1928

Electrical Engineering, Wireless Telegraphy, Applied Chemistry and Pharmacy: Prospectus of Courses 1928-29

City of Dublin Vocational Education Committee

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1928-29.

Clár na scúrsaí.

Sráid Chaoimhín.

ELECTRICAL ENGINEERING, WIRELESS TELEGRAPHY, APPLIED CHEMISTRY and PHARMACY.

Prospectus of Courses.

Kevin Street.
City of Dublin Municipal Technical Schools.

BOLTON STREET TECHNICAL INSTITUTE.
SCHOOL OF MECHANICAL AND MOTOR CAR ENGINEERING.
SCHOOL OF ARCHITECTURE AND BUILDING TRADES.
SCHOOL OF BOOK PRODUCTION AND PRINTING TRADES.

KEVIN STREET TECHNICAL INSTITUTE.
SCHOOL OF ELECTRICAL ENGINEERING.
CHEMISTRY, PHYSICS, AND WIRELESS TELEGRAPHY.
ART, ART CRAFTS AND MISCELLANEOUS TRADES.
SCHOOL OF DOMESTIC SCIENCE.

PARNELL SQUARE TECHNICAL INSTITUTE.
SCHOOL OF COMMERCE.
SCHOOL OF DOMESTIC SCIENCE.

CHATHAM ROW.
MUNICIPAL SCHOOL OF MUSIC.

Note.—The General Prospectus of the Technical Schools is divided into eight parts, issued separately in booklet form. Each booklet is complete as regards the arrangements, Time Tables, Syllabuses, etc., of the particular Department and classes dealt with. The following is a list of the booklets:—

No. 1. Mechanical and Motor Car Engineering and Allied Trades.
No. 2. Electrical Engineering, Wireless Telegraphy, Physics and Chemistry.
No. 3. Architecture and Building Trades.
No. 4. Book Production and Printing Trades.
No. 5. Commerce.
No. 6. Domestic Science.
No. 7. Art and Art Crafts and Miscellaneous Trades.
No. 8. School of Music.

Copies of any of the booklets may be had at any of the Technical Institutes, at the Public Libraries of the Corporation, or by post (2d.) from the Offices of the Technical Schools.
CALENDAR and MEMORANDA.

1928

Mon., 3rd Sept. Day Apprentice School resumes:

Wed., 5th Sept. First Term, School of Music, begins.


Mon., 24th Sept. Instruction in all Technical Classes begins during this week.

Thurs., 20th Dec. Final Meeting of Classes before Christmas.

1929


Mon., 14th Jan. Second Term, School of Music, begins.

FEBRUARY Entries for Public Examinations are made about the end of this month. Exact dates will be notified to the Classes.

Wed., 27th March Final Meeting of Classes before Easter.

Mon., 8th April Classes resume.

Fri., 10th May All Evening Classes close except Special Classes preparing for Examinations.

Sat., 11th May School of Music closes.

Fri., 26th July Day Apprentice School closes.
Preface.

The City of Dublin Municipal Technical Schools were founded in October, 1887, as an outcome of the Artisans’ Exhibition held in the City in 1885. The Schools were originally housed in an historic but unpretentious building in Kevin Street. From the foundation, and practically without interruption, the record of progress and expansion has been continuous, and now the Schools occupy three very large Technical Institutes at Bolton Street, Kevin Street and Parnell Square, and several classes are accommodated in other buildings throughout the City, affording in all accommodation for upwards of 5,000 students.

CURRICULUM.

The present curriculum of the Schools provide complete Courses of Instruction in

- Mechanical Engineering and Allied Trades.
- Electrical Engineering and Allied Trades.
- Radio Communication.
- Motor Car Engineering.
- Locomotive Engineering.
- Naval Architecture.
- Architecture, Building Trades and Furniture Trades.
- Book Production and Printing Trades.
- Applied Chemistry.
- Botany, Materia Medica, and Pharmacy.
- Art and Art Crafts.
- Music.
- Commerce.
- Domestic Science
- Catering Industries.
- and numerous Miscellaneous Trades.

Evening Courses.

Evening Courses are provided in all the subjects outlined above, and enable those engaged in the day-time to acquire an intimate knowledge of the principles that underlie the processes carried out in their daily work.

Day Courses.

Day Courses and Classes are arranged in most of the Departments of the Schools. The Day Apprentice School provides whole-time two years’ Courses in selected trades for boys who have just left school. The Day Trade Dressmaking Course provides similar training for girls, and Day School of Commerce a whole-time training to boys and girls.

Special Day Courses are provided for those actually engaged in trades—arrangements being made with employers whereby their apprentices can attend the Schools during part of several days each week. At present it has only been possible to arrange such Courses in a few cases—notably Painters and Decorators and the Printing Trades—but it is hoped, with the co-operation of the employers, to gradually extend this system to all trades.

Arrangement of Courses.

The Courses in all Departments, both Evening and Day, are arranged progressively to cover from two to five Sessions, according to the nature of the subject. The Courses in general include two or more subjects bearing on the main subject, and the instruction is given in such a manner as to illustrate the application of the principles of Science and Art to the daily work of the students.

Advanced Work.

The Laboratories and Workshops of the Schools are very completely equipped with the best and latest apparatus and machinery, and senior students are given every facility for advanced or research work.

New Classes.

If it can be shown that there is a demand for a new class, the teacher and requisite equipment will be provided.

Lectures.

Special lectures of a popular nature will be given during the Session.

Cinema.

A complete cinema installation has been provided in the Technical Institute, Bolton Street, and films of an educational nature will be shown from time to time. These displays will be duly notified to students in their classes.

Debating Society.

Students of the Technical Schools are eligible for membership of the Debating Society. Annual subscription, one shilling.
ENTRANCE EXAMINATIONS.

