1935

Electrical Engineering, Radiotelegraphy, Physics, Mathematics, Applied Chemistry and Pharmacy: Prospectus of Courses 1935-36

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

Scoileanna Ceard-Oideachaí
city of Dublin Technical Schools

Seirbháin
1935-36

Session
1935-36

Electrical Engineering, Radiotelegraphy, Physics, Mathematics, Applied Chemistry and Pharmacy.

Prospectus of Courses
Kevin Street
CITY OF DUBLIN
VOCATIONAL EDUCATION COMMITTEE

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Bolton Street,

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Chief Executive Officer.

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Mr. Sean Campbell, 35 Lower Gardiner Street.
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Mr. Thos Darcy, 27 Aungier Street.
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PROFESSOR B. F. Shields, 87 Pembroke Road.
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ALDERMAN C. Breathnach, ll.d., t.d., 384 Clontarf Road (ex-officio).
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CHATHAM ROW (School of Music).

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COUNCILLOR M. O'Sullivan, 7 Bothar Moibhi, Glasnevin.
SENATOR MRS. CLARKE, t.c., Baymount, 95 Clontarf Road.
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Mr. W. J. Whelan, 35 Lower Gardiner Street.
Mr. M. P. Rowan, 27 Leeson Park.
Mr. J. T. Doyle, Osborne Lodge, Mount Prospect Road, Doolymount.
Mr. Thos. M. Murphy, 16 Cowper Road.
Mr. Jos. O'Reilly, 9 Lower Leeson Street.

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Mr. L. Beirley.
Mr. J. Sheerin.
Mr. Sleator.

MASTER TAILORS.
Mr. E. J. McWilliam.
Mr. W. O'Conor.
Mr. W. Scott.
Mr. R. Boyd.
GENERAL NOTICES

Entrance Examinations — Fees — Regulations

Entrance Examinations will be held at the Technical Institute, Kevin Street, every evening during the week commencing 16th 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.

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>Introductory Courses</td>
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<td>Pharmaceutical Chemistry (Lectures)</td>
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<td>Do. do. (Practical)</td>
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<td>Medical Chemistry</td>
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<td>Practical Pharmacy (per term)</td>
<td>0 15 0</td>
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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 4th, 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 1935-36**

**Teaching Staff**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Degree</th>
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<tbody>
<tr>
<td>E. Morton</td>
<td>Principal and Head of the School of Physics, Electrical Engineering and Chemistry</td>
</tr>
<tr>
<td>F. Nolan</td>
<td>M.Sc.</td>
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<tr>
<td>Henry C. Clifton</td>
<td>B.A.</td>
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<tr>
<td>James J. McCormick</td>
<td>M.D., B.L., M.Sc.</td>
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<td>Harold A. Hodgens</td>
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<td>William Fegan</td>
<td>A.M.I.E.E.</td>
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<td>Michael Lambert</td>
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<tr>
<td>Geo. Ring</td>
<td>B.Sc., A.R.C.Sc.I., B.E.</td>
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<td>P. Brickell</td>
<td>A.M.I.E.E.</td>
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<td>W. P. Collins</td>
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<td>James Moran</td>
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<tr>
<td>M. O'Keeffe</td>
<td></td>
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<tr>
<td>J. O'Toole</td>
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<tr>
<td>E. Moynihan</td>
<td>A.R.C.Sc.I.</td>
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<td>A.R.C.Sc.I.</td>
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<td>P. Bertram Foy</td>
<td>B.Sc., F.I.C., A.R.C.Sc.I.</td>
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<td>K. Hanway</td>
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<td>G. A. Watson</td>
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<td>W. J. Looby</td>
<td>B.Sc., A.R.C.Sc.I., H. Dip. in Ed.</td>
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<td>F. J. Barragry</td>
<td>M.P.S.I.</td>
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<td>E. J. Hughes-Dowling</td>
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<tr>
<td>J. Gately</td>
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<td>H. D. Thornton</td>
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<td>B. Dixon</td>
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<td>P. Conlon</td>
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### TECHNICAL INSTITUTE, KEVIN STREET.

