

HARRIS INSTITUTE, PRESTON.

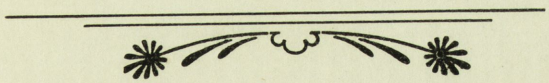
HARRIS INSTITUTE,

PRESTON.



PROSPECTUS

Session 1910-1911.



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HARRIS INSTITUTE,

PRESTON

PROSPECTUS

Session 1910-1911.

CONTENTS.

MEMBERS OF COUNCIL 5

Day Classes.

MATRICULATION AND SCIENCE 10

ENGINEERING 17

COMMERCIAL 23

AGRICULTURE 33

Day and Evening Classes.

DOMESTIC SCIENCE 59

ART 73

CERTIFICATE 83

Evening Classes.

SCIENCE AND MISCELLANEOUS 87

ORGANISED COURSES :—

BUILDING TRADES 101

MECHANICAL ENGINEERING 125

PHYSICS AND ELECTRICAL ENGINEERING 139

COTTON SPINNING 159

COTTON WEAVING 173

COMMERCIAL 181

SCHOLARSHIPS AND PRIZES 197

HARRIS COUNCIL.

1910-1911.

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Mr. E. Carey, LL.B. (Liverpool)

*Member of the Council of the Corporation of Preston.

Principal and Secretary.

T. R. JOLLY, F.C.I.S.

Day Classes.

Matriculation & Intermediate Science.

Day Classes.

SESSION 1910-1911.

The Session commences on Monday, 26th September, 1910, and consists of Three Terms :—

Winter Term—

26th September to 22nd December, 1910.

Spring Term—

10th January to 13th April, 1911.

Summer Term—

18th April to 6th July, 1911.

All communications to be addressed to—

T. R. JOLLY,
Principal and Secretary.

University Classes.

These provide complete Courses of Instruction for the Joint Matriculation of the Northern Universities ; the Intermediate B.Sc. and Intermediate B.Sc. Tech. Manchester ; the Intermediate B.Sc. Liverpool ; the Matriculation and Intermediate Examinations of the University of London ; and the various Preliminary Professional Examinations, including Medical and Dental.

The Institute is affiliated to

THE MANCHESTER UNIVERSITY,

and recognised as a privileged Institution under their Ordinances to the extent that the attendance in the courses in Physics, Mathematics, and Chemistry at the Institute is accepted as satisfying the attendance for the Intermediate B.Sc. or Intermediate B.Sc. Tech. Courses.

The following is an extract from the " Manchester University Calendar " as applied to Privileged Institutions :—

A Student of an affiliated Institution shall be exempted from attendance on such portion or portions of the regular course of study in the University as the Senate may approve, provided that—

(a) He has attended at the recognised Institution a course of study approved by the Senate and extending over at least two years, unless for special reasons and on the recommendation of the Council the Court of the University shall reduce this period to one year in any individual case.

(b) Before the commencement of the course of study at the recognised Institution the student shall have attained the age of 17 years.

(c) At least one year of study at the recognised Institution shall be taken subsequent to the passing of the Matriculation Examination by the student, or such other examination as may be approved by the Joint Matriculation Board as exempting from the Matriculation Examination.

(d) In no case shall a degree be conferred upon any person who has not attended in the University during two years at least the courses of study recognised for such degree.

THE LIVERPOOL UNIVERSITY

also recognises the Institute under the provisions of Ordinance 29, Clause 4, for the purposes of courses of study qualifying for a degree in Science. The terms of this Clause are as follows :—

In the case of any affiliated College or Instiution or of any part of such College or Institution recognised for the purposes of this Clause, students who have attained the age of 17 years and have passed the Matriculation Examination of the University, or an examination or examinations exempting from the Matriculation Examination, shall be allowed to attend at any such College or Institution a part or whole of a course of study approved by the Senate of the University as qualifying in part or in whole for exemption from the first year of attendance upon courses of study in the University. Such students may be then admitted to any degree examination for which a year's study is prescribed, and may enter the University as students of the second year, and shall be allowed to present themselves for the Degree of Bachelor in their respective faculties in the same way and under the same conditions as though they had attended during the first year of study the prescribed courses within the University.

Composition Fees.

Students wishing to take a definite Course of Lectures, suitable for the Examination of the Manchester, Liverpool, and London Universities may do so on payment of a Composition Fee of £10 10s. for the Course.

All fees *must be paid in advance*, and Students must obtain the official receipt and show the same to the Lecturer before their names can be entered on the Register.

FEES.

For each Course of Lectures in any ONE Subject :—

	£	s.	d.	
One hour per week	1	1	0	per Session
Two hours per week	1	11	6	,,
Three hours per week	2	2	0	,,
Laboratory Fees (Physics), three hours weekly	1	11	6	,,
,, (Chemistry), three hours weekly	1	11	6	,,

Fees for Term by arrangement.

STAFF.

Subject.	Lecturer.
Mathematics	J. T. CORKILL, B.A.
Physics and Mechanics	G. E. GITTINS, A.I.E.E.
	A. W. HOLDEN.
	H. WHALLEY, B.Sc.
Chemistry	R. H. JONES, M.Sc., F.C.S.
	A. BAGULEY, B.Sc., F.I.C.
Botany	J. HARRISON, A.R.C.Sc.
Latin, French, English	F. W. JACKSON, B.A.

University Courses.

MATRICULATION COURSE.

Subject.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
English & History		3-0 to 4-0		3-0 to 4-0	4-0 to 5-0	
French			12-0 to 1-0		3-0 to 4-0	
Latin				2-0 to 3-0		9-30 to 10-30
Mathematics	3-30 to 4-30				10-30 to 11-30	
Advanced Mathematics			10-30 to 12-30		9-30 to 10-30	10-30 to 11-30
Mechanics	11-0 to 12-0	11-0 to 12-0	9-0 to 10-0		9-0 to 10-0	
Chemistry	11-30 to 12-30	11-30 to 12-30		11-15 to 12-30	9-30 to 10-30	
Mag. & Electricity	2-0 to 3-30	10-0 to 11-0		10-0 to 11-0		
Botany	9-30 to 10-30		2-0 to 4-0			

INTERMEDIATE COURSE.

Subject.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Mathematics			10-30 to 12-30		9-30 to 10-30	10-30 to 11-30
Physics		10-15 to 12-15 2-0 to 3-30		11-0 to 12-0 2-0 to 4-30	12-0 to 1-0	
Chemistry	10-15 to 11-15 (Tut.) 1-30 to 3-30 (Prac.)	9-0 to 10-0	9-30 to 10-30 2-15 to 4-15 (Prac.)	9-30 to 10-30	2-0 to 4-0 (Prac.)	

Syllabus of Classes.

MATHEMATICS.

Lecturer, J. T. CORKILL, B.A., Inter.B.Sc.

Matriculation Course—

(1) Arithmetic and Elementary Algebra to Quadratic Equations (inclusive), with Arithmetical and Geometrical Progressions, and an Elementary treatment of Irrational Quantities and Proportion.

(2) Geometry—the subjects covered by Euclid I. to IV.

Hours—Monday, 3-30—4-30 ; Friday, 10-30—11-30.

Intermediate Course—

(1) Substance of Euclid VI. ; Elementary Solid Geometry ; Mensuration of Simpler Solids.

(2) Algebra—the simpler portions beginning with Progressions.

(3) Plane Trigonometry to Solution of Triangles (inclusive).

(4) Analytical Geometry of the Straight Line and Circle.

[*For more Advanced Students*—Elementary Analytical Geometry of the Conic Sections ; Differentiation and Integration of Simple Algebraical and Trigonometrical Functions.]

Hours—Wednesday, 10-30—12-30 ; Friday, 9-30—10-30 ; Saturday, 10-30—11-30.

PHYSICS AND MECHANICS.

Lecturers, G. E. GITTINS, A.I.E.E. ; A. W. HOLDEN, Inter., B.Sc. ; H. WHALLEY, B.Sc.

Matriculation Course—

(1) Mechanics—Solids and Fluids.

Hours—Monday and Tuesday, 11 to 12 ; Wednesday and Friday, 9 to 10.

(2) Magnetism and Electricity.

Hours—Tuesday, 10 to 11 ; Thursday, 10 to 11 ; Monday, 2 to 3-30.

Intermediate Course—

(1) The Properties of Matter, the Chief Phenomena of Sound, Heat, Light, Electricity, and Magnetism, treated in an elementary manner.

(2) Practical Physics.

Hours—Tuesday, 10-15 to 12-15, 2 to 3-30 ; Thursday, 11 to 12 2 to 4-30 ; Friday, 12 to 1.

CHEMISTRY.

Lecturers, R. H. JONES, M.Sc. ; A. BAGULEY, B.Sc., F.I.C.

Preliminary Course—

Elementary Science of Common Life.

Hours—Monday and Friday, 10-30 to 11-30 ; Tuesday, 11-30 to 12-30.

Matriculation Course—

Elementary Inorganic Chemistry.

Hours—Monday, 11-30 to 12-30 ; Tuesday, 11-30 to 12-30 ; Friday, 9-30 to 10-30 ; Thursday, 11-15 to 12-30 (Practical).

Intermediate Course—

Hours—Monday, 10-15 to 11-15 (Tut.), and 1-30 to 3-30 ; Tuesday, 9 to 10 ; Wednesday, 9-30 to 10-30, 2-15 to 4-15 ; Thursday, 9-30 to 10-30 ; Friday, 2 to 4.

BOTANY.

Lecturer, J. HARRISON, A.R.C.Sc.

Matriculation Course—

Elementary Botany.

Hours—Monday, 9-30 to 10-30 ; Wednesday, 2 to 4.

LATIN.

Lecturer, F. W. JACKSON, B.A.

Subjects—Accidence and Elementary Syntax, Translations from English into Latin, Special Author and Unseen Translations.

Hours—Thursday, 2 to 3 ; Saturday, 9-30 to 10-30.

FRENCH.

Lecturer, F. W. JACKSON, B.A.

Subjects—Accidence and Elementary Syntax, Etymology, Translation, and Composition.

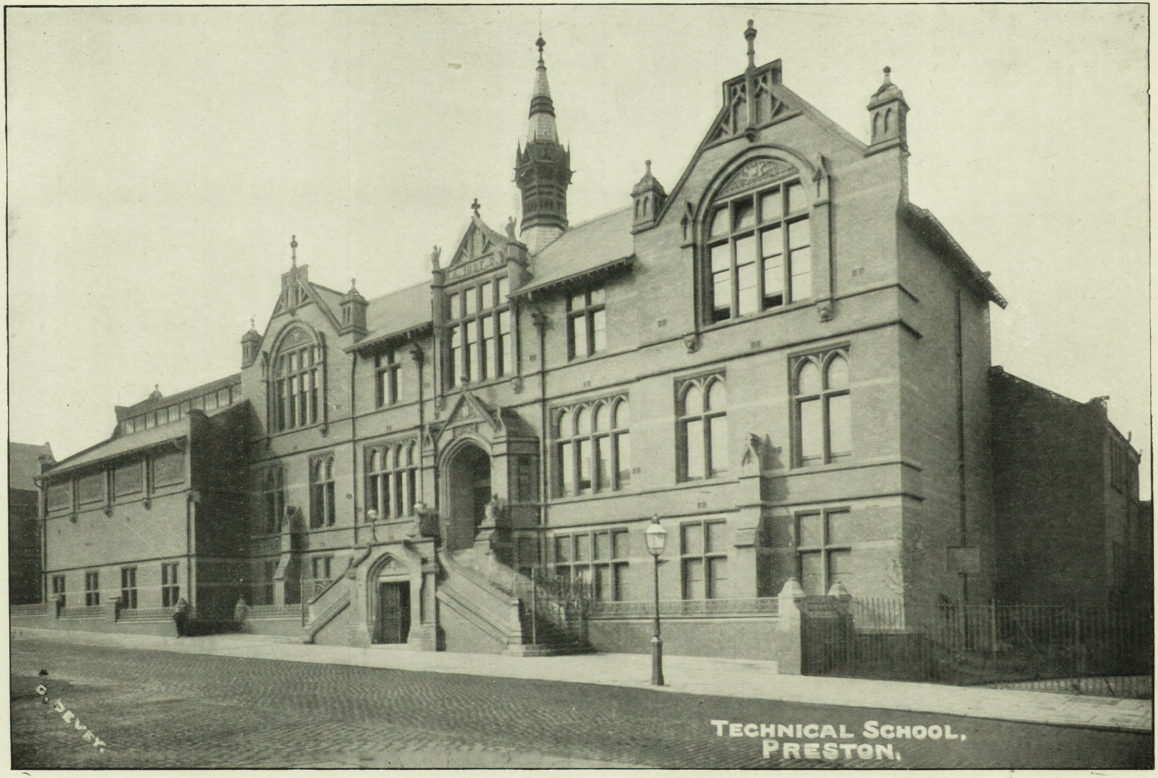
Hours—Wednesday, 12 to 1 ; Friday, 3 to 4.

ENGLISH AND HISTORY.

Lecturer, F. W. JACKSON, B.A.

Subjects—English Grammar—Parsing, Analysis, and Composition ; Elementary Knowledge of the Language and Literature ; History as per Syllabus.

Hours—Tuesday, 3 to 4 ; Thursday, 3 to 4 ; Friday, 4 to 5.


C. DELEY.
TECHNICAL SCHOOL,
PRESTON.

Day Engineering Classes.

Engineering Department.

Lecturers :

Mechanical Engineering, E. C. MOYLE, A.R.C.Sc., A.M.I.M.E.
Electrical Engineering, G. E. GITTINS, A.I.E.E.

Assistant Lecturers :

Mechanical Engineering, J. H. BINFIELD, Wh.Ex.
F. W. WALKER, Dip. M.E.

Electrical Engineering, A. W. HOLDEN (Honours Medallist),
H. WHALLEY, B.Sc.

The Engineering Department offers full Courses of Instruction as per Time Table, extending over three years, in the Science and Practice of Engineering. The instruction is given principally in the following branches, viz. :—

Mechanical Engineering.
Electrical Engineering.
Civil Engineering.

The full Course in each of these branches includes—

(*a*) Lecture Courses and Class Work.
(*b*) Drawing Office Practice.
(*c*) Engineering Laboratories.
(*d*) Certain specialised Courses for Advanced Students.

The Department contains well-equipped Engineering Laboratories, including steam engine laboratory, in which is placed a compound horizontal steam engine specially arranged for experimental work, a boiler, superheater, condenser, steam and air pumps, and other accessories, and a gas engine.

The Mechanical Laboratory is suitably equipped with machines and apparatus to illustrate important mechanical principles, and to allow of tests being made to ascertain the strengths of materials.

The Electrical Laboratory contains a full equipment of dynamos and motors for all classes of work, together with the necessary instruments for making measurements of power, efficiency, &c.