In the present year Entrance Examinations will be held at the Bolton Street, Kevin Street, and Parnell Square Technical Institutes, every evening during the week commencing 17th September, and on as many evenings afterwards as may be necessary. All new Students are advised to attend at 7.0 p.m. Those who can produce the Junior or any Higher Grade Certificate of the Intermediate Education Board, or the Higher Grade Certificate of the National Board, or some equivalent Certificate, need not sit for the Entrance Examination, and should make application for admission early in the Session.

The Entrance Examination consists of easy papers in English, Arithmetic, and Elementary Drawing, and First and Second Class Passes will be awarded. Those who pass in the First Class are eligible to take any Specialised Course.

These Examinations are not obligatory for trades' students.

SPECIALISED COURSES.

The Official Specialised Technical Courses are open to all Students who pass the Entrance Examination in the First Class, or are otherwise qualified. Each one is to take up, under advice or approval, the particular Course which most nearly meets his requirements, and is to adhere to this definite programme without any subsequent variation. If he ceases to attend any component subject of this Course he is liable to forfeit his entire Ticket.

No Student may attend for more than two Sessions in any one stage of the same subject.

Teachers, Pupil Teachers, and Monitors may enter for Special Courses that suit their needs, apart from the Official Courses. Such a Course will be regarded as an Official Technical Course. The same privileges will apply to Students whose needs are not met by the Official Courses. In their case the Course Subjects must be arranged and sanctioned by the Head Teacher.

The stage of any subsidiary subject may be changed to fit the Student’s particular grade of knowledge, the special evening allotted to Laboratory or other work may be altered, and a Student may be drafted from one class to an equivalent one. Any such changes must be sanctioned by the Head Teacher.

PREPARATORY COURSES.

Those who pass the Entrance Examination in the Second Class, or who have spent one year in the Sixth Standard of a National or Secondary School, may enter one of the "Introductory" Courses. Those who pass in the Third Class, or have not passed the Sixth Standard, are only at liberty to join one of the "Preliminary" Courses.

The Introductory Course Classes are of such a nature as to fit students to take up a Specialised Course of Technical Instruction in the following School Session. The subjects of instruction are:

(a) English.
(b) Elementary Mathematics and Arithmetic.
(c) Drawing or Elementary Science or Elementary Domestic Economy.

The Preliminary Courses are similar to the Introductory, but of a more elementary character.

Any Trade Student who is taking an Introductory Course may attend the First Year Practical Class in his particular trade.

A class in Irish may be added to the Introductory or Preliminary Courses if desired, without extra fee.

FEES.

The fee for a full course or for a single class in Technological or Science subjects is usually 7s. 6d., Commercial or Domestic Economy subjects 10s. Special fees are: Wireless Telegraphy, 23 for Day Course; £2 for Evening Course; Day Commercial Course, £3; Motor Car Driving, £2; Practical Chemistry, 15s.; Practical Pharmacy, 15s.; Pharmaceutical Chemistry, £1 10s.; Materia Medica, 7s. 6d.; Botany, 7s. 6d.; Day Classes in Domestic Science, £1.

Holders of the Higher Grade Certificate will be admitted free on production of the Certificate.

If a student wishes to take up a class in addition to those of the Course, an extra fee must be paid except in the case of Irish.

All fees are payable in advance and cover the full Session or Term. Fees are not returnable.

GENERAL NOTICES.

The general enrolment of Students commences on Monday, 17th September, 1928.

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

Pupils actually in attendance at a Day National School or Day Secondary School are not eligible for admission to Evening Courses or Classes.

Teachers may be consulted on their class nights as shown in the Time Tables.

If any Student is absent from three consecutive meetings of any Class, unless for valid cause shown before the third meeting, his Ticket for the Class, or for the whole Course of which it is part, is liable to be cancelled without further warning.

The Trade classes are intended for those engaged in the several trades. Others will not be admitted before November 7th, 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 remain in a laboratory or workshop class if his attendance at the lecture or drawing class proves unsatisfactory.

A class may be discontinued in the event of an insufficient number of Students joining or attending; and the number of evenings allotted weekly to any class may be reduced if there be a falling off in the attendance of Students. The right is reserved to close classes for any other reason whatever.

Students are to make good any damage done by them.

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

The Scheme for a Day Apprentice School was adopted by the Conference on the Industrial Training of Apprentices, by the Technical Education Committee, by the Department of Agriculture and Technical Instruction, and by the Corporation of Dublin.

The object of the Scheme is to link technical education closely with industry by giving a specialised training from the outset of a boy's industrial career.

Apprenticeship Scholarships—approximately one hundred—may be awarded annually, on the results of examinations, to boys between the ages of fourteen and sixteen years. The Scholarships entitle the holders to a free training for two years in the Apprentice School, together with a payment of six shillings weekly for the first year, and eight shillings weekly for the second year; books and instruments will be supplied.

The Scholarships and Free Places are strictly confined to boys whose parents or guardians are resident in rate-paying houses within the boundaries either of the City of Dublin or the Urban Districts of Rathmines and Rathgar.

The course of instruction is altogether in the daytime; it covers 30 hours weekly for 46 weeks in each year; approximately one-third of the time in first year and two-thirds in the second year are devoted to a thoroughly practical and theoretical training in the trade for which the boy is preparing.

Pupils are allowed to select as far as possible the trades they desire to follow, and on the conclusion of the two years' course the Employers' and Trades Associations will allocate the boys to existing vacancies for apprentices.

An attendance of not less than eight hours weekly at the Technical School will be required during the terms of apprenticeship (i.e., after the boy has left the Apprentice School).

The courses at present in operation are:—(1) Plumbers; (2) Carpenters; (3) Printers; (4) Mechanical Engineering; (5) Electrical Engineering; (6) Sheet Metal Plate Work; (7) Cabinetmaking; and (8) Painting and Decorating, Brass-finishing, Motor Car Engineering, Brick-laying, Quantity Surveying. The date and full particulars of Entrance Examinations will be duly announced in the Schools and in the Dublin Press from time to time.

Shorter Courses varying slightly from the above terms are conducted for the Catering Industry (training of Chefs, Waiters, and Waitresses).