#### 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>TRAINER</th>
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<td>1K</td>
<td>English</td>
<td>Tues.</td>
<td>7.30-8.30</td>
<td>28</td>
<td>J. Gately</td>
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<tr>
<td>1K</td>
<td>Arithmetic</td>
<td>Tues.</td>
<td>8.30-9.35</td>
<td>28</td>
<td>J. Gately</td>
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<td>1K</td>
<td>Drawing</td>
<td>Wed.</td>
<td>7.30-9.30</td>
<td>14</td>
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<td>2K</td>
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<td>Mon.</td>
<td>7.30-8.30</td>
<td>28</td>
<td>J. Gately</td>
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<td>2K</td>
<td>Elementary Mathematics—F</td>
<td>Mon.</td>
<td>8.30-9.35</td>
<td>28</td>
<td>J. Gately</td>
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<tr>
<td>2K</td>
<td>Elementary Science—A</td>
<td>Fri.</td>
<td>7.30-9.30</td>
<td>8</td>
<td>E. Morahan</td>
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<tr>
<td>3K</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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<tr>
<td>3K</td>
<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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<tr>
<td>3K</td>
<td>Drawing—F</td>
<td>Wed.</td>
<td>7.30-9.30</td>
<td>14</td>
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<tr>
<td>4K</td>
<td>Electrical Engineering—L.A.</td>
<td>Mon. or Fri.</td>
<td>7.30-10.00</td>
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<td>4K</td>
<td>Electrical Installation—Lect. I</td>
<td>Wed.</td>
<td>7.30-8.30</td>
<td>5</td>
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<td>4K</td>
<td>Electrical Laboratory—I</td>
<td>Wed.</td>
<td>8.35-10.00</td>
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<td>4K</td>
<td>Physics for Electricians</td>
<td>Tues.</td>
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<td>5K</td>
<td>Electrical Writing—Pract. II</td>
<td>Thurs.</td>
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<td>5K</td>
<td>Electrical Installation—Lect. II</td>
<td>Tues.</td>
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<td>Mon.</td>
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<td>6K</td>
<td>Electrical Fitting—Pract.</td>
<td>Wed.</td>
<td>7.30-10.00</td>
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<td>6K</td>
<td>Electrical Engineering—O.C. and A.C.</td>
<td>Thurs.</td>
<td>7.30-10.00</td>
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<td>6K</td>
<td>Practical Drawing</td>
<td>Fri.</td>
<td>7.30-10.00</td>
<td>11</td>
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<td>7K</td>
<td>Cable Jointing</td>
<td>Mon. &amp; Wed.</td>
<td>8.0-10.00</td>
<td>18</td>
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<td>8K</td>
<td>Electric Welding</td>
<td>Mon. &amp; Thur.</td>
<td>8.0-10.00</td>
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<td>J. O'Toole</td>
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### ELECTROTECHNOLOGY

#### ELECTRICAL ENGINEERING PRACTICE

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>SUBJECT</th>
<th>DAY</th>
<th>HOUR</th>
<th>ROOM</th>
<th>TRAINER</th>
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<tr>
<td>11K Electrical Engineering—I.A.</td>
<td>Thurs.</td>
<td>7.30-10.00</td>
<td>12-18-8</td>
<td>H. Flood</td>
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<td>11K Physics for Electricians—I.A.</td>
<td>Mon.</td>
<td>7.30-10.00</td>
<td>9</td>
<td>H. Flood, M. Henderson</td>
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<td>12K Electrical Engineering—I.B.</td>
<td>Wed.</td>
<td>7.30-10.00</td>
<td>12-18-8</td>
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<td>Mon.</td>
<td>7.30-10.00</td>
<td>4-6</td>
<td>G. Ring, F. Brickell</td>
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<td>Wed.</td>
<td>7.30-10.00</td>
<td>4-6</td>
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<td>14K Applied Mechanics—I.</td>
<td>Mathematics</td>
<td>Thurs.</td>
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<td>16K Power Plants and Producers</td>
<td>Wed.</td>
<td>7.30-10.00</td>
<td>4-6</td>
<td>P. Cormack</td>
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<td>17K Electrical Engineering—V.</td>
<td>Tue., Thur.</td>
<td>7.30-9.30</td>
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### POST OFFICE ENGINEERING COURSES