The Courses of Instruction are of a thoroughly practical character, and are such as to enable Students taking the full three years' Engineering Course to obtain a sound knowledge preparatory to entering the works or drawing office of an Engineer.

It will afford a valuable training, and will be found useful to those who wish later to become associated with the various professional Institutions, such as the Institutions of Civil, Mechanical, or Electrical Engineers, or to those desirous of competing for Whitworth Scholarships and Exhibitions, or the Bachelor of Science Degree in Engineering of the University of London.

Students will be allowed to use for reference the Engineering and Technological works in the Reference Library.

Lockers will be provided at a cost of 1s. 6d. per annum, and each Student will be required to take one.

All Engineering Students will be required to pass an entrance examination in Arithmetic, Dictation, English Composition, and Simple Algebra. Students unable to pass this entrance examination are advised to take the preliminary course.

Scholarships and Prizes of considerable value are open to Students of ability, enabling them to pursue their studies at the Universities or the Royal College of Science, London.

The Session commences on Monday, September 26th, 1910, and consists of three Terms :—

Winter Term.—September 26th to December 22nd, 1910.

Spring Term.—January 10th to April 13th, 1911.

Summer Term.—April 18th to July 6th, 1911.

ENGINEERING DEPARTMENT.

Mechanical, Electrical, and Civil.

FIRST YEAR.

Monday	9 to 10 Pure Mathematics	10 to 11 Practical Mathematics	11 to 12 Mechanics (Solids)	2 to 3-30 Magnetism & Electricity (Practical)	3-30 to 4-15 English
Tuesday	9 to 10 Pure Mathematics	10 to 11 Magnetism & Electricity	11 to 12 Mechanics (Solids)	2 to 3-30 Practical Physics	3-30 to 4-15 English
Wednesday	9 to 10 Mechanics (Fluids)	10 to 11 Pure Mathematics	11 to 12-30 Machine Drawing	2 to 4 Machine Drawing	
Thursday	9 to 10 Exercise Class	10 to 11 Magnetism & Electricity	11 to 12 Pure Mathematics	Holiday	
Friday	9 to 10 Mechanics (Fluids)	10 to 11 Practical Mathematics	11 to 12 Physics	2 to 4 Practical Plane and Solid Geometry	

SECOND YEAR.

Monday	9-30 to 11 Practical Mathematics	11 to 12-30 Graphics		2 to 4 Machine Drawing	
Tuesday	9-15 to 10-15 Applied Mechanics	15-15 to 11-15 Practical Mathematics		2 to 4 Mechanical Engineering (Laboratory)	
Wednesday	9 to 10 Practical Mathematics	10 to 11 Electrical Engineering	11 to 12 Exercise Class	2-30 to 3-30 Practical Mathematics	3-30 to 4-30 Mechanical Engineering (Laboratory)
Thursday	9-15 to 10-15 Heat Engines	11-15 to 12-15 Practical Mathematics		Holiday	
Friday	9-30 to 10-30 Electrical Engineering	10-30 to 12 Electrical Engineering (Laboratory)		2 to 4 Machine Drawing	

THIRD YEAR.

Monday	9 to 10 Electrical Engineering	10 to 12 Electrical Engineering (Laboratory).		2 to 4 Machine Drawing	
Tuesday	9 to 10 Practical Mathematics	10 to 11 Heat	11 to 12-30 Physics (Laboratory)	2 to 4 Building Construction	
Wednesday	9 to 10 Practical Mathematics	10 to 11 Heat Engines	11 to 12-30 Mechanical Engineering (Laboratory)	2 to 3 Magnetism and Electricity	3 to 4-30 Electrical (Laboratory)
Thursday	9 to 10 Practical Mathematics	10 to 11 Heat	11 to 12 Electrical Engineering	Holiday	
Friday	9 to 10 Practical Mathematics	10 to 11 Theory of Structures and Strength of Materials	11 to 12 Hydraulics and Machines	2 to 4 Machine Drawing	

Fourth Year Students.

A Special Time Table will be arranged for each Student with a view to specialising in that particular branch of Engineering to which he intends to devote himself.

At the end of the third year's Course the Student will be examined, and a diploma awarded according to the Class obtained in this Examination. The homework and laboratory note books will be considered when marks are awarded.

Fee.

£5 5s. 0d. per Session.

Day Commercial Classes.

Day Commercial Classes.

Day Commercial Classes.

STAFF.

Head of Department, VINCENT E. COLLINGE, F.Inc., S.T., A.C.I.S.

Subjects.	Lecturers.
Arithmetic (Com.) and Mathematics	J. T. CORKILL, B.A., Inter.B.Sc
Book-keeping, Business Methods, Commercial Correspondence, Handwriting, Shorthand, and Typewriting	V. E. COLLINGE, A.C.I.S.
English and French	F. W. JACKSON, B.A.

INTRODUCTION.

Special Day Commercial Courses are arranged, the following subjects being taught :—Arithmetic (Commercial), Book-keeping, Business Methods, Commercial Correspondence, English, French, Handwriting, Mathematics, Shorthand, and Typewriting.

The main object of these Courses is to fit youths of both sexes for commercial life by affording them facilities for the acquiring of a knowledge of the subjects required of them in business. The work is thoroughly practical, the theoretical and academic being supplemented at all points from a varied business experience. While thus laying emphasis on the practical, it may be desirable to point out to parents and guardians that the educational value of the subjects is ever kept in mind ; and it is invariably the case that the mental calibre of the Students is improved after a course of study. The training is suitable, not only to the clerk and typist, but also to the prospective warehouseman, manager, or employer, or to those who are to take up the accountancy or secretarial profession.

There are three distinct Courses open to Students—full, short, and special—and they are strongly advised to take one of the first two, so as to include English. Individual subjects, or any group of subjects, may, however, be taken if desired. A Second Year's Course is provided.

The instruction will be given in preparation for the Examinations of the Royal Society of Arts, the London Chamber of Commerce, and the Lancashire and Cheshire Union of Institutes.

The Principal is frequently asked to recommend qualified Day Students for important positions connected with local business firms.

The Classes, except where otherwise indicated, will be held at the Technical School, Corporation Street.

First Year.

TIME TABLE.—FULL COURSE.

Subject and Class.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
**Commerce*—					
Arithmetic (Commercial)	2-30 to 3-30			11-30 to 12-30 (Institute)	
Book-keeping	9-0 to 11-0				
Business Methods	11-12		9-0 to 11-0	9-10	
Shorthand—					11-12
Theory		9-0 to 10-0			9-0 to 10-0
Typewriting.....		† 10-0 to 11-0 11-12			† 10-0 to 11-0
**English*		2-0 to 3-0			2-0 to 3-0
French		4-0 to 5-0		4-0 to 5-0	
Mathematics		3-0 to 4-0		10-30 to 11-30 (Institute)	

**Short Course.*—The Classes in these Subjects constitute the *Short Course* in Commercial Subjects.

Special Course.—The Classes headed "Commerce" constitute the *Special Course* in Commercial Subjects.

†Class hours; extra hours for practice will be arranged.

SYLLABUSES—FIRST YEAR.

Arithmetic (Commercial)—

Arithmetical theory and practice. Applications of Arithmetic, such as practice, percentages, discount, interest, stocks, profit and loss, exchange, averages, areas, simple solid contents. The metric system (values, weights, and measures)—and the coinage of France, Germany, United States, and India.

Mental Arithmetic and Tots.—

Book-keeping.—

The use of subsidiary office books, petty cash, wages, stock books, and journal; the keeping of purchase, sales, and return day books and cash book; the ledger, and the posting of simple transactions; balancing the accounts; single and double entry; proof of the ledger by the trial balance; preparation of profit and loss accounts and balance sheets; simple mercantile terms.

Business Methods, &c.—

Handwriting—round, text, and small-hand; addressing envelopes; copying a draft letter, or manuscript, a tabular statement or printed matter, &c., correcting any erasures, additions or alterations

therein ; copying and ruling up, where necessary, arithmetical examples, items of an invoice, a statement, a receipt, a Bill of Exchange, a telegram or other commercial forms of document in general use, and the displaying of headings, or other matter by different sizes of writing ; simple lettering with the pen, and without the use of the pencil thus :—A B C, A B C, &c. Composing letters. Press copying, indexing, docketing. Making out business forms, such as order notes, invoices, statements, cheques, &c., Petty cash book and household expenses book. Postal regulations relative to British, colonial, and foreign letters, patterns, and parcel post. Postage book. Postal and money orders. Registration. Inland and foreign telegrams. Filing. The meaning of simple business terms and abbreviations.

Shorthand (Theory).—

Instruction will be given in the principles of Phonography set forth in the " Manual " (Instructor, pt. 1). Advanced principles will be introduced early, and application made especially to commercial phraseology.

Typewriting.—

The syllabus is shown by the examination test, which will comprise the following items :—

(1) The typing of a carelessly written letter, not to exceed 120 words in length.
(2) The composition and typing of a reply to the letter given in paragraph 1.
(3) Questions on the care, oiling, &c., of a typewriter, including the use of the variable spacer, the adjustment of margins for different kinds of work, line spacing, &c.
(4) The indication of correct fingering and correct division of words.
(5) The copying of an arranged tabulation or specification.
(6) The typing of an invoice, or other commercial statement, from unarranged details given.

Candidates will be required to attempt the whole of the questions.

Note.—Accuracy and neatness being of the greatest importance, the quality of the work will be noticed, rather than the speed.

English.—

Parsing and analysis of simple, compound, and complex sentences. Composition on historical, geographical, or general themes. Figures of speech. Sentence formation and correction of common errors in English.

French.—

The elementary rules of accidence and syntax. Translation and retranslation. Reading of prose selections and an easy prose author. Practice in conversation.

Mathematics.—

(1) Algebra.—Definitions and explanations of algebraical signs and terms. Numerical substitutions. Integral indices. Addition, subtraction, multiplication, and division of algebraical expressions, and fractions. Factors. Simple equations and problems producing them. Graphs.

(2) Geometry.—Angles and parallels; triangles; parallelograms; problems; loci; easy deductions.

Second Year.

TIME TABLE.—FULL COURSE.

Subject and Class.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday
**Commerce*—					
Arithmetic (Commercial)	2-30 to 3-30			11-30 to 12-30 (Institute)	
Book-keeping	11-0 to 12-0			9-0 to 10-0	
Business Methods, &c.			9-0 to 11-0		
Shorthand (Speed)		11-0 to 12-0			11-0 to 12-0
Typewriting		† 10-0 to 11-0			†10-0 to 11-0
**English*		2-0 to 3-0			2-0 to 3-0
French		4-0 to 5-0		4-0 to 5-0	
Mathematics		3-0 to 4-0		10-30 to 11-30 (Institute)	

**Short Course.*—The Classes in these Subjects constitute the *Short Course* in Commercial Subjects.

Special Course.—The Classes headed "Commerce" constitute the *Special Course* in Commercial Subjects.

†Class hours; extra hours for practice will be arranged.

SYLLABUSES SECOND YEAR.

Arithmetic (Commercial).—

More difficult exercises in: Proportional parts, banker's discount, stocks and shares (ordinary stock, preference stock, debentures), profit and loss. Compound interest, with special reference to repayment of loans. The use of logarithms (more particularly for problems on compound interest, insurance, and annuities). Rates of exchange and transactions with home and foreign bills. The money market colum of a daily newspaper, Metric system. Coinages. (*Tables of logarithms and currencies will be given on the examination paper.*)

Book-keeping.—

Book-keeping by double entry, including the opening and keeping of the following books taken in the order mentioned : Journal, bought day book, sold day book, returns book (inwards and outwards), cash book and petty cash book, ledger (sold and bought).

Taking stock : The balancing of the accounts and the testing of the correctness of the postings by a trial balance, the preparation of an account of profit and loss and a balance-sheet in such forms as to show the exact position of the business at date of stocktaking. To dissect or summarise the subsidiary books.

The meaning and use of mercantile terms, *i.e.*, bills of exchange, shipping, insurance, joint stock company, &c. Joint stock company and partnership accounts.

The examination test will consist of (1) an examination in theory —candidates will be required to answer not more than four questions upon mercantile terms and definitions ; (2) the preparation of a trial balance to prove the accuracy of not exceeding twenty items ; (3) the preparation of an account of profit and loss, and a balance-sheet.

Business Methods and Commercial English.—

1. The writing of essays, having reference to commercial matters (*All examination candidates will be required to attempt an essay*).

2. The condensing of market reports into telegrams.

3. Indexing and precis writing.

4. The drafting of business letters, advertisements, and circulars, and the preparation of commercial forms and accounts, such as accounts current, account sales, foreign bills of exchange, statements of receipts and payments, &c.

5. Definition of commercial terms and phrases.

Examination Note.—In writing the letter and essay the candidate should endeavour to be clear and to the point, and should use simple English, without waste of words, and without faults of grammar.

Shorthand (Speed).—

Instruction will be given in the special principles of abbreviation, phrasing, intersection, &c., set forth in the " Reporter " (Instructor, pt. 2), and dictation of a great variety of matter relating to commerce, politics, science, religion, &c., will be given at rates varying from 50 to 150 words per minute. For Examination the Student may take one of four tests :—3 minutes at 60, 80, or 100 ; or 4 minutes at 120 words per minute ; and the following points will be specially noticed :—(1) Shorthand note. (2) Accuracy of transcription. (3) Spelling and punctuation. (4) Reasonable neatness. *The main consideration, however, will be accuracy in the transcript.*

Typewriting.—

The syllabus is shown by the examination test, which will comprise the following items in addition to those specified in the Junior Grade syllabus :—

(1) Typing appropriate replies to given letters.
(2) Questions on correct forms of address.
(3) Punctuating, paragraphing, and capitalising a passage.
(4) Typing of meanings of abbreviations.
(5) Typing from badly spelled, unpunctuated, abbreviated, and confused manuscripts.
(6) Questions on duplicating processes.
(7) The display of titles and headings.
(8) Typing an invoice or statement from printed or manuscript copy.

NOTE.—Accuracy and neatness being of the greatest importance *the quality of the work will be noticed, rather than the speed.*

English.—

Parsing and analysis of simple, compound, and complex sentences, composition on historical, geographical, or general themes, figures of speech, sentence formation, and correction of common errors in English.

French.—

The elementary rules of accidence and syntax, translation and retranslation, reading of prose selections and an easy prose author, practice in conversation.

Mathematics.—

In addition to the First Year Syllabus, the following :—

1. *Algebra.*—Greatest Common Measure and Least Common Multiple. Fractional expressions. Square Root. Quadratic Equations and Problems producing them.
2. *Geometry.*—Areas ; the Right Angled Triangle ; Elementary Geometry of the Circle ; Trigonometrical Functions of the Common Angles.

FEES.

Commercial Subjects.