UNIVERSITY SCHOLARSHIPS.

The Corporation of Dublin provide Sixteen Scholarships and reserve four of these for Students who have attended the City of Dublin Technical Schools, each of the annual value of £60, tenable for three years. Candidates must have attended the City of Dublin Technical Schools during at least one Session as a condition of eligibility for admission to the Scholarship Examination, and such candidates must have been in (bona fide) regular daily employment.

SPECIAL TRAINING FOR DIPLOMAS.

1. Courses of training will be instituted in the autumn session with a special view to the requirements of students preparing for admission to the recognised engineering institutions.

2. For the present the course will be confined to candidates for the Institution of Electrical Engineers and the Institution of Automobile Engineers.

3. The courses will be open to students between the ages of 17 and 25 selected on the results of an entrance examination which will be a test of general educational and of elementary technical attainments.

4. The courses may comprise both day-time and evening classes; they will be of a progressive nature covering a total period of approximately three years.

SCHOLARSHIPS.

1. The Technical Education Authority offers seven Scholarships each in Electrical Engineering and Automobile Engineering. Four of these Scholarships in each subject will be reserved for students of the Day Apprentice School; three in each subject will be open for competition to other students of the Schools or to applicants from elsewhere.

2. The award of the Scholarships will be made on the results of an examination.

3. The value of each Scholarship will be:

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>£5</td>
</tr>
<tr>
<td>2nd Year</td>
<td>£7</td>
</tr>
<tr>
<td>3rd Year</td>
<td>£10</td>
</tr>
</tbody>
</table>

4. The Technical Education Authority reserves the right to cancel a Scholarship in the case of faulty attendance, want of progress, indiscipline, or other unsatisfactory conduct.

Note.—For the current year the number of Scholarships in Electrical Engineering will be five, two of which will be reserved for students of the Electrical Engineering Section in the Day Apprentice School.
THE FOY SCHOLARSHIP.

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 above Scholarships are provided for by the Dublin Mechanics' Institute Residuary Fund, which has been made available for Industrial Scholarships.

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.

THE MULLIGAN SCHOLARSHIPS.

As a result of a bequest, Sixteen Scholarships of £1 each will be awarded on the results of the second year examination of the Department of Education.

DAY APPRENTICE SCHOOL SCHOLARSHIPS.

(See page 10.)

PRIZES.

SCHOOL PRIZES.

First and Second Prizes are awarded in each year of each subject on the results of the Sessional Examination to Students who have obtained not less than 70 per cent. marks and have at least 60 per cent. attendance of the actual class meetings.

SPECIAL PRIZES.

Numerous prizes are offered by Employers and Trade Unions; chiefly the Dublin Building Trade Employers' Association, the Irish Quantity Surveyors' Association, the Dublin Guild of Building Workers' Union, the United Operative Plumbers' Association, Dublin Brick and Stonemasons' Trade Union, Operative Plasterers' Society, Master Drapers' Association, Armstrong Siddeley Motors, Ltd., etc.
Schools of Electrical Engineering, Wireless Telegraphy, Applied Chemistry and Pharmacy.

STAFF.

E. MORTON, A.R.C.S.C.I., A.I.C. ... Head Teacher of the School of Physics, Electrical Engineering and Chemistry.
William D. Horgan, B.A. ... Physics and Electricity.
Henry C. Clifton, B.A. ... Mathematics.
James J. McCormick, B.A. ... English, etc.
Harold A. Hodgens ... Wireless Telegraphy.
William Fegan ... Electrical Engineering.
Michael Lambert ... Instrument Making.

PART TIME LECTURERS AND DEMONSTRATORS.

Electrical Engineering. W. P. Collins ... Electrical Installation Work.
James Moran ... do.
P. Bricklei, A.E.E. ... do.
E. Moyhhan, A.R.C.S.C.I. ... Physics and Electricity.
G. W. Harris, B.A. ... do.
P. Bertram Foy ... Applied Chemistry.
M. J. O'Connor ... Pharmaceutical and Medical Chemistry.
G. A. Watson, A.R.C., Sci. ... do.
J. Bell, Sc.D. ... Physical Chemistry.
John Shiel, L.P.S.I., L.R.C.S. ... Materia Medica
Patrick O'connor, B.Sc., A.R.C.S.C.I. ... Botany.
D. K. O'connell, M.P.S.I. ... Pharmacy.
D. S. MacEoin ... Irish.
P. J. Hayes, A.R.C.S.C.I. ... Telephony.
J. O'Sullivan ... Telegraphy.
H. J. Barriscale, B.E. ... Post Office Engineering.
E. J. Hughes-Dowling ... Mathematics.
J. Gately, M.A. ... English and Mathematics. (Introductory Course).

School of Electrical Engineering.

EXPLANATORY STATEMENT.

ELECTRICAL ENGINEERING.

The Courses in Electrical Engineering extend over four years and cover the general field of Continuous and Alternating current work.

Students are required to take with their classes in Electrical Engineering special suitable classes in Technical Mathematics, Machine Drawings and Design, and power Producing Plants.

Facilities are provided for senior students to take in their final years specialised work in any particular line of Electrical Engineering.

The laboratories have been recently arranged and extended, and are spacious and well appointed. The equipment includes:-

A Double Current Machine—10 K.W.—for Single, Double or Three Phase Work; or for use as a Rotary Converter. A Newton Two-Pole D.C. Generator, specially designed for tests. 4 K.W. Machines to work as Series, Shunt, or Compound. D.C. Generator—Ring Wound—8 K.W. A Crompton Testing Set arranged for carrying out Hopkinson’s Efficiency Tests, Rotary Converter Tests, etc., and also to act as a Synchronous Motor Converter. Types of D.C. and A.C. Motors. An Oscillograph with accessories. A comprehensive collection of modern Electrical Instruments of precision for testing.

ELECTRICAL INSTALLATION WORK.