#### TELEGRAPHY

<table>
<thead>
<tr>
<th>No. of Course</th>
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<tr>
<td>18K Technical Telegraphy—I.</td>
<td>Thurs.</td>
<td>8.0-10.00</td>
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<td>18K Magnetism and Electricity</td>
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<td>19K Technical Telegraphy—II.</td>
<td>Fri.</td>
<td>8.0-10.00</td>
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#### TELEPHONE

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<th>HOUR</th>
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### POST OFFICE ENGINEERING

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<th>No. of Course</th>
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<tr>
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<td>22K Instrument and Wiring (Pr.)</td>
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### RADIO TECHNOLOGY

**RADIO COMMUNICATION.**

- **23K** Radio Communication—I... 8.0-10.0, 12 & 10 P. J. O’Callaghan.
- **24K** Magnetism and Electricity—I... Fri. 7.30-10.0 P. J. O’Callaghan.

**SECOND YEAR.**

- **26K** Radio Communication—I... 8.0-10.0, 4 & 6 W. Pegan.

**RADIO SERVICE.**

- **26K** Magnetism and Electricity—I... Fri. 7.30-10.0 P. J. O’Callaghan.

**SECOND YEAR.**

- **28K** Radio Service—I... Thurs. 8.0-10.0 H. Hodgens.
- **29K** Radio Communication—I... Tues. 8.0-10.0 P. J. O’Callaghan.

**MORSE PRACTICE.**

- **27K** Telegraph Practice... Mon., Wed., Th. 7.30-9.30 J. V. Honan.

### INSTRUMENT MAKING AND LABORATORY ARTS

**TRAINING COURSES FOR WIRELESS OPERATORS**

(See Page 10).

### PHYSICS AND MATHEMATICS

**GENERAL PHYSICS.**

- **31K** Physics—I... Mon. 7.30-10.0 12 & 10 P. J. O’Callaghan, F. Whelan.
  - (A Class in Mathematics may be taken in addition).

**SECOND YEAR.**

- **32K** Physics—I... Wed. 7.30-10.0 9 & 10 P. J. O’Callaghan.
  - (A Class in Mathematics may be taken in addition).

**MAGNETISM AND ELECTRICITY.**

- **33K** Magnetism and Electricity... Fri. 7.30-10.0 12 & 10 P. J. O’Callaghan.
  - (A Class in Mathematics may be taken in addition).

### SPECIAL COURSES

- **34K** • SANITATION SCIENCE.
- **35K** • ELECTRICITY FOR RADIOLOGISTS.
- **36K** • PHYSICAL OPTICS.
- **37K** • OPTICAL INSTRUMENTS.

* The Special Courses listed above will be organised in the Session 1935-36. Intending students should consult the Principal.