	Session.	Term.
	£ s. d.	£ s. d.
Full Course	5 5 0 ..	1 17 6
Short Course	3 15 0 ..	1 7 6
Special Course	3 3 0 ..	1 2 6
Three Subjects	2 12 6 ..	0 18 6
Two Subjects	1 15 0 ..	0 12 6
One Subject	1 1 0 ..	0 7 6

The Session commences on Monday, September 26th, 1910, and consists of Three Terms :—

Winter Term—September 26th to December 22nd, 1910.
Spring Term—January 10th to April 13th, 1911.
Summer Term—April 18th to July 6th, 1911.

Textbooks, &c.

Note.—Before obtaining these books, students should ascertain from the teachers if others in their possession may be used.

	Net price. s.	d.
Algebra—"Elementary Algebra," by BAKER & BOURN—(*Bell*)	2	3
or HALL & KNIGHT	3	5
Arithmetic (Commercial)—"Commercial Arithmetic," by PENDLEBURY & BEARD—(*Bell*)	1	11
Bookkeeping, 1st Year—"Primer of Bookkeeping," by THORNTON—(*Macmillan*)	0	9
Easy Exercises, by THORNTON—(*Macmillan*) ...	0	9
MSS. Books	1	0
Bookkeeping, 2nd Year—"Student's Complete Commercial Bookkeeping," by FIELDHOUSE—(*J. W. Bean*) ...	3	0
Business Methods, &c.—		
"Student's Business Methods," by FIELDHOUSE—(*J. W. Bean*)	1	11
"Vere Foster's Civil Service Copy Book," 12 medium—(*Blackie*)	0	2
1st Year—Facsimile Commercial Forms—Home Trade—(*Macmillan*)	0	6
2nd Year—Facsimile Forms—Export Trade—(*Macmillan*)	1	0
English—"Matric. English Course"—(*Univ. Tutl. Press*) ...	2	8
French—"Hossfeld's French Course"—(*Hirschfeld Bros., Ltd.*)	2	3
Geometry—"School Geometry," Parts I.-IV. by HALL & STEVENS—(*Macmillan*)	2	3
Shorthand (Theory)—"Pitman's Instructor," Part I. ...	1	2
„ (Theory and Speed)—"Hallet & Machin's Commercial Exercises"	0	9
„ (Speed)—"Pitman's Instructor," Part II... ...	1	6
Typewriting—"Morton's Manual of Typewriting, &c."—(*Pitman's*)	1	11

Also Exercise Books, &c., as directed.

School of Agriculture.

School of Agriculture.

SESSION 1910-1911.

The Agricultural School is carried on by the Council of the Harris Institute, by arrangement with the Lancashire County Council, as part of the County Scheme of Instruction in Agriculture.

The School is open to all, and Students resident within the Administrative County of Lancaster are given free instruction, and receive in addition a maintenance allowance while in attendance at the School.

County Students seeking admission, should, in the first instance, apply for particulars to the Director of Education, County Offices, Preston.

External Students should apply to T. R. Jolly, Principal of the Institute.

The *Session* commences on Tuesday, September 27th, and consists of two terms.

First Term—From Tuesday, September 27th to December 22nd, 1910, about 13 weeks.

Second Term—From Tuesday, January 10th to April 7th, 1911, about 13 weeks.

Rules of Discipline.

Students are required to attend punctually and regularly the classes for which their names are entered, and are expected to satisfy the Lecturers with their diligence and progress in the prescribed class work.

The Principal of the Institute is responsible for the attendance and discipline of the Students, and leave of absence from any class must be obtained from him. In the case of absence without leave, a written explanation must be sent to him.

All Students are required to take the Terminal Examinations in the classes which they attend.

The Courses of study taken by Students holding Scholarships must be approved by the Director of Education.

Students are required to provide themselves with the Text Books used in the classes which they attend.

Students who do not live with their parents or guardians are required to reside in approved apartments or lodgings, a list of these being kept at the Office of the Institute. Students may, however, apply to the Secretary for approval of any house at which they desire to stay. Removals cannot be made during a Session without reporting the matter to the Principal for his approval. At the end of each term, reports as to conduct, regular hours, &c., of the Students will be obtained from the housekeeper at whose house the Student resides, such reports being submitted to the Agricultural Committee for their consideration.

FEES.

The Fees for *external* Students not resident within the Administrative County of Lancaster are—

For Full Course :—

£10 10 0 per Session.
£5 5 0 per Term.

Terms for *Single Subjects* may be had on application to the Principal.

Approved students *resident within* the Administrative County are admitted free, and in addition receive a maintenance or travelling allowance of not exceeding ten shillings per week, during the Session.

All Fees are payable in advance.

STAFF:

Lecturers :

Agriculture	THOMAS MILBURN, Ph.D. (Halle), N.D.A., N.D.D. R. C. GAUT, M.Sc., N.D.A., N.D.D. A. W. PATTEN, B.Sc., N.D.D.
Dairy Farming	A. W. PATTEN, B.Sc., N.D.D.
Chemistry	R. H. JONES, M.Sc., F.I.C., F.C.S.
Agricultural Chemistry	ALLAN BAGULEY, B.Sc., F.I.C.
Agricultural Bacteriology and Zoology	A. W. PATTEN, B.Sc., N.D.D.
Agricultural Botany and Geology	J. HARRISON, A.R.C.Sc. (Lond.).
Building Construction	F. J. PYE, A.B.I.C.C., (Medallist).
Veterinary Science	C. BLACKHURST, M.R.C.V.S.
Land Surveying	F. E. DIXON, A.M.I.C.E.
Engineering and Mechanics	G. E. GITTINS, A.I.E.E. E. C. MOYLE, A.R.C.Sc. (Lond.) F. W. WALKER, 1st Dip.M.E.
Physics	G. E. GITTINS, A.I.E.E.
Mathematics	J. T. CORKILL, B.A., Inter.B.Sc.
Mensuration	R. C. GAUT, M.Sc., N.D.A., N.D.D.
English	F. W. JACKSON, B.A.
Bookkeeping	V. E. COLLINGE, A.C.I.S., F.Inc.S.T.
Drawing	A. R. GLADWELL, A.R.C.A. (Lond.).
Woodwork	S. RUTTER.
Cookery	Miss AMELIA SEED.

Principal and Secretary :
T. R. JOLLY, F.C.I.S.

SYLLABUS OF CLASSES.

1.—For Students taking the First Winter Course.

AGRICULTURE.

Soils : Introductory considerations involved ; origin ; soil and subsoil ; value of constituents — sand, clay, chalk, humus ; texture ; capacity for water ; surface tension and capillarity ; percolation and drainage ; movement of water—effects of drainage and tillage operation ; causes affecting temperature ; important chemical constituents—nitrogen, phosphoric acid, potash, lime ; dormant and available constituents ; living organisms—bacteria, nitrification and denitrification ; fertility and sterility, liming, marling.

Rotations of Crops : Principles ; different methods of cropping ; circumstances determining which crops should be grown—soil, climate, markets, labour, &c. ; intensive culture ; bare fallows.

Pastures and Meadows : Herbage—clovers, grasses, and miscellaneous plants ; brief description of best grasses and clovers, &c. ; laying down of land to grass—seeding and general management.

Insects : What an insect is ; metamorphoses—egg, larva, pupa, imago ; explanation of terms—grub, maggot, caterpillar ; mode of life of insects, useful and injurious forms ; description and life history of some common insects.

Farm Demonstrations : Special points of a practical kind, bearing on the above, are considered and explained.

BOTANY.

Anatomy.—The general facts relating to flowering plants so far as can be seen without a microscope; the root, stem, leaf, and flower ; their relations to one another and comparison of their various parts.

Histology.—Structure of the vegetable cell, characters of cell-contents ; the minute parts of the plant generally, and their arrangement in stems, roots, leaves, and flowers.

Physiology.—Nutrition : foods used by plants ; their various sources, and the methods by which they are assimilated.

Respiration : The utilisation of oxygen and the evolution of carbon dioxide.

Photo-synthesis : The converse of respiration, and the production of sugar and starch in the green parts of plants.

Transpiration : Passage of water from roots to leaves, and thence to the atmosphere.

Movements of Protoplasm : Rotation and revolution of the living matter in cells.

Fertilization : Fusion of generating nuclei and the production of seed.

Systematic Botany.—Outlines of classification; methods of comparing plants; characteristics of some of the more important natural orders of plants.

Practical Work.—Examination of typical plants and parts of plants; also occasional field demonstrations.

CHEMISTRY.

Weights and measures—Lengths, areas, volumes, and weights; English and metric systems.

Density and specific gravity.

Heat and temperature; thermometers.

Atmospheric air; barometric pressure; Boyle's law; Charles' law; diffusion of gases.

Oxygen and nitrogen; burning.

Water—its composition; natural waters; hard and soft waters; solution and solubility.

Fire, flame, and fuel; wasteful action of common grates.

Acids, alkalies, and salts; ammonia, quick lime, slaked lime, lime water.

Carbon, carbon monoxide, carbon dioxide.

Properties of some common materials used in the arts.

Metals—Iron, copper (brass), lead, silver.

Blue, green, and white vitriols; alum.

Coal gas and its manufacture; cost of coal gas as fuel; reading of the gas meter.

Petroleum—Its sources and composition.

Properties of materials of organic origin important in food or in domestic use.

Different types of carbon compounds; acetic acid, vinegar; fats and oils, soaps, glycerine; sugar and sugars, starch; gluten and albumen, spirit of wine.

COOKERY.

Lessons on the following principles, illustrated by suitable dishes:—Stewing, baking, boiling, frying, grilling, steaming, egg-cookery, batters, reheating of cold meat, preservation of foods, invalid foods, principles of dietaries, vegetable foods, cheese-cookery, pastry, buying and choice of food, &c.

Lessons to be combined demonstration and practice, and worked out on scientific lines.

DRAWING.

Model Drawing.—The cube, square, prism, triangular prism, cylinder and cone in simple positions, both above and below the level of the eye; drawing common objects similar in construction to the models named above, both from actual objects and from memory; making perspective drawings of objects from plans and elevations.

Geometry—Plain and diagonal scales; problems relating to areas; plans and elevations of simple solids; alteration of ground line.

ENGLISH.

Writing from dictation of passages from newspapers.

Sentence forming and correction of common errors.

The elements of English Grammar, including easy parsing and analysis.

The writing of letters (social and business).

Essays on subjects of general interest, together with easy paraphrase of passages of verse and prose.

The recognition of simpler figures of speech.

MATHEMATICS.

Arithmetic.—Principles of arithmetical operations applied to whole numbers and vulgar and decimal fractions ; the metric system ; approximations ; averages ; contracted multiplication and decimals ; use of logarithmic tables ; square root.

Algebra.—Addition, subtraction, multiplication, division ; numerical substitutions ; factors ; simple equations and problems producing them ; fractions ; graphs.

Geometry.—Angles and parallels ; triangles ; parallelograms ; problems ; loci.

MENSURATION.

General measurements relating to lengths and areas—The foot, link, chain, acre, metre, and are.

Measurement of lengths and areas—Triangle, parallelogram, irregular quadrilateral, circle.

General measurements relating to solids—The foot, pound, gallon, gramme.

Measurement of solids—Parallelopiped, prism, cylinder, pyramid, cone, prismoid.

WOODWORK.

The lessons in woodwork will be associated with drawing.

The Course will include descriptions of the more common kinds of woods, and the purposes for which they are best adapted ; instruction in the use and care of tools ; graduated exercises in bench work, dealing with the principles of construction of farm appliances.

II.—For Students taking the Second Winter Course.

AGRICULTURE.

Draining.—Indications that land requires draining ; methods of draining ; advantages of draining.

Irrigation.—Methods of irrigation ; advantages and disadvantages ; sewage irrigation.

Warping.—Description of the process ; cropping of warp land.

Manuring.—General principles : Farmyard manure, its production, management, storage, composition, properties, and application ; town stable manure and its purchase ; green manuring, its applicability to farm practice ; artificial manures, their sources, composition, properties, and application ; the unit system of valuation ; valuation of compound manures.

Crops and Catchcrops.—Ordinary crops of the rotation, their history and geographical distribution; preparation of the land; manuring; sowing; summer treatment; harvesting and utilisation; cost of production of typical root and corn crops, and valuation of the produce.

Special crops of the rotation and brief description of their history, geographical distribution, cultivation, and uses.

Catchcrops: Their applicability to farm practice.

Insect and fungoid attacks.

Weeds.—Principal weeds of the farm, their identification and suppression.

Seeds.—Identification of the seeds of crops dealt with during the course.

Farm Stock.—Breeds common in Lancashire—brief description of points, selection.

Breeding.—Principles involved; rearing; general management.

Feeding.—Rules to be observed; characteristics of the various foods; rations for different classes of stock; considerations to be borne in mind when purchasing food; home-grown and purchased foods; practical details.

Farm Demonstrations.—The more practical points arising out of the above are dealt with on the Farm.

BOOKKEEPING.

The making out of ordinary business forms, order notes, invoices, credit notes, statements, cheques, and receipts; the use of the subsidiary office books, petty cash, wages, and stock books.

The keeping of purchases, sales, and return day books, cash book (with three columns for cash, bank, and discount), waste book, and journal.

The ledger and the posting of simple transactions to personal and impersonal accounts.

The preparation of a trial balance, an easy profit and loss account, and a balance sheet.

The meaning of simple business terms and abbreviations.

BOTANY.

The Course will be mainly occupied with a fuller treatment of the subjects enumerated in the syllabus for the First Winter Course, with the addition of the following:—

Anatomy.—Modifications undergone by different kinds of stems, roots, leaves, and flowers, enabling them to function as storage, protective, climbing, or attracting organs; cladodes, bracts, prickles, thorns, spines, and flattened stems.

Kinds of fruits—true fruits and pseudocarps; inflorescences; various kinds of seeds; growing points, and origin of roots and shoots; stomata and lenticels.

Physiology.—Twining and climbing of plants with reference to irritability and the purposes served by them; ascent of sap; the absorption of water; movements of water in the plant; turgescence, and the mechanical action of the guard-cells of stomata; plants and their environment; effects produced by light, heat, soil, air, and moisture; development of plants; reproduction by spores, seeds, and cuttings; the germinating power of seeds; what germination is; self and cross pollination and fertilization; fall of the leaf.

Classification.—Crops and weeds; ephemerals, annuals, biennials, and perennials; herbaceous and woody; herbs, shrubs, and trees; scientific classification of plants into natural orders. More particular attention will be given to the common grasses and such plants as constitute our chief farm crops and weeds.

Practical Work.—Microscopic examination of prepared sections of all parts of flowering plants; examination of prepared sections of all parts of flowering plants; examination of hard specimens for winter buds, lenticels, phyllotaxis, inflorescence, &c.; examination of the common kinds of grasses; classification of plants. Occasional field or open-air demonstrations will be given.

CHEMISTRY.

Chemical changes distinguished from temporary physical changes.

Indestructibility of matter.