As distinct from the regular course in Electrical Engineering, special practical courses in Electric Wiring and in general Electrical Engineering Work are provided. These courses may extend over a few years. Special attention is given to the practical instruction, but students are required to take the lectures and classes in suitable subjects.

SPECIAL COURSES FOR POST OFFICE OFFICIALS.

By arrangement with the Post Office Authorities, special classes and courses will be formed to meet the requirements of the several Post Office Departmental employees. The courses may include the following:-

Technical Telegraphy (Junior and Senior).
Technical Telephony (Junior and Senior).
Electricity and Magnetism for Post Office Employees.
General Post Office Engineering and Linesmen’s Work.
Radio Communication.

SCHOOL OF WIRELESS TELEGRAPHY AND TELEPHONY.

In view of the development of Wireless Telegraphy in Ireland and the demands of amateurs and candidates for Wireless appointments, special courses and classes have been arranged.
### 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>
</tr>
</thead>
<tbody>
<tr>
<td>1K</td>
<td>English</td>
<td>Tues.</td>
<td>7:30-8:30</td>
<td>23</td>
<td>J. Gately</td>
</tr>
<tr>
<td>1K</td>
<td>Drawing</td>
<td>Wed.</td>
<td>7:30-9:30</td>
<td>14</td>
<td>Miss M. Whelan</td>
</tr>
</tbody>
</table>

### SPECIAL CLASSES IN IRISH—Free to Course Students.

<table>
<thead>
<tr>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irish—I.C.</td>
<td>Tues.</td>
<td>7:30-9:30</td>
<td>25</td>
</tr>
<tr>
<td>Irish—I.D.</td>
<td>Wed.</td>
<td>7:30-9:30</td>
<td>25</td>
</tr>
</tbody>
</table>

### PRELIMINARY COURSE—Fee, 5s. for Course.

### INTRODUCTORY COURSES—Fee, 5s. Gd. for each Course.

<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>4K</td>
<td>English—F</td>
<td>Mon.</td>
<td>7:30-8:30</td>
<td>23</td>
<td>J. Gately</td>
</tr>
<tr>
<td>5K</td>
<td>English—G</td>
<td>Thurs.</td>
<td>7:30-8:30</td>
<td>23</td>
<td>J. Gately</td>
</tr>
<tr>
<td>5K</td>
<td>Mathematics—F</td>
<td>Wed.</td>
<td>7:30-9:30</td>
<td>14</td>
<td>Miss M. Whelan</td>
</tr>
</tbody>
</table>

### ELECTRICAL ENGINEERING—Fee, 7s. 6d. for each Year of Course.

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Day</th>
<th>Hour</th>
<th>Room</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST</td>
<td>Elect. Engineering—I.A.</td>
<td>Thurs.</td>
<td>7:30-10.0</td>
<td>19-10-8</td>
<td>E. Moynihan, G. W. Harris</td>
</tr>
<tr>
<td>SECOND</td>
<td>Elect. Engineering—I.B.</td>
<td>Tues.</td>
<td>7:30-10.0</td>
<td>12-10-8</td>
<td>E. Moynihan, G. W. Harris</td>
</tr>
</tbody>
</table>

### ELECTRICAL INSTALLATION WORK—Fee, 7s. 6d. for each Year of Course.

<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>14K</td>
<td>Electrical Wiring—Lect. I.</td>
<td>M. or W.</td>
<td>7:30-8:30</td>
<td>5</td>
<td>W. Fegan</td>
</tr>
<tr>
<td>14K</td>
<td>Electrical Wiring—Pract. I.</td>
<td>M. or W.</td>
<td>8:30-10.0</td>
<td>1</td>
<td>J. Moran, W. P. Collins</td>
</tr>
<tr>
<td>15K</td>
<td>Electrical Engineering—I.</td>
<td>Tu. or Th.</td>
<td>7:30-10.0</td>
<td>8</td>
<td>E. Moynihan</td>
</tr>
<tr>
<td>15K</td>
<td>Physics for Electricians—I.</td>
<td>M. or W.</td>
<td>7:30-10.0</td>
<td>8</td>
<td>E. Moynihan, G. W. Harris</td>
</tr>
</tbody>
</table>

### TECHNICAL TELEGRAPHY—Fee, 7s. 6d. for each Year of Course.

<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>17K</td>
<td>Technical Telegraphy—I.</td>
<td>Thurs.</td>
<td>8:0-10.0</td>
<td>8</td>
<td>J. O'Sullivan</td>
</tr>
<tr>
<td>18K</td>
<td>Technical Telegraphy—II.</td>
<td>Fri.</td>
<td>8:0-10.0</td>
<td>9</td>
<td>J. O'Sullivan</td>
</tr>
</tbody>
</table>

### TECHNICAL TELEPHONY—Fee, 7s. 6d. for each Year of Course.

<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>19K</td>
<td>Technical Telephony—I.</td>
<td>Mon.</td>
<td>8:0-10.0</td>
<td>9</td>
<td>P. Hayes</td>
</tr>
<tr>
<td>20K</td>
<td>Technical Telephony—II.</td>
<td>Tues.</td>
<td>8:0-10.0</td>
<td>9</td>
<td>P. Hayes</td>
</tr>
</tbody>
</table>

### POST OFFICE ENGINEERING—Fee, 7s. 6d. for each Year of Course.

<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>21K</td>
<td>Post Office Engineering—I.</td>
<td>Mon.</td>
<td>8:0-10.0</td>
<td>9</td>
<td>H. J. Barricale</td>
</tr>
</tbody>
</table>

### GENERAL PHYSICS—Fee, 7s. 6d. for each Year of Course.

### INSTRUMENT MAKING—Fee, 7s. 6d. for each Year of Course.

### RADIO COMMUNICATION—Fee, 7s. 6d. for each Year of Course.

### ELECTRICAL INSTALLATION WORK—Fee, 7s. 6d. for each Year of Course.

### TECHNICAL TELEGRAPHY—Fee, 7s. 6d. for each Year of Course.

### TECHNICAL TELEPHONY—Fee, 7s. 6d. for each Year of Course.

### POST OFFICE ENGINEERING—Fee, 7s. 6d. for each Year of Course.

### GENERAL PHYSICS—Fee, 7s. 6d. for each Year of Course.

### INSTRUMENT MAKING—Fee, 7s. 6d. for each Year of Course.

### RADIO COMMUNICATION—Fee, 7s. 6d. for each Year of Course.

### TECHNICAL TELEGRAPHY—Fee, 7s. 6d. for each Year of Course.

### TECHNICAL TELEPHONY—Fee, 7s. 6d. for each Year of Course.

### POST OFFICE ENGINEERING—Fee, 7s. 6d. for each Year of Course.

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### TECHNICAL TELEGRAPHY—Fee, 7s. 6d. for each Year of Course.

