledge of pests in wheat and its products; reasons for heating, sweating and degeneration of wheat.

Elementary principles of breadmaking; effects of yeast, salt, temperature and time on breadmaking; gluten and the effect of quality and quantity on breadmaking; tests for nitrogen, gluten, ash and fibre; influence on bread-making of natural properties of flours and of bleachers and improvers; starch, sugar and enzymes.

Action of improvers; methods of improving flour quality.
Bleaching, natural and artificial.

Milling Processes and Operation:
Quality of flour from various wheats; merits and demerits.
Art of wheat blending.
Design of flow sheets.
Advanced knowledge of overhead control of milling machinery such as is expected from mill foremen.
Manipulation of:—
(a) Washers and conditioners.
(b) Screenroom machinery.
(c) Breaks and reductions.
(d) Graders, purifiers and dressers.
(e) Grinders for screenings and wheat-feed.

Flour grading.
Flour bleaching.
Flour improving.
Production of wheatings and bran.
Manufacture of specialities; wheatmeal, self-raising flour, biscuit flour, soft and strong flours, flour for export.

Management. Finished Products:
2. Insurance against fire.
Wheat valuation; calculations of the values of wheats, taking into account the impurities, moisture content and flour content.
Planning of economic grists.
Periodical calculation of gain or loss of weight in screen-room and mill; the effect on costs.
Calculation of flour extraction; its effect on costs.
Divides; how obtained and calculated, and their effect on costs.
Costs of manufacture and of selling, distribution and administration.
Effect of output on costs; fixed and variable charges.
Common faults in flour and wheat-feed.

TECHNOLOGY OF THE MANUFACTURE OF PIGMENTS, PAINTS, AND VARNISHES.

This Course is designed to provide those engaged in these industries with a knowledge of the chemical nature of the materials used, and of the scientific basis underlying works operations.


CHEMISTRY FOR PHOTOGRAPHY, PHOTO-MECHANICAL WORK, LITHOGRAPHY, Etc.

This class forms part of the Courses in Photography, Photomechanical Work and Lithography (see Book Production and Printing Trades Booklet).

To understand the processes used in Photography, Photomechanical Work, Lithography, etc., it is necessary to have some knowledge of chemistry and its general principles. Throughout the part of the syllabus devoted to General Chemistry, frequent reference is made to applications to these chemical processes.


BOTANY FOR SEEDSMEN.

First Year.

Examination of a simple flowering plant; its chief organs.

Various forms of root, stems and leaf; modifications of these organs for special purposes; food storage; vegetative propagation.

The cell and cell contents in embryonic and adult structures, variations in type of cells of different organs.

Tissues.

Brief survey of the chemical nature of the principal components of plant bodies; food, food storage and translocation.

Such of the minute structure of root, stem and leaf of herbaceous and of woody types as is necessary to explain the physiological processes connected with absorption, respiration, transpiration, assimilation, movement, growth in length and in thickness.

Buds and branching. Winter condition of some trees of different types.

Forms of inflorescence. The flower; variety of structure of floral organs.

Detailed structure of stamen and of pistil.
Pollination and fertilization.
Fruit.
Seed Dispersal.
Germination.

Various forms of vegetative and of floral organs of plants as illustrated by reference to some members of the commoner families of flowering plants.
SECOND YEAR.
Characters of common forage plants.
Identification of seeds of farm and garden crops.
Seed testing.
Introduction to the study of lower plants by reference to the general structure, physiology and mode of life of Fern, Moss, Alga, Fungus and Bacillus.
Outline of principles of classification of Fungi.
Survey of the commoner fungoid pests, and insect pests of farm and garden.

FIRST YEAR COURSE IN MEDICAL CHEMISTRY.
Subjects:
MEDICAL CHEMISTRY.
PHYSICS FOR CHEMISTRY.

FIRST YEAR.
See Syllabus for Pharmaceutical Chemistry.

PHYSICS FOR CHEMISTRY.
FIRST YEAR.
See Syllabus under First Year Course in Applied Chemistry.

SECOND AND THIRD YEAR COURSES IN MEDICAL CHEMISTRY.
Subjects:
INORGANIC CHEMISTRY.
CHEMICAL ANALYSIS.
INORGANIC CHEMISTRY.
CHEMICAL ANALYSIS.

SECOND AND THIRD YEARS.
See Syllabuses under Second and Third Year Courses in Applied Chemistry.
PHARMACEUTICAL COURSES.

The Pharmaceutical Society of Ireland recognise and accept certificates of attendance at courses of instruction in

**THEORETICAL CHEMISTRY AND PHYSICS.**

**PRACTICAL CHEMISTRY.**

**BOTANY.**

**MATERIA MEDICA.**

Applications for enrolment should be made as early as possible before the dates fixed for the commencement of the courses.

The Courses are intended for chemists' assistants who have passed their preliminary and are working for their final examinations.