Properties of gases; air; relation of air to flame and combustion generally; composition of the atmosphere.

Preparation and properties of oxygen and nitrogen; hydrogen; water.

Laws of chemical combination; law of definite proportions by weight; law of multiple proportions; law of volumes; equivalents; connection between equivalent and atomic weight.

Mixture and combination distinguished.

Chlorine and hydrogen chloride; atomic theory.

Carbon and its compounds with oxygen.

Sulphur and its compounds with oxygen and hydrogen.

Acids: General properties; characteristic properties of hydrochloric, sulphuric, and nitric acids.

Properties of a few common sulphates, chlorides, nitrates, and carbonates.

Nitrogen, and its compounds with oxygen and hydrogen, nitrous oxide, nitric oxide, ammonia.

General characters of the metals; general preparations of salts.

Practical Work.—The effects of heat, water, and acids upon various substances ; if a gas is evolved, the identification of such gas ; recognition of materials which have been exhibited upon the lecture table, and the properties of those which have been demonstrated, *e.g.*, sulphur, iodine, charcoal, manganese dioxide, potassium chlorate, nitre, sal ammoniac, &c. ; quantitative experiments of a simple kind ; determination of equivalents ; percentage of carbon dioxide in a carbonate ; standard acid and alkali.

GEOLOGY.

General introduction to the various branches of the subject in order to indicate their inter-relationships.

Objects of the science ; its application to other studies, and to the industries of agriculture, engineering, mining, and metallurgy.

Crust of the earth.

General physical characters, such as colour, hardness, lustre, crystallographic form, &c., and the chemical composition of the commoner rock-forming and other minerals.

Rocks, and their classification into aqueous, igneous, and metamorphic clays, limestones, sandstones, shales, &c., with their characters and modes of formation ; mineral veins and lodes ; changes to which rocks are subjected ; stratification and upheaval ; fissility ; cleavage ; jointing ; folding ; and faulting.

Action of the atmosphere, springs, streams, and ocean on rocks ; and the general weathering of rocks and formation of soil.

Principles of palæontology, and the identification of strata by means of the fossils which they contain ; movements in the crust of the earth ; changes in climate as shown by changes in the life-forms.

Geological maps and sections ; faults, overlaps, and unconformability of rock-layers ; general distribution of the various formations or deposits in the British Isles.

Economic products of the various formations, such as coal, slates, limestones, salts, ores, building stones, and mineral manures.

The Student will have access to a good collection of minerals, rock-specimens, and many of the more characteristic fossils ; to maps illustrating more particularly the geology of Lancashire, and general maps for the British Islands.

MATHEMATICS.

Arithmetic.—Contracted methods ; use of logarithmic tables, percentages ; interest ; profit and loss ; stocks and shares ; ratio and proportion.

Algebra.—Factors ; greatest common measure and least common multiple ; fractional expressions ; square root ; quadratic equations and problems ; graphs.

Geometry.—Areas ; the right angled triangle ; the circle ; chords, tangents, angles, the trigonometrical functions of the common angles.

MECHANICS.

Dynamics.—Units of length, mass, time; velocity, uniform and variable; acceleration; motion due to gravity; Newton's laws of motion.

Statics.—Force; representation of forces by means of straight lines; parallelogram of forces; triangle of forces; resolution of forces; equilibrium of forces; moment of a force; principle of moments; like parallel forces; unlike parallel forces; centre of gravity; centre of gravity of a uniform rod; work; power; study of simple machines.

MENSURATION.

Revision of the work done during the previous Winter Course. Calculation of problems relating to practical Agriculture.

In addition, the following will be dealt with:—Similar plane figures; the sphere; similar solids; velocity of water; rainfall.

VETERINARY SCIENCE.

Structure of the Body.—Situation of the various organs; differences between the horse and other farm animals.

Conditions on which Health depends.—Air, food, water, general sanitation.

Respiratory System.—Lungs; circulation of the blood.

Digestive System of the Horse.—Alimentary canal; process of digestion.

Digestive System of the Cow.—Comparison with that of the horse.

Foot of the Horse.—Structure; principles of shoeing.

Dentition.—How to determine the age of the horse, cow, and sheep by their teeth.

First Aid to Injured Animals.—Treatment of wounds, bruises, and sprains, bleeding, &c.

Demonstrations.—Proper methods of handling and approaching animals; administration of medicines; making proper beds for sick animals; application of bandages.

III.—For Students taking the Third Winter Course.

AGRICULTURAL BOTANY.

Morphology.—The structure of plants; the principles of classification; the natural orders (phanerogams and cryptogams) dealing specially with those of importance to the agriculturist.

Physiology.—The life of the plant; organs and their functions—nutritive and reproductive.

Pathology.—Diseases of plants, and their causes; parasites—phanerogams, fungi, bacteria; prevention and cure.

Cultivation.—Conditions in plant life favourable to (*a*) the improvements of cultivated plants, and (*b*) the destruction of weeds; new varieties of plants; pastures; pruning.

Practical Work.—Preparation and examination of sections of the various parts of plants; examination of seeds of crops, weeds, dry and growing specimens of plants; preparations of common fungoid diseases.

GENERAL CHEMISTRY.

Chemical Physics.—Matter and energy—pure and mixed matter—methods of separating mixtures—simple and compound substances—kinetic and potential energy—transformation and conservation of energy.

The solid, liquid, and gaseous states of matter and the phenomena accompanying change of state.

Heat—the measurement of heat—thermometers—calorimeter—the effects of heat and pressure on gases.

Gaseous diffusion—vapour tension—the barometer.

Mass and weight—the balance—specific gravity—density—hydrometry.

Metric system of weights and measures.

Inorganic Chemistry.—The chief elements found in the commonest forms of matter.

The atomic theory—molecular condition of matter, atomic and molecular weights.

Chemical combination—symbolic notation—equations.

Hydrogen—its compounds with chlorine, oxygen, nitrogen, and carbon.

Oxygen—oxidation—combustion—respiration.

Water—natural waters—their impurities and purification.

Acids—bases—salts.

Carbon—its compounds with oxygen, sulphur and nitrogen.

Nitrogen—nitric acid—nitrates—and nitrites.

Sulphur—sulphides—sulphuric and sulphurous acids—sulphates.

Chlorine—bromine—iodine. Chlorides—chlorates—chloride of lime, bleaching.

Phosphorus—phosphates—superphosphate.

Silica—silicates—arsenic.

Metals—ores—general metallurgic processes.

Alkalies—chief alkaline salts—alkalimetry—acidimetry.

Lime—the chief lime compounds.

Magnesium, zinc, iron, lead, copper, mercury, silver, and their technically important salts.

Organic Chemistry.—Distillation of coal and wood—nature of chief products.

Hydrocarbons—paraffins—olefines and their chief oxidation products—alcohols, aldehydes, acids.

Fermentations—alcoholic, acetic, lactic, butyric.

Carbohydrates—sugars, starch, cellulose, dextrine, gums.

Fats—glycerol—saponification. Benzine—phenol.

Tartaric, citric and other common vegetable acids.

Amines and amides—urea. Proteids, peptones, gelatine, &c.

Practical Work.—Qualitative analysis of mixtures containing not more than four salt radicles, positive or negative ; volumetric analysis—use of standard acid and alkali, potassium permanganate, and silver nitrate ; quantitative experiments of a more advanced kind.

GEOLOGY.

Lectures.—Chief minerals entering into the composition of rocks; origin and composition of aqueous and igneous rocks ; general principles of the classification of rocks ; leading divisions of the stratified rocks, and their geographical distribution in the British Islands.

Stratification, cleavage, and faulting of rocks.

Influence of the geological structure of a country on the configuration of the land and the composition of the soil ; relation of strata to water supply and drainage ; origin of springs.

The various mineral manures, their sources, characters, and mode of occurrence.

Different kinds of building stones and road materials ; distribution of the various economic substances.

Practical Work.—Examination of hand and microscopic specimens and preparations of fossils, minerals, rocks, &c. Drawing of longitudinal and horizontal sections from data obtained from ordnance and geological maps ; occasional field demonstrations.

MENSURATION AND LAND SURVEYING.

Ordinary rules of superficial and solid mensuration ; volume of a prismoid ; applications to practical questions ; estimation of weights of bodies whose dimensions and specific gravity are known.

Land surveying by chain ; plotting from field book, and determination of areas surveyed ; the simpler " field problems."

The use and adjustment of instruments employed in surveying and levelling.

Levelling and plotting from field book.

A sufficient knowledge of trigonometrical surveying for the determination of heights and distances by theodolite ; as essential to this, solution of plane triangles by the aid of logarithmic tables.

A knowledge of the various classes of maps published by the Ordnance Survey Department, and their scales.

AGRICULTURAL ZOOLOGY.

The part played by common animals in helping or hindering agricultural operations, as illustrated by moles and voles, insectivorous and other birds, snails and slugs, useful and injurious insects, arachnids and myriopods, earthworms, &c.

General Structure of Insects, especially the external characters.

Life-history of Insects.—Various forms of larvæ ; economic importance of different stages.

Classification of Insects.—The general characters of the following natural orders : Coleoptera, lepidoptera, hymenoptera, diptera, hemiptera, orthoptera, neuroptera.

Acarina, injurious to food crops and live stock.

Parasitic Worms.—Flukes, tapeworms, and threadworms.

Preventive and Remedial measures in regard to insects, acarines, and worm parasites, *e.g.*, farm practice in relation to the discouragement of insect attack ; encouragement of insect-eating birds and animals ; artificial remedies ; insecticides ; treatment for parasites.

Practical Work.—Typical worms, insects—useful and injurious—acarines, slugs, birds, &c., will be studied.

IV.—For Students taking the Fourth Winter Course.

AGRICULTURE.

Soils.—Classification of soils ; characters and composition ; suitability for cultivation.

Improvement of Soil.—Drainage, irrigation and warping ; the application of lime, marl, clay, ashes, &c.

Rotations.—The principles of rotations ; rotations suitable for different soils and climates—systems of farming.

Manures.—The properties of manures—general and special ; amounts used per acre ; period and mode of application ; treatment and disposal of sewage.

Food-stuffs.—The properties of feeding substances ; their suitability for different classes of farm stock—considerations affecting their use—rations for different classes of stock.

Crops.—Farm crops (cereals, agricultural grasses and clovers, forage plants and roots) ; how they grow—their cultivation, including cleaning, harvesting, and storage—diseases—insect injuries and remedies.

Weeds and Parasitic Plants.—Best methods of eradication.

Pests of the Farm.—Injuries to crops and live stock of the farm due to mammals, birds, and insects, with their prevention and remedies.

Weather.—Meteorology, or the effect of climate on farming conditions.

Live Stock.—The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, pigs, and poultry—their characteristics—the districts where they are generally met with.

Machinery.—The uses and prices of the machines and implements used in farming in different parts of Great Britain.

Buildings.—Buildings required on different classes of farms in various districts.

Farming Capital.—Calculations of the cost of stocking and working arable and stock farms ; farm valuations ; rent, taxes, and cost of labour.

Farm Demonstrations.—Demonstrations are held at intervals during the Session, at the County Council Farm, and at other farms, having features of special interest; live stock is also studied at the Auction Mart, Preston.

BACTERIOLOGY.

(*Before Christmas.*)

Bacteria.—Their nature, forms, conditions of life; artificial cultivation; pure culture; mounting and staining.

Bacteria in Air and Water.—Variation in numbers; the contamination of water; water as a carrier of disease; estimation of bacteria in air and water.

Bacteria in the Soil.—Transformations of carbon and nitrogen—nitrification and denitrification; bacteria and their relation to the higher plants.

Parasitic Bacteria.—Bacteria as the causes of disease; anthrax; tuberculosis; vaccination; resistance against bacteria.

Bacteria in Dairy Products.—Useful and injurious bacteria found in milk, butter, and cheese; fermentation and its control; Pasteurization and sterilization of milk.

DAIRY FARMING.

(*After Christmas.*)

The Dairy Farm.—Situation; soil; water supply; buildings; pastures and meadows; rotation crops.

The Dairy Cow.—Points of a good dairy cow; comparison of breeds; rearing young stock; selecting; drafting; feeding—summer and winter; home-grown and purchased foods.

Milk.—Composition; variations in composition; milking—hand and machine; management of milk; cleanliness; cooling; milk tests and records.

Disposal of Milk.—New milk; cream; cheese; butter; sale of milk regulations.

Composition and Utilization of Dairy By-Products.—Skim-milk and separated milk; butter-milk; whey.

Equipment of Farm and Dairy, &c.—Stock required; utensils; cost; approximate return from a dairy farm.

AGRICULTURAL BOOKKEEPING.

Principles of book-keeping; single and double entry; opening books, description of subsidiary books, with examples of entries therein; the ledger; posting; preparation of trial balance; valuation of stocks and effects; closing and proving the books preparation of profit and loss account and balance sheet; ruling off accounts.

Application of four special methods to farms of varying requirements ; apportionments of rents, &c. ; bad debts ; banking ; bills of exchange (inland) ; capital accounts ; consignments ; depreciation ; discount ; expenditure—capital and revenue ; goodwill ; house expenses ; improvements ; income tax ; insurance ; interest ; leases ; partnership accounts ; petty cash ; repairs and renewals ; withdrawals.

BUILDING CONSTRUCTION.

Properties, qualities, supply, price, &c., of the commoner materials used in constructing farm buildings.

Drawing exercises ; plans, elevations, and sections.

Construction of farm buildings, foundations, walls, roofs, &c.

Ventilation, lighting, and drainage.

AGRICULTURAL CHEMISTRY.

Soil.—The origin, formation, and classification of soils ; the constitutents of soils ; the supply of plant-food by the soil ; the chemical and physical properties of soils of different kinds ; the adaptation of soils to particular crops ; the relations of air and water to soils ; nitrification and the biology of the soil ; the chemical and physical effects of tillage operations and drainage ; the improvement of soils ; causes of infertility ; mechanical and chemical analysis of soils.

Plant-life.—The constitutents of plants ; the relations of atmosphere, rainfall, heat, and light to vegetation ; the sources of plant-food.

Manures.—The supply of plant-food by manure ; the improvement of the soil by manuring ; the classification of manures as regards their composition, nature, and use ; the manures in general use upon the farm ; farmyard manure and other natural manures ; green-manuring ; liming, marling, claying ; artificial manures, their origin and manufacture ; the changes which manures undergo in the soil ; the influence of drainage ; the application of manures ; the analysis of manures ; the adulteration of manures.

Crops.—The composition of the principal farm crops ; characteristics of particular kinds of crops ; the influence of climate and season ; the manuring of particular crops ; the changes that take place during the various stages of their growth ; rotation of crops.