### TECHNICAL TELEPHONY—Fee, 7s. 6d. for each Year of Course.

### POST OFFICE ENGINEERING—Fee, 7s. 6d. for each Year of Course.

Advanced Course in Physics and Pure Mathematics suited to the standard of the London University Degree. Examination in Science and Engineering will be arranged if sufficient demand is made for such.
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<th>No. of Course</th>
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<td><strong>MEDICAL CHEMISTRY—Fee, 50s. for each Year of Course.</strong></td>
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<td><strong>PHARMACEUTICAL CHEMIST—Fee, 30s. for Full Course (Two Terms).</strong></td>
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<td><strong>MATERIA MEDICA—Fee for the Course, 7s. 6d.</strong></td>
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<td>Practical Pharmacy</td>
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<td>7.30-10.0</td>
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<td>D. K. O'Connell.</td>
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| * A Special Class in Physical Chemistry, open to Students of the third, fourth and fifth years of the Applied Chemistry Course, is being arranged for the Session, 1928-29, and is specially suitable to those Students who intend taking the Associateship Examination of the Institute of Chemistry for Great Britain and Ireland. See page 40.
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 use 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.

Subjects:

Electrical Engineering.

Mathematics, Mechanics, and Drawing.

(Physics for Electricians).

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 co-efficient—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.

Mathematics, Mechanics, and Drawing.

(Physics for Electricians).

First Year.

Mathematics: Fractions and decimals—curtailment of unnecessary figures—examples such as shunts and divided circuits—measurement and calculation of perimeters, cross-sectional areas, surfaces, volumes, and weights of simple details of apparatus and machines in the metric and British systems—the triangle, rectangle, trapezium, circle, cylinder, cone and frustum—square root—finding diameter of a cylinder from its weight, density and length—percentages as applied to errors regarding instruments, varying prices of materials, etc.—simple calculations such as cost of energy to lamps and motors, efficiencies of motors, etc.—curves such as those showing change of resistance of copper with temperature, quantity of heat furnished by different currents to a lagged resistance coil, and change of resistance of a lamp filament with increase of voltage—sine, cosine, and tangent and values for 0, 30, 45, 60, and 90 degrees—use of tables—graph of a voltage sine wave using simple angles—average and maximum voltages and their approximate ratio. Mechanics: Concrete illustrations of electrical and mechanical forces—parallelogram of forces—resolving forces—triangle and polygon of forces—moments of forces, parallel forces, centres of gravity—levers pressures of loaded beam on supports—laws of couples. This section will be illustrated by appropriate electrical and mechanical examples. Drawing: Simple geometrical figures and hexagons, ellipses, cross-sections of cables and polygons to scale, from specified dimensions and angles, to illustrate distributing networks.
SECOND YEAR COURSE IN ELECTRICAL ENGINEERING

Subjects:
- Electrical Engineering
- Mathematics
- Machine Drawing

Electrical Engineering

Practical units for current, voltage, resistance power and energy—Ohm’s law—measurement of resistances—Wheatstone bridge—use of megger—ohm-meter and generator, and volt-meter for measuring insulation resistance—principles of commercial measuring instruments—electrical and mechanical properties of conductors and insulators—the 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—circuit diagrams—reversal 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—simple phase—elementary theory of construction of alternator—frequency—effects 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

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 \( A \) and \( E \) for areas by squared paper and Simpson’s rule—ratio of area to perimeter and bearing on economy of copper wires—area of a sine current half-wave and ratio of its average to its maximum value—equations—examples involving simple equations—finding \( D \) knowledge of \( D \) and \( D/L \)—determining \( X \) and \( Y \) knowing \( 1/X + 1/Y \), and \( X \) and \( XY \), as required in testing the insulation resistance of two-wire circuits—trigonometry—radial measure—relation between degrees and radians—angular velocity of current or voltage vectors and their instantaneous values—meaning of the form \( I \sin (at + \theta) \)—geometrical proofs for expanded \( \sin (\alpha + \beta) \) 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 algebraic 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 horsepower—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

Freehand diagrammatic sketches of electrical apparatus, and the conventional drawing of circuits and connections, such as those associated with measuring instruments, storage batteries, and direct current machines. Freewheel 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

Subjects:
- Electrical Engineering
- Applied Mechanics
- Power Plants and Producers

Electrical Engineering


Electrical Lighting: Lamps; types used, construction and efficiencies—principles of photometry and of illumination. Friction: Motors used; control, speed-time curves, etc.

Applied Mechanics II

See Syllabus under Third Year of Course in Mechanical Engineering.

Mathematics III

Third Year

FOURTH AND FIFTH YEARS' COURSES IN ELECTRICAL ENGINEERING.

Subjects:

ELECTRICAL ENGINEERING.

Mathematics.

POWER PLANTS AND PRODUCERS.

ELECTRICAL ENGINEERING.

FOURTH AND FIFTH 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 harmonics—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 methods of starting and synchronising—induction motor; construction—uses—transformer connections, phase-transformations—alternators; common types—synchronous motors, principles, performance and tests.