### PHYSICAL CHEMISTRY

- **47K** Physical Chemistry—Lecture... Wed. 7.30-10.0 23 F. Nolan
  - Physical Chemistry—Laboratory... Wed. 7.30-10.0 23 F. Nolan
<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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<tbody>
<tr>
<td></td>
<td>INDUSTRIAL CHEMISTRY</td>
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<tr>
<td></td>
<td>SPECIALISED COURSES IN TECHNICAL ANALYSIS.</td>
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<td></td>
<td>FOOD AND DRUGS.</td>
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<tr>
<td>49K</td>
<td>Technical Analysis</td>
<td>Thrs. &amp; Fri.</td>
<td>7.30-10.0</td>
<td>22</td>
<td>B. G. Fagan; H. Thornton.</td>
</tr>
<tr>
<td></td>
<td>OILS AND FATS</td>
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<tr>
<td>49K</td>
<td>Technical Analysis</td>
<td>Thrs. &amp; Fri.</td>
<td>7.30-10.0</td>
<td>22</td>
<td>B. G. Fagan; H. Thornton.</td>
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<tr>
<td></td>
<td>GAS MANUFACTURE</td>
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<tr>
<td>50K</td>
<td>Technical Analysis</td>
<td>Thrs. &amp; Fri.</td>
<td>7.30-10.0</td>
<td>22</td>
<td>B. G. Fagan; H. Thornton.</td>
</tr>
<tr>
<td></td>
<td>COURSE FOR DIPLOMA OF VETERINARY STATE MEDICINE EXAMINATION.</td>
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<tr>
<td>51K</td>
<td>Technical Analysis</td>
<td>Thrs. &amp; Fri.</td>
<td>7.30-10.0</td>
<td>22</td>
<td>B. G. Fagan; H. Thornton.</td>
</tr>
<tr>
<td></td>
<td>TECHNOLOGY OF MANUFACTURES</td>
<td></td>
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<tr>
<td></td>
<td>BREWING SCIENCE AND CHEMISTRY OF FERMENTATION.</td>
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</tr>
<tr>
<td>52K</td>
<td>Lecture and Laboratory</td>
<td>Mon.</td>
<td>6.0-6.0</td>
<td>23</td>
<td>W. J. Looby.</td>
</tr>
<tr>
<td></td>
<td>INDUSTRIAL BACTERIOLOGY AND ENZYME CHEMISTRY.</td>
<td></td>
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<tr>
<td>53K</td>
<td>Lecture and Laboratory</td>
<td>Tues.</td>
<td>7.30-10.0</td>
<td>23</td>
<td>W. J. Looby.</td>
</tr>
<tr>
<td></td>
<td>CEREAL CHEMISTRY AND FLOUR MILLING PROCESSES.</td>
<td></td>
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<tr>
<td>54K</td>
<td>Lecture and Laboratory</td>
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<tr>
<td></td>
<td>TECHNOLOGY OF PAINT AND VARNISH MANUFACTURE.</td>
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<tr>
<td>55K</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></td>
<td>CHEMISTRY FOR PHOTOGRAPHY. PHOTO-MECHANICAL PROCESS WORK, LITHOGRAPHY, ETC.</td>
<td></td>
<td></td>
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<tr>
<td>56K</td>
<td>Lecture and Laboratory</td>
<td>Thurs.</td>
<td>7.30-9.30</td>
<td>22</td>
<td>G. A. Watson.</td>
</tr>
<tr>
<td></td>
<td>CHEMISTRY AND BOTANY FOR SEEDSMEN.</td>
<td>Fri.</td>
<td>7.30-9.30</td>
<td>23</td>
<td>W. J. Looby.</td>
</tr>
<tr>
<td></td>
<td>MEDICAL CHEMISTRY</td>
<td>Wed. &amp; Fri.</td>
<td>7.30-8.30</td>
<td>25</td>
<td>P. J. Hurley.</td>
</tr>
<tr>
<td>56K</td>
<td>Medical Chemistry—Lect.</td>
<td></td>
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<tr>
<td></td>
<td>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>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. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>59K</td>
<td>Chemistry and Physics, Lecture</td>
<td>Mon. &amp; Fri.</td>
<td>7.30-9.30</td>
<td>25</td>
<td>P. J. Hurley.</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>
</tr>
</tbody>
</table>

* POST-LECTURE COURSES IN PRACTICAL CHEMISTRY.
(September to January; January to May; May to August).

<table>
<thead>
<tr>
<th>No. of 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>Chemical Laboratory (120 hours).</td>
<td>Mon., Wed.</td>
<td>7.0-10.0</td>
<td>21</td>
<td>P. J. Hurley.</td>
</tr>
<tr>
<td></td>
<td>Lab. (Optional)</td>
<td>Thurs., Fri.</td>
<td>7.0-10.0</td>
<td>21</td>
<td>H. Thornton.</td>
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</table>

* BOTANY
(September to May).