Foods.—The constitutents of foods, and their functions ; the nutritive value and digestibility of foods ; the chemical composition and use of the principal feeding-stuffs employed on the farms and the sources of their supply ; the main facts regarding respiration and digestion ; the relation of foods to the production of work, meat, milk, and manure ; the adaptation of food to special requirements ; the residual manurial value of foods, and the circumstances affecting it ; the estimation of unexhausted fertility ; analysis and adulteration of foods.

Water.—Rain-water; hard and soft waters; drinking-waters; irrigation and sewage.

Dairying.—The composition of milk, and the conditions which influence its quality and supply; cream and cream-separation; butter and butter-making; cheese and cheese-making; the influence of ferments on milk and milk products; the preservation of milk; milk-testing.

Practical Work.—Quantitative analysis by gravimetric methods; volumetric analysis; analysis of water, milk, butter, cheese, manures, feeding-stuffs, and soils.

AGRICULTURAL ENGINEERING.

Heat.—Specific heat, latent heat, the unit of heat; total heat of water: as ice, water, and steam; conduction, convection, and radiation of heat; mechanical equivalent of heat; principle of combustion; quantity of heat generated by combustion; modes of transforming heat of combustion into power, as in the steam engine, and in gas and oil engines.

Air.—Properties of air, elasticity, density; barometer; moisture; movement; winds; windmills.

Water.—Composition, impurities, weight; height of column to balance atmosphere; flow of water; friction of water in pipes and channels; usual speed of flow; power derived from falls of water; water-wheels; turbines; water-pressure engines; pumps; potable water; sources of supply; means of purification; storage.

Mechanics.—Centre of gravity; stability of structures; the lever; toothed wheels; pulleys and ropes; wrapping connectors; winches; differential pulleys; laws of motion; strength of materials, tensile, compressive, torsional, and transverse; elastic limit; ultimate strength; horse-power; animal and human power; friction of surfaces and axles; lubrication.

Steam Engine.—Construction of an ordinary portable-engine boiler and of a Cornish boiler, and its setting; fittings of a boiler; construction of the stationary and portable steam engine; single cylinder; double cylinder; compound; steam and fuel consumed per horse-power.

Gas and Petroleum Engines.—Principle of action; sources of loss; fuel and water required per horse-power.

Electrical Generators, Motors, and Conductors.—Principles of action; losses in electrical machinery; efficiency; detection of faults; use of fuses and cut-outs; horse-power of motors; Ohm's law.

Construction of Agricultural Implements.—The mode of action and the general principles involved in the construction of farm implements; the adjustments of implements for different descriptions of work; lubrication of implements for different descriptions of work; lubrication; working or wearing parts.

VETERINARY SCIENCE.

Lectures.—Anatomy and physiology, including the comparative anatomy of the bones of the animals of the farm, and the structure and functions of the different organs and tissues of the horse, ox, sheep, and pig.

The digestive processes and principles of nutrition in the above animals.

A general knowledge of the blood and its circulation, and the processes of respiration, secretion, and excretion.

The physiology of reproduction, and its bearings on healthy breeding.

The period of gestation in the mare, cow, ewe, and sow, and the special management of these animals prior to, at the time of, and after, parturition.

The management of farm stock in health and disease.

Demonstrations.—During the session students will visit the abattoir and farms for special instruction.

SCHOOL COURSES.

First Winter Session.

The first winter's Course is of a preparatory character, leading to the more specialised work of the following year; it also prepares Students for the Junior Agricultural Exhibition Examinations of the Lancashire Education Committee.

Second Winter Session.

The second winter's Course constitutes the Junior Course in Agriculture and the Allied Sciences This Course affords suitable preparation for the Senior Agricultural Exhibition Examinations of the Lancashire Education Committee.

Third Winter Session.

The third winter's Course deals with the subjects of Part I. of the Examination for the National Diploma in Agriculture. This Course also provides preparation for the Junior Agricultural Scholarship Examinations of the Lancashire Education Committee.

Fourth Winter Session.

The fourth winter's Course deals with the subjects prescribed for Part II. of the Examination for the National Diploma in Agriculture, and is arranged to provide preparation for that Examination, as well as for the Senior Agricultural Scholarship Examinations of the Lancashire Education Committee.

SHORT COURSES IN AGRICULTURE.

This Course, which comprises two winter Sessions, is suitable for those who are not in a position to devote four winters to the study of Agriculture and the Allied Sciences, but who wish to gain a working acquaintance with the general principles underlying Agricultural operations.

TIME TABLES OF AGRICULTURAL CLASSES.

Course for Diploma.

FIRST WINTER SESSION.

Hour.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
a.m. a.m. 9-30 to 10-30	BOTANY	AGRICULTURE	AGRICULTURE (9-15 to 10-15)	AGRICULTURE	BOTANY
a.m. a.m. 10-30 to 11-30	MATHEMATICS	MENSURATION	WOODWORK (10-30 to 12-30) OR COOKERY (10-30 to 1-0)	MATHEMATICS	CHEMISTRY
a.m. p.m. 11-30 to 12-30	TUTORIAL CHEMISTRY	CHEMISTRY		MENSURATION	MATHEMATIC
p.m. p.m. 2-0 to 4-0	DRAWING	ENGLISH (2 to 3) MATHEMATICS (3 to 4)	HOLIDAY	*FARM DEMONSTRATION	ENGLISH GRAMMAR (2 to 3)

* In the event of the weather being unfavourable a lecture of an hour's duration will be given in the Class-room

SECOND WINTER SESSION.

Hour.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
a.m. a.m. 9-30 to 10-30	AGRICULTURE	GEOLOGY.	MATHEMATICS	GEOLOGY	CHEMISTRY
a.m. a.m. 10-30 to 11-30	CHEMISTRY	BOTANY	VETERINARY SCIENCE	PRACTICAL CHEMISTRY	AGRICULTURI
a.m. p.m. 11-30 to 12-30	MATHEMATICS	AGRICULTURE	AGRICULTURE		MENSURATIO
p.m. p.m. 2-0 to 4-0	*FARM DEMONSTRATION	MATHEMATICS (2 to 3) MECHANICS (3 to 4)	HOLIDAY	AGRICULTURAL BOTANY	BOOKKEEPIN

* In the event of the weather being unfavourable a lecture of an hour's duration will be given in the Class-room

THIRD WINTER SESSION.

Hours.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
a.m. a.m. 9-30 to 10-30	*PHYSICS (9 to 10)	CHEMISTRY. (9 to 10)	CHEMISTRY	ORGANIC CHEMISTRY	TRIGONOMETR
a.m. a.m. 10-30 to 11-30	AGRICULTURAL GEOLOGY	AGRICULTURAL ZOOLOGY	PRACTICAL BOTANY	AGRICULTURAL ZOOLOGY	AGRICULTURA GEOLOGY
a.m. p.m. 11-30 to 12-30		AGRICULTURAL BOTANY		AGRICULTURAL BOTANY	AGRICULTURA ZOOLOGY
p.m. p.m. 2-0 to 4-0	PRACTICAL CHEMISTRY	MENSURATION AND LAND SURVEYING	HOLIDAY	MENSURATION AND LAND SURVEYING	PRACTICAL CHEMISTRY

* After Christmas Tutorial Chemistry will be taken instead of Physics.

FOURTH WINTER SESSION.

Hour.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
.m. a.m. -30 to 10-30	VETERINARY SCIENCE.	ENGINEERING (9-15 to 10-15)	VETERINARY SCIENCE	ENGINEERING (9-15 to 10-15)	VETERINARY SCIENCE
.m. a.m. 0-30 to 11-30	AGRICULTURE	AGRICULTURAL CHEMISTRY	AGRICULTURE	BOOKKEEPING	AGRICULTURE
m. p.m. 1-30 to 12-30	PRIVATE STUDY	AGRICULTURE	AGRICULTURAL CHEMISTRY		AGRICULTURAL CHEMISTRY
.m. p.m. 2-0 to 4-0	*BACTERIOLOGY AND DAIRYING, 2-0 to 3-0 p.m.	AGRICULTURAL CHEMISTRY	HOLIDAY	AGRICULTURAL CHEMISTRY	BUILDING CONSTRUCTION (2 to 3) ENGINEERING (3 to 4)

* Monday afternoons will also be utilized for Farm Demonstrations.

Short Course in Agriculture.

FIRST WINTER SESSION.

Hour.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
m. a.m. 30 to 10-30	BOTANY	AGRICULTURE	AGRICULTURE (9-15 to 10-15)	AGRICULTURE	BOTANY
m. a.m. 0-30 to 11-30	TUTORIAL CHEMISTRY	MENSURATION	WOODWORK (10-30 to 12-30) OR COOKERY (10-30 to 1-0)	MATHEMATICS	CHEMISTRY
m. p.m. 1-30 to 12-30	MATHEMATICS	CHEMISTRY		MENSURATION	MATHEMATICS
m. p.m. 2-0 to 4-0	DRAWING	ENGLISH (2 to 3) MATHEMATICS (3 to 4)	HOLIDAY	*FARM DEMONSTRATION	ENGLISH GRAMMAR (2 to 3)

In the event of the weather being unfavourable a lecture of an hour's duration will be given in the Class-room.

SECOND WINTER SESSION.

Hour.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
m. a.m. 30 to 10-30	AGRICULTURE	GEOLOGY	MATHEMATICS	GEOLOGY	CHEMISTRY
m. a.m. 0-30 to 11-30	MATHEMATICS	BOTANY	VETERINARY SCIENCE	PRACTICAL CHEMISTRY	AGRICULTURE
m. p.m. 1-30 to 12-30	CHEMISTRY	AGRICULTURE	AGRICULTURE		MENSURATION
m. p.m. 2-0 to 4-0	*FARM DEMONSTRATION	MATHEMATICS (2 to 3) MECHANICS (3 to 4)	HOLIDAY	AGRICULTURAL BOTANY	BOOKKEEPING

In the event of the weather being unfavourable a lecture of an hour's duration will be given in the Class-room.

Scholarships.

The Exhibitions and Scholarships offered by the Lancashire County Council are tenable at the School, and are open to all Students attending the Classes and are resident in the Administrative County.

Full particulars relating to the conditions of free admission to the School, and the Exhibitions and Scholarships offered by the County Council, may be obtained on application to the Director of Education, County Offices, Preston.

Prizes.

Prizes will be awarded to the Students on the results of the Terminal and Sessional Examinations.

Analytical Department.

Analyst, ALLAN BAGULEY, B.Sc., F.I.C., F.C.S.

The Chemical Department of the School is prepared to analyse and report on samples submitted to the Department for that purpose.

Care is taken to ensure the accuracy of any analysis, but no responsibility with regard to it is assumed.

On forwarding samples, *separate* letters should be sent specifying the nature of the information required, and, where possible, the object in view.

All samples for analysis, and all communications referring to analysis, must be addressed to T. R. Jolly, Principal and Secretary, Harris Institute, Preston, and endorsed "Analytical Department."

Separate letters should be sent specifying the nature of the information required, and, if possible, the object in view.

The Laboratory of the Institute will usually be closed during the month of August.

FEES.

Special Fees for Analysis payable by Farmers.

The following Fees for Analysis will be payable by Farmers residing in the County of Lancaster, provided that such Analysis and reports be required for *bona-fide* agricultural purposes, and for the private information only of the Farmer applying for them ; and they are not conducted for the use of manufacturers or traders.

In the event of any Analysis or report showing a manure or feeding stuff to be either impure or below the guarantee given by the purchaser, the latter is at liberty to show such report and Analysis to the vendor ; but if the material proves to be up to the guarantee given, the Analysis and report must *not* be communicated to either vendor or manufacturer.

No money value of a manure or feeding stuff will be assessed, but if the Farmer names the price charged, the cost of carriage, and any other items which influence the cost, the Analyst will say whether the material be worth the sum charged.

In the event of any report being misused, the Farmer shall be called upon to pay the ordinary Analyst's fee of one or two guineas.

List of Fees.

	£	s.	d.
1.—Determination of the percentage of Nitrogen in a Sample of Sulphate of Ammonia, Shoddy, Horn Dust, Dried Blood, or other Nitrogenous Manure ..	0	2	6
2.—An Analysis of a Sample of Nitrate of Soda	0	2	6
3.—Determination of the percentage of Soluble Phosphates in a Sample of Mineral Superphosphate or in any other Manure	0	2	6
4.—Determination of the percentage of Insoluble Phosphates in a Sample of Basic Slag (Thomas' Phosphate Powder), or in any other Manure.....	0	2	6
5.—Determination of the percentage of Soluble and Insoluble Phosphates in any Manure.....	0	3	6
6.—Determination of the percentage of Nitrogen, together with the Soluble *or* Insoluble Phosphate in any Manure (such as Bone Meal, &c.)	0	3	6
7.—Determination of the percentage of Nitrogen, together with the Soluble *and* Insoluble Phosphates in any Manures (such as Dissolved Bones, Compound Manures, &c.)	0	5	0
8.—Determination of the percentage of Potash in Sulphate or Muriate of Potash, &c.	0	2	6
9.—Determination of the percentage of Lime in Limestone or Marl	0	3	6
10.—Determination of the percentage of Lime, Magnesia, and Phosphoric Acid in Limestone or Marl	0	5	0
11.—Determination of the percentage of the essential constituents in a Feeding Stuff (Oilcakes, Meals, &c.)..	0	5	0
12.—A *Complete* Analysis of any Manure or Feeding Stuff ..... 10s. to	1	0	0
13.—A *Partial* Analysis of a Sample of Soil	0	10	0
14.—A *Complete* Analysis of a Sample of Soil	1	10	0
15.—Determination of the Hardness of a Sample of Water	0	3	6
16.—An Analysis of a Sample of Water to determine its suitability for domestic purposes	0	10	6
17.—Analysis of a Sample of Milk, Butter, or Cheese....	0	5	0

Note.—(1) Fees for other determinations will be given on application.

(2) All Fees must be paid at the time of sending the sample to the Principal, Harris Institute, Preston.

Instructions for Selecting and Sending Samples for Analysis.

Artificial Manures.

Take a large handful from several of the bags, break down any lumps with the hand, and mix the whole well together on a large sheet of paper. From the heap select six small portions of about 4 oz. each, and, after mixing these thoroughly together, put the mixture into a clean, dry, wide-necked bottle, with a well-fitting cork or stopper, or into a well-fitting clean tin box. Samples for analysis should upon no account be merely put up in paper.

Soils.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench vertical scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about one pound weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separately while being sent to the analyst, that he may examine them individually before mixing in the laboratory.

Waters.

The water should be sent in a perfectly clean Winchester quart bottle, made of clear glass, and with a well-fitting glass stopper, which is readily obtained at any chemist's shop, or the same will be supplied, ready for use, on application to the Principal of the Harris Institute—the carriage to be paid by the sender of the water. The sample bottle should be rinsed out twice with the water to be analysed before being filled. Well water should be allowed to run for some time before the sample is drawn. Standing water from cisterns, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, about four inches below the surface. Spring or stream water should be sampled in dry weather, by immersion, if possible ; but, if not deep enough for that, a perfectly clean cup or glass should be used for transferring the water to the bottle. When the bottle has been filled, the stopper should be rinsed in the water before being replaced, after which it is to be securely tied down and sealed. For determination of the degree of hardness only one quart wine bottle of the water is required; this bottle must also, of course, be perfectly clean.