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 \( \sin (a+\sin) \cdot a \sin (a+2d)+ \ldots \) to \( n \) terms—calculation of hysteretic coefficients from hysteresis curve of sample of iron—graph of \( f = Ax^2 + \sin mt \); \( t \) being time and \( I \) current—measurement of slope at a point on sine and other curves such as those representing \( y = ax \) and \( y = ax^2 \)—simple differentiation with respect to \( x \) of forms such as \( ax^n \) and \( ax^2 \); \( n \) being 1, 2, 3, or 4; \( a \sin x, a \cos x, a \tan x, a \sec x \); \( a \sin bx, a \cos bx, a \tan bx, a \sec bx \); \( \log x \)—simple integration of forms such as \( ax^n \) and \( ax^2 \) 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.

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 gaskets 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, calculators, 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 and special systems—drawing up wiring schedule for small installation—errection 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 disadvantages 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 3 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.

See Syllabus under Second Year Course in Electrical Engineering.

MACHINE DRAWING.

First Year.
See Syllabus under First Year Course in Mechanical Engineering.
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 disturbances 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 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 subdividing 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—analogy with temperature, level, and pressure—work done by or against electric forces—electric field—electrostatic induction—electrostatic capacity—Leyden jar and plate condenser—electrophorus—frictional electric machine—influence machines—electric discharge. Electric Currents: Simple voltaic cells—local action and paraxial—constant cells—general description of their use. Chemical action taking place in the most common forms of cells—electrosynthesis—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—amperes, volts, ohms—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 force 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, in-
struments 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—airial lines—modern
practice—stresses on poles—static and kinetic stresses on wires, law
connecting sag and stress, regulation of wires—factors of safety—under­
ground 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 Ex­
changes; magneto and common battery, complete multiplex, 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 prin­
ciples 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 cir­
cuits—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 for­
mulage—effects of leakage—conductance—comparative efficiencies of
wires of various materials and gauges, open, underground, and sub­
marine. **Testing:** Wheatstone bridge—tangent, ballistic and reflect­
ing galvanometers—ammeters—voltmeters—theory, construction, and
methods of use—localisation of earths, contacts, and disconnections
on line wires—capacity, resistance, inductance, and insulation mea­
surements—measurement of resistance and E.M.F. of batteries—Post
Office Morning Test system (for long-distance lines). **Miscellaneous:**
Kirchhoff's and Maxwell's laws—electro-magnet coils, simple formulae
for telephone repeaters. Suitable illustrative diagrams will be syste­
matically 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 REPAIRING.**

**GENERAL SYLLABUS.**

**Materials:** Metals—alloys—woods—insulating materials—mechanical
properties of each and suitability for different purposes. **Tools:**
Varieties and uses—making and setting—defects and treatment. **Pro­
cesses:** Filing—bending—soldering—welding—polishing—lacquering—
surface finishing—drilling—tapping—silvering. **Lathe Work:** Turning
tapering—beveling—mill-heading—screw-cutting. **Glass Blowing:**
Bending—joints—straight and T or Y shapes—bulb blowing. **Fine
work:** Use of phosphor-bronze and quartz filaments—mounting of
spider threads—silvering of glass. **Design and Construction of Instru­
mements:** General mechanical principles—lever—springs—screws—
periodic and aperiodic, ballistic and dead-beat system—dimensions and
proportions—workmanship and finish. **Weighing Scales:** Considera­
tions of range of reading—factors determining sensitivity—precision
and accuracy—systems of control—gravity—tension—torsion—spring.
**Special Work:** Construction of fixed and variable inductances,
condensers and other parts for wireless receiving sets—design and construc­
tion of panels and switchboards for such sets using two, three or more
valves—general assembling of all component parts of wireless systems.

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

It may be pointed out here that Part II., i.e., the profes­
sional 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 ex­
amination have only to pass a qualifying examination in the fol­
lowing subjects: English or another language, Applied Mechanics,
General Physics or Inorganic Chemistry, Electricity and Mag­
etism.

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 14 K.W. Full Ship's Wireless Set, provided with all Auxiliary and Emergency Gear (and modern Valve Receiving and Transmission Sets). Students have spacious rooms for Morse Practice and the use of the fully-equipped Electrical and Physical Laboratories of the Institute.

INSTRUCTION.

The Course of Training is arranged to prepare students in the shortest possible time for the Examination for Proficiency in Radio-telegraphy. The instruction consists of Lectures and Practical Work in Technical Electricity and Technical Wireless Telegraphy (including Continuous Wave and Valve Working), with special practice on the 14 K.W. Set, Morse training and instruction in the Handbook for Wireless Operators, etc.

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 up to obtaining the First Class P.M.G. Certificate of Proficiency, and are payable in advance, are as follows:

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Students may arrange to take, with the approval of the Headmaster, any special course in the Day or Evening programme. In the case of students requiring a short intensive course reduced fees may be arranged.

ADMISSION.

Students are expected to have a good general education up to the standard of the Junior Grade of the Intermediate Board, or 7th Standard of the National Board, with special attention to Handwriting and Spelling.

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 six months in the Day School and proportionately longer in the Evening Course.

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 8th Book. Algebra: Permutations and combinations—progressions—complete theory of indices—the Biomial theorem. Plane Trigonometry: Formulae for finding the sine, cosine, etc., of the sum.
and difference of two angles, and of the multiples and sub-multiples 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. \textit{Graphs:} 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.

\textbf{PURE MATHEMATICS.}

\textbf{Third and Higher Years.}

\textbf{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 numbers—De Moivre’s theorem. \textit{Solid Geometry:} Properties of straight lines and planes; their intersections, inclinations, parallelism, perpendicularity, etc.—properties of the sphere, and of cylinders and cones. \textit{Spherical Trigonometry:} Definitions of great and small circles, angles and sides of spherical triangles—fundamental relations between spherical functions. \textit{Geometrical Conics:} Properties of the parabola, ellipse, and hyperbola deduced by pure geometry from definition in plane. \textit{Coordinate 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 circles, and determination of circles satisfying given conditions of their tangents and normals; properties of their diameters, axes, foci, conjugate diameters, asymptotes, poles and polars—discussion of the general equation of the second degree. \textit{Differential Calculus:} Definitions, limits, differential co-efficients—differential 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—determination of a function and of implicit functions—maxima and minima of functions of one independent variable—determination 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, sub-normals, 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. \textit{Integral Calculus:} Meaning of definite and of indefinite integrals—integration of the more frequently occurring functions—integration by parts—rational functions—formulæ 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. \textit{Elementary Differential Equations:} Integration of differential equations of the second and higher orders with constant co-efficients.