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>61K</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. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>62K</td>
<td>Materia Medica</td>
<td>Thurs.</td>
<td>8.30-9.30</td>
<td>23</td>
<td>Dr. J. Shiel.</td>
</tr>
</tbody>
</table>

* Courses recognised by the Pharmaceutical Society of Ireland.

PRACTICAL PHARMACY.

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>63K</td>
<td>Lecture and Practical</td>
<td>Mon., Tues.</td>
<td>7.30-10.0</td>
<td>24</td>
<td>F. J. Barragry.</td>
</tr>
<tr>
<td></td>
<td>Thrus., Fri.</td>
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</table>

LANGUAGE COURSES

IRISH FOR STUDENTS OF SCIENCE AND TECHNOLOGY.

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>64K</td>
<td>Irish</td>
<td>Wed.</td>
<td>8.9-10.0</td>
<td>25</td>
<td>W. J. Looby.</td>
</tr>
</tbody>
</table>

GERMAN FOR STUDENTS OF SCIENCE AND TECHNOLOGY.

<table>
<thead>
<tr>
<th>No. of Course</th>
<th>Subject</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>65K</td>
<td>German</td>
<td>Mon.</td>
<td>8.9-10.0</td>
<td>23</td>
<td>F. Nolan.</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.

**DAILY 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 A.</td>
<td>Tues., Wed., Fri.</td>
<td>11.30-12.30</td>
<td>11</td>
<td>H. Hodgens</td>
</tr>
<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>Mon., Thurs.</td>
<td>3.0-4.0</td>
<td>11</td>
<td>H. Hodgens</td>
</tr>
<tr>
<td>Section A.</td>
<td>Tues., Thurs.</td>
<td>2.0-3.0</td>
<td>11</td>
<td>H. Hodgens</td>
</tr>
<tr>
<td>Section B.</td>
<td></td>
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<td></td>
<td></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>11.30-12.30</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>J. V. Honan</td>
</tr>
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</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>
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</thead>
<tbody>
<tr>
<td>Telegraphy Practice (including handling of radio-telegrams)</td>
<td>Mon., Wed., Thurs.</td>
<td>7.30-9.30</td>
<td>13</td>
<td>J. V. Honan</td>
</tr>
<tr>
<td>*Technical and Practical Radio</td>
<td>Tues.</td>
<td>7.30-9.30</td>
<td>11</td>
<td>H. Hodgens</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—measurement 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—free-hand sketching and measurement of models—methods of making drawings of simple parts of machines and apparatus.

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**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.

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**SCIENCE, MATHEMATICS, AND DRAWING.**

*(Physics for Electricians).*

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.

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 \( I \) sine
\( (at−g) \)—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 trigonometrical 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.

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.

MATHMATICS 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—autotransformer; 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 \( \tan (A \pm B) \) in terms of \( \tan A \) and \( \tan B \)—values of \( \sin A \pm \sin B \) and \( \cos A \pm \cos B \) in terms of the sines and cosines of half the sum or difference of \( A \) and \( B \)—solution of triangles—sum of the series \( a^n + \sin (a + d) + \sin (a + 2d) + \ldots \) 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 \( I \) 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 \( ax^n \) in which \( n = 1, 2, 3, \) or \( 4 \); \( a \) \( \cos x \), \( a \) \( \tan x \); \( a \) \( \sin bx \), \( a \) \( \cos bx \), \( a \) \( \tan bx \); \( \log x \)—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—energy consumed by electric cooking and heating apparatus and advantages or disadvantages compared with other means of heating and cooking—wiring up and connecting simple telephones and intercommunication 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.


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—Lenz'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.
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.

Construction: Testing of materials employed—aerial lines—modern practice—stresses on poles—static and kinetic stresses on wires, law connecting sag and stress, regulation of wires—factors of safety—underground and submarine lines, modern practice. Telephone Apparatus: Construction and theory of telephonic apparatus 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.

GENERAL SYLLABUS.