N.B.—Samples should be dated and despatched to the laboratory immediately after being taken.

It ought to be unnecessary to add that the water supply of every farm should be above suspicion.

Limestone, Marls, Ironstones, and other Minerals.

Whole pieces, weighing from 4 to 8 oz., should be sent. These may be enclosed in small linen bags or wrapped in paper if there is no tin at hand.

Oil Cakes.

Take three slips (of the entire breadth of the cake) from the middle of three whole cakes, breaking the latter into two halves for the purpose. The three strips should then be packed in a tin, and the latter dated, labelled, and sealed down.

Feeding Meals.

Samples of these should be taken in the same manner as samples of manure, and put into tins. About 4 to 6 oz. are sufficient for an analysis.

School of Domestic Science.


HARRIS
INSTITUTE
SCHOOL OF
DOMESTIC SCIENCE
G. DEVEY.

Training School of Domestic Science.

STAFF.

Principal :
Miss BASTER.

Training School Staff :

Miss HUNTLY.
Miss O'NEILL.
Miss MARSHALL.
Miss BOLTON.
Miss NORWOOD.
Miss VINING.
Miss SEED.

Additional Staff for Evening Classes, etc. :

Miss ATKINSON.
Mrs. LAMB.
Miss E. GREEN.
Miss HALLIWELL.

Chemistry Lecturer :
Mr. R. H. JONES, M.Sc., F.C.S.

Lecturer in Method and Education :
Mr. F. W. JACKSON, B.A.

Sick Nursing and Ambulance :
Dr. W. H. IRVIN SELLERS, J.P.

Correspondent for National Union :
Miss ASCROFT.

Principal and Secretary of Harris Institute :
T. R. JOLLY.

SESSION 1910-1911.

The School of Domestic Science is held at Glover's Court.
The work of the School includes :—

1.—Training School for Teachers.
2.—Day and Evening Classes in Domestic Science Subjects.
3.—Evening Continuation School.
4.—Central Classes in Cookery, Laundry Work, and Household Management, for Girls from the Elementary Schools in the District.
5.—External Lectures.

Training School.

The Courses of the Training School are arranged to provide suitable Courses of Instruction for Students working for Diplomas as Teachers of—

Cookery,
Laundry Work,
Housewifery,
Combined Domestic Subjects (including Cookery, Laundry, and Housewifery),
Dressmaking,
Needlework, and
Millinery.

The Session of the Training School commences on Tuesday, September 13th, 1910, and consists of three terms—

Winter Term—September 13th to December 23rd.
Spring Term—January 16th to April 12th.
Summer Term—April 25th to July 7th.

Rules of the School.

1.—No Student can be admitted until 18 years of age.

2.—Candidates must be sufficiently educated to be able to perform the duties of a teacher after the special training is finished. The Committee will require a candidate to pass a test examination in reading, writing, dictation, arithmetic, and simple composition prior to admission to the privileges of the School. She must also produce a satisfactory Medical Certificate.

3.—Students can be admitted at the beginning of any term, if there are vacancies, but they are advised to join in September if possible.

4.—Students are expected to attend Classes punctually and regularly.*

5.—Students will be expected to wear the uniform of the School, with cotton or flannel blouse (patterns of which may be obtained), plain white linen apron, sleeves, collar, and white mob cap. Specimen cap, price 1s.; sleeves, 6d,

* In cases of illness a card (or if the Student is responsible for work in which preparation is involved, *e.g.*, Teaching or Demonstrating, a telegram) must be sent to the Principal to account for absence. After three days a medical certificate must be sent.

6.—Students should provide themselves with six aprons, tea towels, pairs of sleeves, three caps, two dishcloths, and two oven cloths. These must be marked with the owner's name.

7.—Students in training are expected to dine at the School, at a charge of 6d. per day.

8.—The Student will be considered to be on probation during the first term, and if she does not show capability for the work she will be advised to withdraw at the end of that period.

9.—Students must at once report any change of address.

10.—Marks are given for excellence of work in all departments, and these will be taken into account in determining the class of the Diploma.

FEES.

The Fee for any specified Course of Training is :—

£6 6s. 0d. per term, except Housewifery, which is £8 8s. 0d. for the Course.

The Cookery requires four terms of Training, the Laundry two terms, Housewifery 1 to 1½ terms. Should a Student require further training, the extra term's fee must be paid.

The Fees incidental to the Diploma Examination amount to 35s. each for the Cookery and Laundry and Housewifery Diplomas, Combined Diploma £4, 30s. each for Dressmaking, Needlework, and Millinery Diplomas. This fee must be paid on entering for the first section of the Examination.

Where a Student fails either in a Theoretical or Practical Examination, and has to re-sit for the same Examination, there will be a proportionate Examination Fee to pay, viz. : 3s. 6d. for a Theoretical, 10s. 6d. for a Practical Examination.

Students intending to take the full Course of Cookery, Laundry Work, and Housewifery, are advised to enter for the Combined Diploma ; the time required is 7 terms (2⅓ years). Fees £6 6s. 0d. per term.

Syllabus of Classes.

Subject to Alteration.

COOKERY.

The Course of Instruction in Cookery is adapted to prepare Students for the Diplomas and Certificates of the Preston Training School which are recognised by the Board of Education. These are—

1.—The Cookery Diploma, first and second class.
2.—The High-Class Cookery Teacher's Certificate, first and second class (open only to holders of above Cookery Diploma).
3.—The Elementary School Teachers' Certificate (open to Certificated Teachers only).
4.—The Superior Household and High-Class Cookery Certificates. This Certificate does not qualify the holder to teach the subject.

The Syllabus of Work and the routine of the Course are in accordance with the requirements of the Board of Education.

The necessary instruction in Science is given in the Chemical Department of the Institute.

TIME TABLE.—Course for the Cookery Diploma.

Subject to Alterations.

Hour.	Mon.	Tues.	Wed.	Thurs.	Fri.
10 to 1	Practical Work	Practical Work	Practical Work	Practical Work	Practical Work
2-30 to 3-30	Hygiene or Physiology	Demonstration.	Children's Classes or Chemistry	Children's Classes or Cookery Theory	Adult Demonstration or Cleaning
3-30 to 4-30	Theory of Education				
7-30 to 9-30	Evening Continuation Classes		7-45 to 9-45 Ambulance Class		

Examination for the Cookery Diploma.

Practical—

a.—Dinner Test ; Time, 3 hours.

b.—Children's Class Teaching ; ¾-hour Demonstration, 1¼ hours practice.

c.—Adult Demonstration, 40 Minutes.



STUDENTS PRACTICE KITCHEN
HARRIS INSTITUTE,
SCHOOL OF DOMESTIC SCIENCE, PRESTON.

Theoretical (*Three papers will be set*)—

d.—Theory of Cookery.

e.—Theory and practice of Education.

f.—Science (including chemistry of the subject, physiology and hygiene).

Books Recommended for Cookery Students.

Food and its Functions, by *J. Knight* (Blackie), 2s. 6d.; Food, *A. H. Church* (Chapman & Hall), 3s. 6d. or 1s.; The Chemistry of Cookery, *Mattieu Williams*, 6s.; Economics of Modern Cookery, *M. Mallock* (MacMillan), 3s. 6d.; King Edward's Cookery Book, *Florence A. George* (Arnold), 3s. 6d.; The Principles and Practice of Teaching and Class Management, by *Joseph Landon* (Holden), 5s.; Elementary Physiology, *Foster & Shore* (Macmillan), 2s. 6d.; Practical Domestic Hygiene, by *Notter & Firth* (Longmans), 2s. 6d.; The Science of Common Life, by *J. B. Coppock* (Swan, Sounenschieu & Co.), 3s. 6d.

(2) High-Class Cookery Teacher's Certificate.

This Certificate is granted only to Teachers holding the Cookery Diploma, and is necessary for those who wish at any time to become Staff Teachers in Training Schools. Fee, £10 10s.

Minimum time of Training, 1 term. Examination Fee, 30s.

Examinations—

1. Theoretical.—Paper on High-Class Cookery.
2. Practical Demonstration.—Dinner of not less than six courses.

(3) Elementary School Teacher's Cookery Certificate.

This Certificate is intended for Certificated Elementary School Teachers only, and is issued in accordance with the requirements of the Board of Education for qualifying Elementary School Teachers (Certificated) to teach Cookery in the Schools in which they are employed.

Time of training, 1 term. Fee £8 8s.

Examinations as for the Cookery Diploma.

(4) Superior Household and High-Class Cookery Certificates.

The National Union will examine in Superior Household and in High-Class Cookery, and will issue Certificates on such examination, but these Certificates will not in any way qualify their holders to teach the subject. The training will extend over a minimum period of three months. Fee £6 6s. Examination Fee, 25s.

LAUNDRY WORK.

The Course of Instruction provided by the School in Laundry Work is recoginsed by the Board of Education as qualifying Students who pass the prescribed Examinations to become Teachers of Laundry Work.

The Syllabus of Work is recognised and approved by the Board of Education.

The necessary instruction in Science is given in the Chemical Department of the Institute.

The Time Table of the Course is given below :—

TIME TABLE.—Laundry Work Course.

Subject to Alterations.

Hour.	Mon.	Tues.	Wed.	Thurs.	Fri.
10 to 11	Practical Work	Laundry Theory	Practical Work	Practical Work or Children's Class	Practical Work
11 to 12		Demonstration.			
12 to 1					
2-30 to 4-30	Hygiene or Physiology / Theory of Education	Children's Class	Chemistry	Practical Work	Children's Class or Cleaning
7-30 to 9-30		Evening Continuation Class	Ambulance Class		

Examinations.

Theoretical—

a.—Theory of Laundry Work.
b.—Theory and Practice of Education.
c.—Science (including Chemistry of the Subject, Physiology and Hygiene).

Practical—

a.—Lesson to Children (2 hours).
b.—Three hours Practical Examination.
c.—Adult Demonstration (40 minutes).

Students are also trained for Certificates as Laundry workers. Time usually required, 3 months. Fee, £5 5s. 0d. per term.

Books Recommended for Laundry Students.

Science of Laundry Work, *M. Rankin* (Longman's), 2s. 6d. ; Art of Laundry Work, *M. Rankin* (Longman's), 2s. 6d.

HOUSEWIFERY.

Students are trained for the Preston Diploma in this Subject. This Diploma is recognised by the Board of Education as qualifying its holder to become a Teacher of Housewifery. Length of training, 13 to 15 weeks, or about 350 hours.

The above Diploma is only issued to Teachers who are already qualified in Cookery and Laundry Work.

TIME TABLE.—HOUSEWIFERY.

Subject to Alterations.

HOURS.	MON.	TUES.	WED.	THURS.	FRI.
10 to 11	Upholstery	Children's Class	Demonstration	Upholstery	Practical Housework
11 to 12			Practical Work		
12 to 1					
2-30 to 4-30	Sewing	Lecture—Sewing	Children's Class	Sewing	Sewing or Upholstery

Students are also trained for the Housewifery or Housekeeper's Certificate. Course includes Cookery, Laundry, Needlework, Housewifery, &c. Minimum training, 2 terms or 625 hours. Fees, £5 5s. per term. Examination Fee, 25s. Further particulars on application.

DRESSMAKING.

Students are trained for the Plain and Full Dressmaking Diplomas of the National Union. The training takes 2 terms for the Plain Diploma, 3 terms for both Plain and Full Diplomas. Fees, £6 6s. per term. Examination Fees, 30s. for each Diploma.

NEEDLEWORK.

Two Diplomas are granted in this subject, *i.e.*, the Plain and Full Needlework Diplomas. Length of training and Fees as for the Dressmaking Diplomas.

MILLINERY.

This Certificate does not qualify for teaching Millinery unless it is held in conjunction with a Diploma in another subject which includes an Examination in Theory and Practice of Education.

Minimum time of training, 180 hours, or 1 term.

Fees as above.

Classes are also held in Dressmaking, Needlework, and Millinery, for Training for the City and Guilds Evening Teacher's Certificates (1st and 2nd year).

Time, 2 days per week for 2nd year Course. Fee £5.

Examination Fee, 20s.

Technical Classes for those not qualifying as Teachers.

Day and Evening Classes in the subjects of Domestic Science are held during the Session.

The Session for the Day Classes commences on Monday, 19th September, 1910 :—

Winter Term—September 19th to December 23rd.
Spring Term—January 16th to April 12th.
Summer Term—April 25th to July 7th.

The Session for the Evening Classes commences on Monday, September 19th, and consists of two terms :—
Winter Term—September 19th to December 23rd.
Spring Term—January 16th to April 12th.

FEES.

The Fees for Students attending these Classes are :—

For a course of 12 Lessons—	£	s.	d.
Household Cookery (Day)	1	5	0
High-Class Cookery (Day)	1	15	0

Plain Cookery (Evening), 5s., or 7s. 6d. per Session, *i.e.*, 24 lessons.

Syllabus of Subjects.

COOKERY.

The HOUSEHOLD COURSE includes lessons in the following subjects, viz. :—Stock, roasting and boiling, soups and vegetables, bread and cakes, fish, sick-room cookery, pastry, puddings, poultry and cheap meat dishes, cold meat dishes, stewing, curry, cooking of rice, &c., clarifying of fat, and one lesson in cleaning, which may be omitted if desired.

THE SECOND HOUSEHOLD COURSE includes more advanced dishes in the above subjects.

The HIGH-CLASS COURSE includes lessons in the following subjects, viz. :—

1. Stocks ; Breakfast dishes.
2. Soups.
3, 4, 5, 11, 12. Fish and Meat Entrees.
6. Puddings.
7. Bread and Cakes.
8. Jellies and Creams.
9. Pastry (puff, short, and Genoese).
10. Savories.

Single Lessons can be taken in Household or High-Class Cookery. Fees 2s. 6d. and 4s. per lesson respectively. Dishes may be chosen by pupil.

Ices and Royal Icing are not included in the above Course, but lessons on these or any other special subjects can be arranged for at a fee of 5s. a lesson.

Pupils taking either the Household or High-Class Course are admitted during the Course to six demonstrations free ; in every other case a charge of 6d. is made for each demonstration.

The Plain Household Evening Course is intended for those engaged during the day, and consists of twelve or twenty-four lessons in simple Household Cookery.

RULES.

1.—Pupils are not required to provide their own materials, but it is hoped that they will purchase at least one of the dishes made by them at the practice classes.

2.—Each pupil must bring with her a tea towel and oven cloth, each marked with her name.

3.—Any crockery taken from the school must be returned without delay, and any that is broken must be replaced.