\textbf{FIRST YEAR COURSE IN RADIO COMMUNICATION.}

\textbf{Subjects:}

\textit{Radio Communication.—I.}

\textit{Electrical Engineering.—I.}

\textbf{Radio Communication.}

\textbf{First Year.}

2. Capacity, charge as proportional 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 Poulsen 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.
13. Methods of keying "spark" and continuous-wave transmitters for Morse signalling.
15. Use of a frame aerial for reception—application to direction finding.

\textbf{Electrical Engineering.—I. (See Syllabus for First Year Electrical Engineering.)}

\textbf{SECOND YEAR COURSE IN RADIO COMMUNICATION.}

\textbf{Subjects:}

\textit{Radio Communication.—II.}

\textit{Electrical Engineering.—(A.C.)}

\textbf{Radio Communication.}

\textbf{Second Year.}

\textbf{Subjects above.}

1. High-frequency measurements—current wave-length capacity and inductance, resistance and decrement—field strength.
3. The subject of clause 4 of the Grade I. syllabus treated quantitatively.
4. The construction and action of high-frequency alternators and transformers.
5. Frequency changers.
6. Construction and action of smoothing devices for rectified alternating-current high-tension supply.
7. Anti-atmospheric and anti-interference devices.
9. Method of connecting radio telephone to land line telephone.

\textbf{Electrical Engineering.—(A.C.)}

\textbf{(See Syllabus for Fourth Year Course in Electrical Engineering.)}
APPLIED CHEMISTRY.

FIRST YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:

INORGANIC CHEMISTRY.

PHYSICS FOR CHEMISTS.

INORGANIC CHEMISTRY.

FIRST YEAR.


PHYSICS FOR CHEMISTRY.

First Year.


SECOND YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:

INORGANIC CHEMISTRY.

CHEMICAL ANALYSIS.

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, hydracids—bleaching powder, sodium hypochlorite, potassium chlorate—catalysts, 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 salts or alloys: Silver, lead, mercury, bismuth, copper, cadmium, arsenic, antimony, tin, iron, aluminium, chromium, manganese, zine, nickel, cobalt, calcium, strontium, barium, magnesius, potassium, sodium and ammonium—qualitative recognition of chlorides, bromides, iodides, hypochlorites, chlorates, fluorides, nitrates, 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 bicarbonate and their use in water treatment—standard silver nitrate solution—use of standard thiosulphate 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.

THIRD YEAR COURSE IN APPLIED CHEMISTRY.

Subjects:

INORGANIC CHEMISTRY.

CHEMICAL ANALYSIS.

INORGANIC CHEMISTRY.

THIRD YEAR.

The metals, chief sources and methods of extraction—alloys, preparation and general properties—periodic system—law of insomorphism—freezing point curves and cooling curves—sodium and potassium manufacture and industrial uses—sodium and potassium—copper and silver—application of silver salts in photography—the alkaline
Third Year.

Ordinary methods of gravimetric analysis, including the estimation of silver, lead, copper, tin, arsenic, antimony, iron, aluminium, zinc, nickel, copper, magnesium, barium, manganese, 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:

Chemical Analysis.

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 halogen in organic compounds—the paraflin series, methane and ethane as typical members—petroleum, occurrence, products and industrial use—halogen derivatives of the paraflins—iodine and its compounds as reagents—unsaturated compounds—ethylare and acetylene compounds—alkali compounds of phosphorus, arsenic and zinc—organo-metallic compounds, use as reagents—unsaturated compounds—ethylare and acetylene—alkyl compounds of oil of mustard oleic acid linseed oil polynedic acids glycerol—glycerol—carbohydrates benzene and toluene—mercuric compounds from coal tar and halogen derivatives—nitro derivaties of benzene aniline mono and di methyl aniline—tolidines diazo compounds phenol di hydroxy benzenes— Boiler Feed Waters—standards for boiler—general consideration and analysis of vinegar, pepper, mustard, ginger, etc. Tea, Coffee, and Cocoa: Composition and analysis—microscopical characteristics—addition of chicory to coffee—coffee extracts, Sugar, Jams, and Honey: Composition and analysis—artificial colours in jam—glucose in honey. Beer, Wine, and Spirits: Analysis—original gravity of beer—standard for spirits. Preservatives and poisonous metals in food.

Drugs.


Water and Water Analysis.

Natural waters and sources of impurities—rain water—surface water—river water—wells and springs—waters used in brewing, distilling, and mineral water industries—bottles, glasses, 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; Polaiske value; Acetylation value; Acid value; Unsaponifiable value.

CLASSIFICATION.

Marine oils, including Manhaden; coal-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 Neat's foot. Vegetable fats, including cocoa-butter; palm and cocoanut. Animal fats, including tallow; butter-fat and lard.

THE WAXES.

Occurrence and properties of sperm oil; camanta wax; beeswax; wool wax. MINERAL OILS.

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

MINERAL OILS.

Paraffin; vaseline and ozokerite.

HARDED FATS.

PRACTICAL COURSE.

INTRODUCTION.

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

Specific tests for certain oils and fats.

Testing and analysis of mineral oil and waxes. Interpretation of results.

Scheme for identification of an oil fat or wax.

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, Electrolys, Rate of Migration, Conductivity of Solutions, Ph. Values.

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.

SECOND AND THIRD YEARS.

See Syllabus under Second and Third Year Courses in Applied Chemistry.