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

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 ½ 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 Radio-telegraphy. 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 Headmaster, 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 RADIOTELEGRAPH 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, to hold either a First or Second Class Certificate of proficiency, issued by the Minister for Posts and Telegraphs in accordance with Article 7 of the General Regulations annexed to the International Radiotelegraph Convention, 1927.

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) 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.

(d) A knowledge of the principal 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 at the prescribed speeds from a double head-gear telephone receiver ordinarily used for radiotelegraph reception, and to describe them legibly.

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

(d) To have a theoretical and practical knowledge of the operation, adjustments and maintenance of the accessory apparatus, such as motor-generator sets storage batteries, etc.

(e) To have the necessary knowledge to make, with the means that would be available on board a ship, the repairs of damaged apparatus.

(f) 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.

(3) The practical examination 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 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:

- Magnetism
- General electrical principles
- Condensers
- Primary and secondary cells
- Direct alternating and oscillatory currents
- Electro-magnets
- Electro-magnetic induction
- Meters
- Motors, dynamos, alternators and converters
- Spark, C.W. and I.C.W. transmitting installations: principles, apparatus, circuits, adjustments, maintenance
- Emergency installations: Ether waves, Aerials, Radiotelephony, transmitting and receiving apparatus: principles, circuits, adjustments, maintenance
- Auto-alarm devices: principles, adjustments, maintenance

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 questions, 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 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 wire and wireless routes of the world.

(6) 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 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, adjustments, 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.

(7) 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.

(8) 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:

- Primary and secondary cells
- Direct, alternating and oscillatory currents
- Meters
- Motors, dynamos, alternators, and converters
- Spark, C.W. and I.C.W. transmitting installations: principles, apparatus, circuits, adjustments, maintenance
- Receiving apparatus: principles, circuits, adjustments, maintenance
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 questions, elementary graphs and the elements of trigonometry.

**PHYSICS AND MATHEMATICS**

**FIRST YEAR COURSE IN GENERAL PHYSICS.**

**Subjects:**

**General Physics.**

**Mathematics.**

**GENERAL PHYSICS.**

**First Year.**


**PURE MATHEMATICS.**

**First Year.**

**Arithmetic:** Fractions and decimals—square root—percentages—interest, simple and compound—estimates—weights and measures.

**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, concurrency, 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.—I.

**FIRST YEAR.**

2. Capacity, charge as proportional to voltage, units—construction of fixed and variable condensers for low voltage—fixed condensers for high voltage. 3. Working ideas of alternating currents—calculation of current in circuits containing resistance, capacity, and inductance—resonance—simple aspect of coupled circuits—damped waves and continuous waves. 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 Poulsen arc generator—principle of smoothing devices for rectified alternating-current high-tension supply. 9. Detecting devices for small currents—crystals, valves—construction and action of telephone receivers. 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.

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,
(Subjects above).

Second Year.

ELECTRICAL ENGINEERING.—(A.C.)
(See Syllabus for Fourth Year Course in Electrical Engineering).

RADIO SERVICE.

First and Second Years.

APPLIED CHEMISTRY.
FIRST YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:
INORGANIC CHEMISTRY.
PHYSICS FOR CHEMISTRY.

INORGANIC CHEMISTRY.

First Year.


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.
Revision of chemical laws, atomic and molecular theories—atomic weight, Dulong and Petit's law—vapour density and molecular weight—diffusion of gases—kinetic molecular theory—water; natural waters, impurities, town supply—treatment of hard water for industrial use, technical methods of filtration—ionic theory; application to analysis—law of mass action—Faraday's laws of electrolysis—hydrogen, peroxide, ozone—halogens; commercial preparation, hydriodic acid—bleaching power, sodium hypochlorite, potassium chlorate—catalysers, influence of the velocity of chemical reactions—sulphuric acid; contact and chamber processes—concentration of sulphuric acid—forming sulphuric acid—sodium thiosulphate, sulphur chloride—coal gas, water gas—producer gas, Mond gas—carbon disulphide, metallic carbides, electric furnace—atmosphere; causes of impurities, estimation and removal—liquefaction of gases, oxides, chlorides, hydrides—commercial uses of phosphorus, phosphates, fertilizers—arsenic, antimony, bismuth; chlorides and oxygen compounds—boron, boric acid—borax—silica, silicates, glass, pottery, silicon and compounds.