4.—Pupils must be regular and punctual at all classes. If a lesson is missed it will be forfeited, except in cases of sudden illness, or when at least 12 hours' notice has been given to the Principal.

PUBLIC DEMONSTRATIONS will be given every Tuesday afternoon from 2-30 to 4-30. Syllabuses of the demonstrations may be obtained at the School. Single lesson, 6d. Tickets admitting the holder to six demonstrations at any time may be had for 2s. 6d. each.

SWEET MAKING CONFECTIONERY.

1.—*Sugar Boiling.*—Walnut and cocoanut ice ; almond, walnut, and cocoanut rock.

2.—*Marzipan.*—In various shapes, colours, and designs.

3.—*Fondant.*—Fondant, walnuts, strawberry, raspberry, pine apple creams, vanilla fondants, moulded fondants.

4.—*Chocolate Dippings.*—Chocolate creams, chocolate nougat, chocolate almonds, pralines.

5.—Satin sticks, walnut mollasse, nougat, toffee, almond candy.

FEES.		£	s.	d.
SINGLE LESSON—One person		0	7	6
,, ,, Two persons . ..	each	0	5	0
,, ,, Six ,, . ..	,,	0	3	6
TWO LESSONS— One person		0	12	0
,, ,, Two persons . ..	each	0	8	6
,, ,, Six ,, . ..	,,	0	6	0
SIX LESSONS— One person		2	0	0
,, ,, Two persons . ..	each	1	5	0
,, ,, Six ,, ...	,,	0	18	0

LAUNDRY WORK.

Demonstrations and practice on the washing of white and coloured flannels, Jæger's garments, stockings, and socks.

Demonstrations and practice on washing and ironing of table and body linen and coloured prints, including hot starching, washing of lace, muslins, &c.

Demonstrations and practice on cold starching, ironing of collars, cuffs, gentlemen's shirts, and a lady's blouse.

Pupils are expected to bring the various articles required for washing and ironing, and to provide themselves with an ironholder.

A Course consists of Ten Lessons.

FEES.

	£	s.	d.	
Day Class	0	10	6	
Evening Class	0	4	6	(24 lessons)
Single Lesson	0	1	6	

DRESSMAKING.

The Elementary and Intermediate Courses include drafting and cutting from measures in various sizes, and making up the following articles :—Women's and children's plain bodices, sleeves, collars, skirts, and blouses. It also includes the re-making of old dresses.

The Advanced or Third Year's Course includes tailor-made costumes, fancy bodices, boys' suits.

PLAIN SEWING.

Courses of Lessons in the above will be given.

Cutting out and making of ladies' and children's underclothing.

Darning, patching, and mending of bed and table linen.

Swiss darning, and re-soling of socks and stockings, &c., &c.

A special Thrift Class for remodelling old garments, &c., is held on Monday evening.

MILLINERY.

The Elementary Course includes making, covering, and trimming buckram and wire shapes.

Trimming straw hats, bonnets, &c. Renovating old hats, ribbons, laces, &c.

The Advanced Course includes making lace hats and bonnets, making children's drawn silk hats and bonnets, making ladies' caps, &c.

FEES.

	£	s.	d.	
For any of the above subjects :—				
Day Class	0	15	0	(1 term)
Evening Class, Millinery	0	5	0	(1 term)
Evening Class, Millinery	0	7	6	(2 terms)

All Evening Continuation Classes 4s. 6d. per session (2 terms).

HOUSEWIVES' COURSE.

Short Courses of Training for young ladies leaving school and other lady pupils will be arranged at intervals as required. These Courses are intended to be of use to pupils in their own homes, and will include practical lessons in Cookery, Laundry Work, and Housewifery, together with demonstrations in each subject. In some cases needlework may also be included. Each course will extend over 12 weeks, and, as a rule, four mornings and one afternoon a week will be occupied with the work.

Fee for the Course, £3 3s. 0d.

TIME TABLE OF TECHNICAL CLASSES.

Subject to Alteration.

Day Classes.

Subject.	Days.	Hours.
Cookery	Wednesday	2-15 to 4-30
Sweet Making	To be	arranged
Laundry Work	Thursday	10 to 12-30
Dressmaking	Thursday	2-30 to 4-30
Plain Sewing	Tuesday	2-30 to 4-30
Millinery	Tuesday or Wednesday	2-30 to 4-30

Evening Classes.

Subject.	Days.	Hours.
Cookery	Friday	7 to 9
Laundry Work	Tuesday	7-30 to 9-30
Dressmaking	Friday	7 to 9
Plain Sewing	Tuesday	7-30 to 9-30
Millinery	Wednesday	7-30 to 9-30
Ambulance	Wednesday	7-45 to 9-15

Evening Continuation School.

Evening Continuation School Classes, conducted under the regulations of the Board of Education, are held at the School on every evening during the Winter Session, from 7-30 to 9-30.

The Classes are open to scholars over 15 years of age.

The Session commences on Monday, September 19th, 1910, and closes on Wednesday, April 12th, 1911.

The Fee is 4s. 6d. per session for two subjects.

Central Classes in Domestic Subjects.

Central Classes in Cookery, Laundry Work, and Housewifery, for the girls of the Elementary Schools of the District, are held in the School of Domestic Science, Glover Street.

The girls attend in sets of 18, each set receiving a lesson of two hours' or two-and-a-half hours' duration—once a week—during the twenty weeks' period of attendance.

The Classes meet daily from 9-30 to 12 a.m., and from 2 to 4-30 p.m.

Fees, 4s. per lesson.

External Lectures.

External Lectures and Demonstrations or Lessons by the Staff of the School of Domestic Science on any of the subjects included in this Prospectus, and also on Sick Nursing, can be arranged for on application to the Superintendent.

The Fees, exclusive of travelling expenses, are :—

	s.	d.	
Lectures or Demonstrations	10	6	per lecture.
Each additional Lecture on same day	5	0	per lecture.
Lessons in Elementary Schools ..	4	0	per lesson.

School of Art.



ART ROOM,
HARRIS INSTITUTE PRESTON.

School of Art.

SESSION 1910-1911.

The Session commences on Monday, September 19th, 1910. It consists of three terms—

Winter Term—September 19th to December 22nd, 1910.
Spring Term—January 9th to April 13th, 1911.
Summer Term—April 17th to July 6th, 1911.

The vacations during the Session will be—
Christmas Vacation—December 22nd, 1910, to January 9th, 1911.
Easter Vacation—Good Friday and Easter Monday.
Whitsuntide Vacation—Whit-week.

The Classes are held at the Institute, Avenham, and Students may enter their names at the Institute, on Friday, September 16th, between 7 and 9 p.m., or at any time during the Session.

Students are expected to conform to the general regulations of the School.

Lockers are provided for the use of Students, but the Council will not be responsible for the loss of any property left by Students in the School.

No work must be taken out of the School without the permission of the Head Master.

SCHOOL STAFF.

Head Master :
ALLEN R. GLADWELL, A.R.C.A. (Lond.).

Second Master :
WILLIAM RATHBONE.

Assistant Teacher :
Miss FRANCES M. BENTHAM.

Pupil Teachers :
Miss FRANCES URQUHART ; Miss MARGARET SCANNELL.

Painters' and Decorators' Work :
ALEXANDER SIMPSON, F.I.B.D.

Art Needlework :
Miss C. M. ARMISTEAD.

FEES.

Lower Scale.

For Students who undertake to prepare for and attend the Art Examinations of the Board of Education, the following is the Scale of Fees :—

DAY CLASSES.

	£	s.	d.
For the whole Session (three Terms)	2	2	0
For one Term.....	1	1	0
Wood Carving (for the Course of 30 Lessons, including also one half-day per week for Drawing or Modelling)	1	1	0
Metal Work do. do. do.....	1	1	0
Art Embroidery do. do. do.....	1	1	0

The Fee for these Courses in Applied Art is, for Students of the School joining for the whole Session, 10s. 6d. for each subject.

EVENING CLASSES.

	£	s.	d
For the whole Session (three Terms)	0	10	0
For one Term.....	0	5	0

Students entering at these Fees are required to follow a course of study approved by the Head Master of the School, and to conform to all rules incidental to Board of Education work.

Higher Scale.

For Students who do not wish to work under the Board of Education Regulations, the Fees are :—

	£	s.	d.	
For each day per week	1	1	0	per Session.
For each day per week	0	10	6	per Term.

All Fees payable in advance at the time of entry.

SYLLABUS OF SUBJECTS.

Elementary.

Geometry and Perspective, Freehand Drawing, Model Drawing, and Light and Shade. Brush Drawing. Modelling in Clay. Elementary Principles of Ornament. Design.

Advanced.

Light and Shade with the Pen, Pencil, Chalk, or Brush.

Painting in oil, water-colour, tempera, &c., from casts of Decorative Art, Antique Figures, Flowers, Fruit, Still Life, Drapery, and the Living Model.

The Anatomy of the Human Figure. Time and Memory Studies.

Modelling in Clay from Casts and Photographs of Decorative Art, and from Foliage, Fruit, &c.

Modelling from the Antique Figure.

Modelling design (Ornamental and Figure).

Architectural Drawing.

Analysis of Ornament and of Plant terms for Decorative purposes.

Designing for Art Manufacturers and Decoration, both in the flat and relief, and for printing and weaving Textile Fabrics.

Figure and Landscape Composition, Decorative and Pictorial.

Moulding and Casting in various methods.

Subject Courses.

Geometrical Drawing.

The Courses of Lectures, which will commence early in October and extend over the first and second terms, are arranged so that the Students may become acquainted with the use of instruments and the principles of construction.

The exercises worked in Class will include the construction of plane figures, and lead to the drawing of geometrical patterns and simple tracery, the use of the scale, and the enlargement and reduction of plane figures in given proportions. Exercises will also be given in the projection of simple solids.

Students are expected to work exercises at home on the Lectures given in Class.

Perspective.

This Course is arranged so that Students may obtain skill in using instruments, ability in the ready application of the rules of perspective to the representation of objects, views of buildings, landscapes, &c., by free hand sketches in pencil, ink, or water-colour.

The exercises worked in Class will represent in perspective from plan and elevation, or from specification, solids, or objects of plane or curved surfaces under various conditions ; drawing reflections of solids or objects in plane mirrors, horizontal or vertical drawing shadows of lines, surfaces, and solids, rectilineal or curved, upon any specified planes and on surfaces of single curvature, by natural or artificial light.

Principles of Ornament.

The Lectures will deal with the following laws :—

(1) Symmetry and Balance. (2) Proportion and Spacing. (3) Subordination. (4) Repose. (5) Congruity. (6) Radiation (7) Contrast, including counter-change. (8) Repetition and Rhythm, including alteration. (9) Unity.

Also with methods of Expression. Division of Surface, Variety of Plane Surface. Also Classes or Styles—(1) Geometric, (2) Realistic, (3) Conventional, (4) Symbolic or Allegorical, (5) Grotesque.

Ornamental Design.

Elementary.—The filling of given shapes and spaces with Floral and Geometrical Ornament. Proportion and setting out of borders, geometric or floral, in flat tints or colours. Repeating patterns.

Advanced.—Applied Design. Designs for Repeating Patterns to be adapted to some specific purpose and some specific method of execution. Designs for borders, panels, diapers, &c., in some well-known historic style. Processes of workmanship such as Stencilling, Inlaying, Wood Carving, Modelling, Casting, &c., so as to make a design which is practically adapted to execution in a given material or by a given method.

Architecture.

The Orders, Greek and Roman. Gothic, Renaissance, and Modern Architecture. Mouldings and Enrichments made use of with each style. Terms in ordinary use in architecture.

Anatomy.

The study of the External forms of the Human Body. The influence of Posture on the form of man. General consideration of the Bones and Joints. Vertebral column and spine. The Thorax,

regions of the flank and the anterior abdominal wall. The Shoulder Girdle and the muscles which influence its movements. The Upper Arm. The Fore Arm. The Hand. The Gluteal region. The Thigh. The Leg and Foot. The Neck. The Head, Face, and Expression. Proportion, male and female.

Decorative Painting.

Painting ornament on coloured ground, in what is known as "Grisaille," in oil or tempers. (1) From copies (2) Original designs for panels, pilasters, friezes, &c.

Modelling.

Modelling in clay from elementary casts of Ornament, Fruit, or Flowers, and Flowers and Fruit from nature. Designs in relief for different processes of execution. Modelling the Figure in relief and in the round from Antique and Life. Use of Human Figure in relief decoration. Instruction in Casting in plaster, wax, &c.

Blackboard Drawing.

A Special Class will be formed suitable for Elementary School Teachers.

Nature Study.

The study of Flowers, Plants, and Natural Objects, such as Shells, Feathers, Birds, and Animals, with a special view to their use in design.

Lettering.

Copying and arranging the best types of Roman and Gothic characters for manuscript, engraving, and painting.

Examinations in the foregoing subjects are held annually by the Board of Education, South Kensington.

Textile Design.

The making of designs for woven fabrics. Lectures will be given at intervals on the following subjects :—

The Planning of Ornament, the History of Weaving, the Treatment of natural Forms, and Colour harmony and contrast.

Metal-work, Wood-carving, and Embroidery.

Classes in these subjects will be arranged, particulars of which may be had on application.

Some knowledge of Drawing is indispensable to the proper study of these crafts, and Students are expected, as they advance with their work, to prepare their own designs.

Students joining the Embroidery Class should, therefore, also attend the Classes in Freehand and Drawing from Nature. Those joining the Metal-work and Wood-carving Classes should take, in addition to the Freehand and Nature Drawing, a course of Modelling.

Painters' and Decorators' Work.

These Classes are open to young men engaged in the above trades.

Students joining are expected to devote three evenings per week to the work and to attend regularly at the Practical and Theoretical Classes, and also at the Drawing Class.

The Syllabus includes :—Uses and Properties of Oils, Paints, and Varnishes, Colour Mixing, Stopping and Filling, Plain Painting, Varnishing, Graining, Marbling, Decorative Painting, Lettering, Stencilling, Gilding, and Glass Embossing.

Sketching Class.

During the summer months an Outdoor Class is held for Landscape Sketching from Nature.

Time Table of Classes and Lectures.

The School of Art is open for Study as follows :—

Day Classes.

	Morning. 10 to 1.	Afternoon 2-30 to 4-30.
Monday	Light and Shade Still Life Antique Modelling	Still Life Antique
Tuesday	Plant Drawing Light and Shade	Plant Drawing Light and Shade
Wednesday	Head Life Class Still Life Antique	Head Life Class Antique
Thursday	Practical Design Repoussé Metal Work	
Friday	Elementary Design Still Life Light and Shade Modelling	Still Life Light and Shade
Saturday	Plant Drawing Light and Shade Still Life	

Students may attend for practice at any time the School is open; but instruction is only guaranteed in the subjects and at the times specified in the Time Table.