CHEMICAL ANALYSIS.

SECOND AND THIRD YEARS.

See Syllabus under Second and Third Year Courses in Applied Chemistry.

CHEMISTRY FOR PHOTOGRAPHY, PHOTO-MECHANICAL 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 technical processes.


PHARMACEUTICAL COURSES.

PHARMACEUTICAL CHEMISTRY.

The Pharmaceutical Society of Ireland recognise and accept certificates of attendance at courses of instruction in Botany, Materia Medica, and Pharmaceutical Chemistry, conducted in the City of Dublin Municipal Technical Schools.

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

Subjects:

LECTURES—THEORETICAL CHEMISTRY AND PHYSICS.

Practical Work—Pharmaceutical Chemistry.

The Course is intended for chemists' assistants who have passed their preliminary and are working for their final examinations. The Session is divided into two terms—September to December, and January to May. The first term is mainly devoted to lectures, and the second to practical work. 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 syllabus.

PHARMACEUTICAL CHEMISTRY.


PHARMACY.

Preparation of drugs for administration—description and manufacture of all official preparations—relation to practical pharmacy of processes of evaporation, distillation, desiccation, and sublimation—disintegration of solid substances—solution, filtration, and expression—making of collodions, confections, decoctions, dilute acids, extracts, glycerines, infusions, juices, liniments, lotions, mixtures, ointments, pills, plasters, powders, solutions, spirits, suppositories, syrups, tinctures, vinegars, waters, and wine.

Demonstrations, as far as possible, will be made of the pharmacopoeial operations; dispensing of physicians' prescriptions, prescription reading, posology; calculation of percentages, and other quantities occurring in prescriptions.

BOTANY.

The cell and cell contents, cell wall, protoplasm, nucleus, cell sap, karyokinesis and growth storage, cellulose, lignin, cutin, suberin, musilage—morphology and anatomy of herbaceous dicotyledon (e.g., helianthus), woody dicotyledon (e.g., tilia), and monocotyledon (e.g., lilium), stem, root, leaf, inflorescence and flower, stamen, anther and pollen, pistil and ovule—fertilisation and development of the embryo—classification of fruits—structure of seed in dicotyledon (e.g., ricinus and vicia), and in monocotyledon (e.g., triticum)—seed dispersal, germination, respiration, movement, transpiration, photo-synthesis, products of metabolism, transport of food, enzymes, absorption, elements of plant food—making and staining of microscopic preparations—classification, coniferae, liliaceae, gramineae, amentaciae, ranunculaceae, cruciferae, papaveraeae, rosacea, seguminosaee, solanaceae, scrophulariaeaceae, labiatae, rubiaeaceae, compositae, umbelliferae, euphorbiaceae.

The Course will be illustrated with fresh and prepared specimens, and as far as possible, with experiments. If time permits, individual experimental work will be encouraged.

MATERIA MEDICA.

Source, character and preparation of the chief alkalis, alkaline earths, metals and non-metals, and inorganic acids—source, character and preparation of the chief organic acids and carbon compounds—description of the physical, chemical and diagnostic characters of drugs—morphology of organised drugs, (e.g., roots, rhizomes, wood, barks, herbs, leaves, flowers, fruit, seeds, etc)—morphology of unorganised drugs, (e.g., resin, gum-resin, oleo-resin, juices, oils, fats, starches and miscellaneous products; sources of above and collection and preparation for the market—active principles of official drugs—official preparation of crude drugs and pharmacopoeial methods of testing and assaying.
Special Classes.

IRISH LANGUAGE.

All Students of the Schools are entitled to attend a class in Irish if they so desire, without extra charge. Classes in the First Year only are held in the Bolton Street Institute, but more advanced students will be provided with instruction in any stage at the Technical Institute, Parnell Square, or Kevin Street.

FIRST YEAR.

Oral: Conversation lessons (questions, answers and general remarks) to afford each student the necessary practice to attain reasonable fluency in conversing on simple matters such as the following:—name and home or residence—salutations on meeting and parting—the clock—days of the week—months and seasons—the weather—money—easy counting—colours and other ordinary properties of common objects—location of objects in the classroom and immediate neighbourhood—parts of the body and clothing—giving and carrying out simple orders. With the conversational lessons, the student will be familiarised with the ordinary constructions in regard to the use of *is* seadh, *ni* lochd, *an* eadh, *nach* eadh, *gurb* eadh, *cad* eadh, *an* bhfuil, *nil* ta, *go* bhfuil, *nach* bhfuil, *an* raibh, *ni* raibh, *bhi* go raibh, *nach* raibh; and of some of the more commonly used verbal nouns such as *suidhe*, *seasamh*, *teacht*, *siubhal*, etc.

Written Work: Each student will keep a note-book to record the salutations, simple phrases, his own name and address, etc., in correct Irish. Rough notes may also be written according to English phonetics or otherwise to aid in the memorising and pronunciation of words and phrases.

Cultural: Students will be taught to memorise simple songs, rhymes, stories, recitations, etc., so as to be able to repeat them with correct *blas*. Verses, etc., will be according to Gaelic metres, and stories or recitations by Gaelic authors.

TEXT BOOK: *An ār Bhreac*. Dr. Hyde.

PRELIMINARY COURSE.

Subjects:

English.

Arithmetic.

Drawing.

This Course is arranged for junior trade students who have had to leave school while still in the lower standards, in order to provide them with the opportunity of qualifying for the Introductory and Specialised Courses. Students are permitted to take a practical class in their trade subject by payment of an extra fee, provided there is room for their admission.

English.

Spelling, correct pronunciation and grammar—formation of sentences—use of verbs, adverbs, prepositions, etc.—simple descriptive compositions.

Arithmetic.

Multiplication tables—simple multiplication and division—easy compound addition, subtraction, multiplication and division—simple mental arithmetic.

Drawing.

Simple freehand sketches from blackboard, familiar objects and from memory—geometrical exercises with compass and set squares—angles, squares, rectangles, circles, etc.