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, nitrates, nitrites, 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.


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 and Fifth Years.

The province of organic chemistry—reason for separate study of carbon compounds—detection and estimation of carbon, nitrogen, sulphur and halogens in organic compounds—the paraffin series, methane and ethane as typical members—petroleum, occurrence, products and industrial uses—halogen derivatives of the paraffins—isomerism—chloroform—the monohydric alcohols—fermentation—oxidation product of the alcohols—formaldehyde and acetone—the fatty acid series—soap and its manufacture—acetic anhydride, acetyl chloride, use as reagents—the amides—the esters—ethyl acetate as typical member—nitro-paraffin—the amines—sulphur and cyanogen compounds—alkyl compounds of phosphorus, arsenic and zinc—organo-metallic compounds, use as reagents—unsaturated compounds—ethylene and acetylene—allyl compounds—oils of mustard—oleic acid—linseed oil—polyhydric alcohols—glycol—glycerol—carbohydrates—benzene and toluene, manufacture from coal-tar and halogen derivatives—nitro derivatives of benzene—aniline—mono and dimethyl anilines—toluidines—azo compounds—phenol—dihydroxy benzenes—aniline dyes—tannic acid—mordants—tanning.

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, limiments, 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; Unasaponifiable 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 coconut.
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; carboxylic acid.
Tests for Common poisons; mineral acids and alkalies; 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.
1. Examination of plant cells as an introduction to the use of the microscope.
2. Preparation of culture media.
3. Study of the life histories of typical yeasts, bacteria and moulds, including their special cultural treatment in the laboratory.
4. Experiments on enzyme chemistry.
5. Bacterial analysis of water, milks, etc.
6. Preservation of foods by sterilization, drying, salting, cold storage, etc.

CEREAL CHEMISTRY AND FLOUR MILLING PROCESSES.

History of wheat, oat, barley and maize plants.
Geographical distribution of the various cereals. Structure and physical characteristics of the cereals with special reference to wheat.
Diseases and pests of cereals; impurities found in cereals.
Cereal chemistry.
Storage of cereals; systems used in various countries.
Classification of wheats according to flavour, stability, strength, etc.
Wheat valuations taking into account impurities, moisture content, flour content, etc.
Milling Processes.

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: A simple study of facts and theories.

Technology: Oils and varnishes including methods of testing. Solvents, resins and gums.

Pigments including mixing and grinding. Drying and properties of films.

CHEMISTRY FOR PHOTOGRAPHY, PHOTO-MEC HA NICAL WORK, LITHOGRAPHY, Etc.

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

To understand the processes used in Photography, Photo-Mechanical 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.

General Chemistry: Physical and chemical changes—mixtures and compounds—elements—chemical laws—elementary treatment of the atomic theory. The Atmosphere: Constitution of the atmosphere—


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 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.

Medical 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.)

I. The plant cell, tissues, and systems.

II. The structure and principal modifications of root, stem, and leaf in Angiosperms; structure of typical flowers, fruits, and seeds.

III. The elements of plant Physiology and plant Biology, including the Ecology of native plants.

IV. The special study of the following:— Bacillus subtilissimus, Spirogyra, Fucus, Mucor, Psalliota, Funaria, Aspidium, Pinus, Cheiranthus.

V. The outlines of classification of Spermaphyta.
The Natural Orders:—Liliaceae, Orchidaceae, Gramineae, Rosaceae, Ranunculaceae, Papaveraceae, Cruciferae, Leguminosae, Compositae, Solanaceae, Scorpiulariaceae, Umbelliferae.


MATERIA MEDICA.
(September to May.)