Recognised certificates for lectures and practical work are given to all students whose attendance and progress are satisfactory. The lectures and practical work cover the subjects outlined in the subjoined syllabuses.

**THEORETICAL CHEMISTRY AND PHYSICS.**

*(September to May.)*

**Inorganic Chemistry:**


Non-Metals: H; O; N, S, C, P, Cl.; Br., I, B., As, Si.

Metals: Sodium group; calcium group; Mg; Zn; Cd.; Pb; Cu; Ag; Hg; Al.; Fe; Mn; Co; Ni; Cr; Sb; Bi; Au; Pt.

Oxides, hydrates and salts.

**Organic Chemistry:**


Paraffin hydrocarbons; homologous series; isomerism; olefine and acetylene series; halogen derivatives; alcohols and mercaptans; aldehydes and ketones; polymerism. Fatty acids—formic, acetic,
palmitic, stearic, oleic acids. Fats; soaps. Oxalic, citric, tartaric and lactic acids. Ethers; esters; amines; amides; cyanogen derivatives; nitrates.

Benzene and its homologues; naphthalene; anthracene; halogen derivatives of benzene; nitrobenzene; aniline; phenol, azo, diazo and hydrazine compounds. Aromatic alcohols, aldehydes and ketones. Aromatic acids—benzoic, salicylic.

Carbohydrates; proteins; glucosides; terpenes and camphors; the principal alkaloids.

**Physics**:


**PRACTICAL CHEMISTRY**.

Qualitative analysis for bases and acids in solutions of simple salts, including the salts of common organic acids.

Principles of organic analysis.

Detection of B.P. substances and the chief alkaloids.

Standard solutions. Volumetric estimations of B.P.

Water analysis—ammonia—nitrates—nitrites—chlorides; total and permanent hardness.

Urine analysis; estimation of sugar.

**BOTANY**.

(September to May.)

1.

The plant cell, tissues, and systems.
Demonstrations, as far as possible, will be made of the Pharmacopoeia operations; dispensing of physicians’ prescriptions, prescription reading, calculation of percentages, and other quantities occurring in prescriptions.

**SPECIAL CLASSES**

**IRISH LANGUAGE.**

**IRISH.**

**FIRST YEAR.**

_Oral_: Conversation lessons on simple matters such as the following:—Name, home or residence, salutations, the clock, days of the week, months and seasons, the weather, money, easy counting, colours, etc. Location of objects in the classroom and neighbourhood, parts of the body and clothing, giving and carrying out simple orders. With the conversational lessons, the student will be familiarised with the use of _is_ and _tá_ and of verbal nouns.

_Written Work_: Each student will keep a note-book to record the salutations, phrases, etc., in correct Irish.

_Cultural_: Memorising of simple songs, rhymes, stories, etc., so as to be able to repeat them with correct _blas_. Stories and recitations by Gaelic authors.

**TECHNICAL GERMAN.**

_Readings_: Fiedler and Sandbach and Linguaphone Course.

GENERAL CURRICULUM OF THE SCHOOLS
UNDER THE CONTROL OF
THE CITY OF DUBLIN VOCATIONAL EDUCATION
COMMITTEE.

BOLTON STREET TECHNICAL SCHOOL
Mechanical Engineering.
Motor Car Engineering.
Gas Engineering.
Metal Plate Work.
Brass Finishing.
Day Apprentice and specialised Daytime Technical Courses.
Day Junior Technical School.

Building Science.
Building and Allied Trades.
Printing and Book Production.
Watchmaking.
Art and Art Crafts.

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

PARNELL SQUARE TECHNICAL INSTITUTE
General Commercial Subjects.
Accountancy and Allied Subjects.
Local Government.
Domestic Science and Housecraft.
Languages.
Retail Distribution.
Transport.
Day Trade Classes:—
Dressmaking.
Shirtmaking (Power).
Cloth Manufacture (Power).
Chefs’ Training Course.

Day School of Commerce.

PEMBROKE TECHNICAL INSTITUTE ( Ringsend and Ballsbridge)
General Commercial Subjects.
Retail Distribution.
Languages.
Domestic Science and Housecraft.
Art and Art Crafts.
Day School of Commerce.
Day Junior Technical School.

RATHMINES TECHNICAL INSTITUTE
General Commercial Subjects.
Accountancy, Auditing and Allied Subjects.
Insurance.
Advertising and Publicity.
Banking, Finance and Foreign Exchange.
Company Secretaries.
Government Accountancy & Finance.
Languages.
Domestic Science and Housecraft.
Day School of Commerce.

CHATHAM ROW SCHOOL OF MUSIC (Day and Evening Classes)
Pianoforte.
Violoncello.
Uilleann and Irish War Pipes.
Elocution.
Violin.
Singing and Choir.
Wind Instruments (Wood & Brass).
Fifes.
Viola.
Orchestra.
Drums and Flute.
Traditional Music.