I. Identification; description; natural origin; family; geographical source; chief constituents and pharmacopoeial requirements of the following:—

Drugs of Vegetable and Animal Origin.
Acacia, aconitum, adeps, adeps lanae, agar, aloe, amyllum, anethum, asafoetida, aurantii cortex, balsamum peruvianum, balsamum tonutum, belladonnae folium, belladonnae radix, benzionum, buchu, calumba, capsicum, carum, caryophyllum, cascara sagrada, cassia, catechu, cera alba, cera flava, cinchona, cinnamomum, coccus, chelochi cornus, colchici semen, colophonium, copaiba, coriandrum, digitalis folium, ergota, flix mas, ipecacuahua, foeniculum, gelatinum, gentiana, glycyrrhiza, hamamelis, hyoscyamus, ipomoea, jalapa, krameria, limonis cortex, limon, lobelia, mel depuratum, morrhuae oleum, myrrha, nux vomica, olivae oleum, ricini oleum, abietis oleum, amygdalae oleum, anethi oleum, anisi oleum, arachis oleum, cadini oleum, lavandulae oleum, limonis oleum, lini oleum, menthae piperate oleum, myristicae oleum, myristicae oleum, rosmarinis oleum, santali oleum, santali australiensis oleum, sesami oleum, terebinthinae oleum, theobromatis oleum, opium, pix carbonis praeparatum, pix liquida, podophylli resina, podophyllum, prunus serotina, quassia, quillaia, rheum, scammoniae resina, scilla, senega, sennae folium, sennae fructus, serpentaria, stramonium, strophanthus, styx, tamarindus, thyroideum, tragacantha, valeriana, zingiber.

II. BACTERIOLOGY.
Definition of bacteria; size; reproduction; motility; structure; spores; effect of light; effect of heat; growth in gases; identification; classification; preparation of sera and vaccines.

III. Definition and storage of the following bacteriological preparation:— antitoxinum diphthericum, antitoxinum tetanicum, antitoxinum welchicum, serum antidysentericum (shiga), toximum diphthericum
calefactum, toxinum diphthericum detoxicatum, toxinum diphthericum diagnosticum, tuberculinum pristinum, vaccinum typho-parathyphosum (t.a.b.), vaccinum vacciniae.

IV.

VITAMINES.

Presence of vitamin bodies in vegetables, fruits, oils, wheat, and rice.

PRACTICAL PHARMACY.

Translation of latin prescriptions; detection of dangerous doses; compounding and dispensing; explanation of process of making non-chemical preparations of the Pharmacopoeia. Resignation of preparations of the Pharmacopoeia which are not of a definite chemical nature, such as extracts, tinctures and powders.

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 tåd 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.

EVENING SCHOOL COURSES.

Architecture and Building.
Furniture.
Chemistry.
Botany, Materia Medica, Pharmacy.
Mathematics.
Physics.
Electrical Engineering and Allied Trades.
Radio Communication
Mechanical Engineering and Allied Trades.
Motor Car Engineering.
Gas Engineering and Gas Fitting.
Oxy-Acetylene Welding.
Electric Welding.
Brassfinishing.
Printing and Book Production.
Art and Art Crafts—Woodcarving, Enamelling on Metal, Leatherwork, Book Illustration.
Commerce and Languages.
Domestic Science and Women’s Work.
Catering Trades.
Bootmaking.
Hairdressing.
Tailoring.
Watchmaking and Repairing.
Music.
Physical Training, and

DAY SCHOOL COURSES.

Day Apprentice Schools.
Day Junior Technical Schools.
Day Schools of Commerce.
Retail Distribution.
Building Science.
Printing (Apprentices).
Painting (Apprentices).
Radio Telegraphy.
Electro Technology.
Shirtmaking (Power Machines)
Clothing Manufacture (Power Machines)
Art Leatherwork
Dressmaking.
Needlework.
Cookery.

DAY CONTINUATION WORK
(for Boys and Girls between 14 and 16 years).
City of Dublin
Vocational Education Committee

scoileanna ceard-oideacaís
City of Dublin Technical Schools

Session 1935-36

DAY SCHOOLS OF COMMERCE
PROSPECTUS OF COURSES

PARNELL SQUARE :: RATHMINES
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