Evening Classes.

		Subject.
Monday	7-15 to 9-15	General Freehand, Light and Shade
Tuesday	6 to 9	Life Class, Antique
Wednesday	7-15 to 9-15	Freehand, Modelling, Light and Shade
Thursday	7-15 to 9-15	Model Drawing, Light and Shade, Antique, Modelling
Friday...	5-30 to 7	Blackboard Drawing
Friday...	7-15 to 9-15	Life Class, Antique

CLASS LECTURES.

The Lectures will commence early in October. Students wishing to take any of these subjects should endeavour to attend regularly from the commencement. Joining later will place them at a considerable disadvantage.

Textile Design	Tuesday	7-15 to 9-15 p.m.
Architecture	Wednesday	7-15 to 9-15 p.m.
Anatomy	Monday	3-30 to 4-30 p.m.
Perspective	Friday	2-30 to 4-30 p.m.
Geometry	Friday	7-15 to 9-15 p.m.

Prizes.

The Council of the Harris Institute offer Prizes in the following subjects :—

For the best set of Studies from Nature, of Birds, Animals, Plants, &c. : two Prizes.

For the best Shaded Drawing of Ornament from the Cast : one Prize.

For the best Shaded Drawing of an Antique Figure : one Prize.

For the best Drawing of a Figure from Life : one Prize.

For the best set of Details of the Figure : one Prize.

For the best set of Drawings of the Features (of Michael Angelo's "David") : one Prize.

For the best Design for Textile Fabrics : two Prizes.

For the best set of Designs to fill a Square, Circle, and Rectangle: one Prize.

For the best Design for any Specific Purpose (painted or modelled) : two Prizes.

For the best Painting of Still Life : one Prize.

For the best Modelled Study : one Prize.

For the best Architectural Drawing : one Prize.

The value of a First Prize is 7s. 6d., and of a Second Prize, 5s.

Prizes are also awarded on the result of Examinations.

Prizes offered by the Board of Education Art Department, including Gold, Silver, and Bronze Medals, and Books, and also a number of Government Scholarships for Art Students, ranging in value from £10 to £150 may be competed for by Students of the Schools.

Three Free Studentships to the Day Classes are offered by the Council to Students of the School (Day or Evening), who are studying Art with a view to becoming designers, craft-workers, or teachers.

Only those Students will be recommended for the approval of the Council who have attended regularly and made satisfactory progress, and who are prepared to give the required amount of time to study.

Certificate Classes.

Certificate Classes.

STAFF.

Arithmetic	J. T. CORKILL, B.A.
Mathematics..	J. T. CORKILL, B.A.
English	F. W. JACKSON, B.A.
History and Geography ..	F. W. JACKSON, B.A.
Principles of Education ..	F. W. JACKSON, B.A.
Science	J. HARRISON, A.R.C.Sc.
Drawing	A. R. GLADWELL, A.R.C.A.
Music	JOSEPH SMITH.
Needlework	MISS WESTWORTH.

SYLLABUS OF CLASSES.

Thursday.....Needlework, 6 to 7.
Science, 7 to 8-15.
Drawing, 8-15 to 9-15.

Friday .....Blackboard Drawing, 5-30 to 7.
English Language and Literature, 7 to 7-45.
Principles of Education, 7-45 to 8-30.

Saturday ....Mathematics, 9 to 9-45.
Arithmetic, 9-45 to 10-30.
Geography, 10-30 to 11-15.
History, 11-15 to 12.
Music, 12 to 12-30.

The Classes for Acting Teachers preparing for the Certificate Examination, 1910, will re-commence on September 22nd, 1910.

Classes will also be held for Acting Teachers preparing for the Certificate Examination in December, 1911. The Session begins on December 5th, 1910, but Students are advised to enter for the Course on September 22nd, 1910, and to attend the present Classes until the new Classes begin on December 6th. Students may join the class in Mathematics, Stage I., held on Tuesday evening, but must see the Lecturer before doing so. Those who join will be required to begin with the Class in September, and to attend regularly.

The Examination is open to Candidates who have satisfied the conditions of the Board of Education. Copies of the Regulations and Syllabus may be obtained on application to the Secretary, Board of Education, Whitehall, London, S.W.

Students who intend to join the Classes are requested to see the Principal or Mr. Corkill, at the Institute, on Friday evening, September 16th. Students will be required to attend the Classes regularly, and to provide themselves with the text-books recommended by the Teachers at the first meeting of each class.

All the Classes are held at the Institute, Avenham, except the Saturday Classes, which are held at the Technical School, Corporation Street.

FEES.

The Fee for the Complete Course in all subjects is £2 2s. per Session. This Fee of £2 2s. will be the same whether Students enter for the Course on September 20th or December 6th.

All Fees are payable in advance at the commencement of the Session for which they are due. Students must obtain the official receipt and show the same to the Lecturer before their names can be entered on the register.

Evening Classes.

Science and Miscellaneous.

Evening Classes.

SESSION COMMENCES ON MONDAY,
THE 19TH SEPTEMBER, 1910.

OBJECTS OF THE SCIENCE AND TECHNICAL SCHOOL.

The aim of the Council, in arranging the work of the Evening Classes, is to provide systematic instruction in the scientific principles applicable to the leading trades and industries of Preston and the District.

The Classes are intended principally for those who, being engaged in industrial occupations in the day time, desire to receive supplementary instruction in the application of Science and of Art to the trades and manufactures in which they are interested.

It must be distinctly understood that the instruction given in the School is intended to supplement and develop, and not to supersede the knowledge gained by practical experience in the workshop or factory. Trades cannot be taught in the Technical School, the necessary manual skill can only come after long practice in the workshop.

The main object of the instruction is to provide a thorough knowledge of the scientific principles underlying the daily work of the Student, so as to enable him to take that intelligent interest in his work which is so essential to success.

The Classes in the School may be broadly divided into two groups :—

(1) TECHNICAL SUBJECTS.—Most of these bear directly upon the industries of the district. In them the scientific principles upon which the various industrial processes depend are fully explained ; and in several branches a Course of practical training is provided.

(2) SCIENTIFIC SUBJECTS AND MODERN LANGUAGES.—The Courses of work in the Science Classes follow closely the Syllabuses of the Board of Education ; and are also suitable for Students preparing for University Degrees or Scholarships. The work is not restricted to industrial applications, but deals also with theoretical principles and pure science of high educational value.

Students will be admitted to the Specialized Courses in Technical or Commercial Subjects if they possess the Preliminary Technical or Preliminary Commercial Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard they will be advised to

attend the Preliminary Courses conducted in the Borough Continuation Schools, *or the corresponding Second Year's Technical Course, which will be conducted, for the present, in the Institute.*

In exceptional cases Students may be excused the Entrance Examination, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the Homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake Specialized Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, conducted by the Preston Education Committee in their Branch Schools, are as follows :—

PRELIMINARY TECHNICAL COURSE.—*First Year.*
Practical Mathematics.
Practical Drawing.
English.

PRELIMINARY COMMERCIAL COURSE.—*First Year.*
Commercial Arithmetic.
Commercial Correspondence.
Commercial Geography.
English.

PRELIMINARY COMMERCIAL COURSE.—*Second Year.*
Commercial Arithmetic.
Commercial Correspondence.
Commercial Geography.
English.
Book-keeping or Shorthand.

*PRELIMINARY TECHNICAL COURSE—*Second Year.*
Practical Mathematics.
Practical Drawing.
Experimental Mechanics and Physics.
English.

* *A Preliminary Technical Course* will also be conducted at the Technical School, Corporation Street. Syllabus as prescribed by the Union of Lancashire and Cheshire Institutes, see page 98.

Third, fourth, and succeeding years' Courses for Commercial and Technical Students will be found under the respective departments.

Evening Classes for preparation for the Matriculation Examination will be arranged if a sufficient number enrol. Fee for Course, £2 2s.

Special Courses can be arranged for Students who do not come under any of these categories.

Students will be expected to attend regularly and punctually throughout the Session, according to their Course Time Table, do the Homework set, and sit for the Examination, when required.

The Lecturers are authorised to report periodically, through the Principal, as to the attendance and Homework of each Student. The Council shall have power in dealing with Students who are unsatisfactory in either of these respects to remove their names from the Register without return of Fee.

A Certificate or Diploma will be issued to all Students who satisfactorily complete a Five Years' Course. The Award of the Diploma will depend on attendance, school and homework, and examination results. These Diplomas may be endorsed by the Board of Education.

Fees per Session.

	£	s.	d.
Preliminary Technical Course, Second Year	0	5	0
Arts and Science, per subject	0	7	6
Any complete Technical Course, Third, Fourth, &c., Years	0	7	6
Any complete Commercial Course, Third, Fourth, &c., Years	0	7	6

A Student who does not desire to take a full Course, and can prove to the satisfaction of the Principal and Lecturer that he can benefit by instruction in a certain subject or subjects, may be allowed to attend the Classes at a Fee of 7s. 6d. per subject, with or without practical work.

Students who enter for Courses must clearly understand that they will be required to attend all the subjects regularly, otherwise they will be compelled to pay a fee of 7s. 6d. for each subject taken. *This rule will be strictly enforced.* In the case of Second Year Technical Course the fee would be 5s.

All Fees must be paid in advance, and Students must obtain the official receipt and show the same to the Lecturer before their names can be entered on the Register.

Registration.

All Students must see the Principal prior to filling up the form for enrolment. He can be seen for this purpose at the Technical School, Corporation Street, on Monday and Tuesday evenings the 12th and 13th September, and at the Harris Institute on Wednesday, the 14th. The Staff will also be present on the above nights to advise Students as to Course of Instruction, Text Books, &c.

An Entrance Examination will be held on Friday evening, the 9th September.

All business communications relating to Classes, Examinations, &c., should be addressed to T. R. Jolly, Principal and Secretary.

STAFF.

Book-keeping	R. E. SMALLEY, A.C.A. H. SOUTHWORTH, A.C.A.
Botany, Geology, Physiology, and Hygiene	J. HARRISON, A.R.C.Sc.
Building Trades	A. J. PYE, A.B.I.C.C., Medallist. J. A. BERTWISTLE, Hons. J. J. ALLEN, Hons. A. C. M. LILLIE, Hons., Medallist. W. TAYLOR. R. ROBERTS, Hons. J. VARLEY, Hons.
Chemistry	R. H. JONES, M.Sc., F.C.S. A. BAGULEY, B.Sc., F.I.C., F.C.S. W. COWPERTHWAITE, Hons.
Commercial Arithmetic	J. RENWICK.
Cotton Spinning	J. TASKER, Wh.Sch. R. BILLINGTON, Hons.
Cotton Weaving	W. MELLOR, Hons., Medallist. E. BLINKHORN, Hons.
Electrical Engineering Subjects	G. E. GITTINS, A.I.E.E.
Magnetism and Electricity	A. W. HOLDEN, Hons., Medallist.
Elementary Science and Physics	H. WHALLEY, B.Sc.
English	A. W. ALLEN, M.A.
French and Latin	F. W. JACKSON, B.A.
Geography (Commercial)	J. RENWICK.
German	H. A. JUTZI.
Harmony	J. TOMLINSON.
Mathematics	J. T. CORKILL, B.A.
Mechanical Engineering Subjects	E. C. MOYLE, A.R.C.Sc., A.M.I.M.E. J. H. BINFIELD, Wh.Ex. F. W. WALKER, 1st Dip. M.E.
Plumber's Work	R. SANDERSON.
Practical Mathematics and Drawing	J. E. ADAMSON. R. L. ADAMSON.
Shorthand (Speed)	E. H. SMIRK, F.Inc., S.T.
Shorthand (Intermediate), and Commercial Correspondence, &c	V. E. COLLINGE, F.Inc., S.T.
Singing	JOSEPH SMITH.
Typography	R. AUSTIN, Medallist. R. C. PYE, Hons.
Typewriting	J. HILTON.

Principal and Secretary:

T. R. JOLLY, F.C.I.S.


Chemical Laboratory
Harris Institute,
Preston, 1905.
G. BIBVEY.

Evening Classes.

The Classes meeting at Avenham are distinguished by the letter A, those meeting at the Technical School, Corporation Street, by the letter C.

MATHEMATICS. (A).

Lecturer, J. T. Cockill, B.A., Lond.B.Sc.

Fee, 7s. 6d.

Stage I., Tuesday, 7 to 9.

(1) *Arithmetic.*—The principles of arithmetical operations and their application to simple questions. Arithmetic as applied to ordinary questions of Commerce and Trade, including Interest, Percentages, Stocks and Shares, Discount, Exchanges, Metric System of Weights and Measures.

(2) *Geometry.*—The properties of Lines, Triangles, and Rectilinear Figures, as far as they are treated in the First Book of Euclid.

(3) *Algebra.*—Elementary Rules as far as Simple Equations and Problems producing them. Factors; H.C.F.; L.C.M.; Fractions; Graphs.

Stage II., Friday, 7 to 9 (suitable for Matriculation).

(1) *Geometry.*—The properties of Rectangles, Circles, and Polygons, as far as they are treated in the 2nd, 3rd, and 4th Books of Euclid.

(2) *Algebra.*—Involution and Evolution; Surds and Indices; Quadratic Equations and Problems producing them; Ratio, Proportion, and Variation.

(3) *Plane Trigometry.*—Measurement of angles; Trigonometrical Functions, and the Conversion of one into another; Arithmetical Values of the Trigonometrical Functions of 30°, 45°, 60°, 90°, 180°, &c.; Logarithms and the use of Tables; Solution of Triangles; Heights and Distances; Area of a Triangle.

Stage III., Thursday, 7 to 9 (suitable for Inter. B.A. or Inter. B.Sc.).

(1) *Geometry.*—Ratio and Proportion with applications to Geometry, as far as the subject is treated in the definitions of Euclid's 5th Book, and in his 6th Book. Centres of Similitude; Harmonic Section; Co-axal Circles; Theory of Inversion.

(2) *Algebra.*—Permutations and Combinations ; Complete Theory of Indices ; Surds and Imaginary Quantities ; Progressions ; Binomial Theory.

(3) *Plane Trigonometry.*—Functions of the sum and difference of two Angles, and of the Multiples and Sub-multiples of an Angle ; Inscribed, Circumscribed, and Escribed Circles ; Area of a Circle and Areas of Regular Polygons inscribed in and circumscribed about a given circle.

INORGANIC CHEMISTRY (THEORETICAL). (A).

Suitable for Matriculation or Teachers' Certificate.

Lecturer, R. H. JONES, M.Sc., F.C.S.

FEE, 7s. 6d.

Stage I., Tuesday, 7 to 8.

Chemical changes distinguished from temporary physical changes.

Indestructibility of Matter.

Properties of Gases. Action of pressure on gases. Boyle's law. Charles' law. Graham's law.

Air. Relation of air to flame, and combustion generally.

Oxygen and nitrogen.

Hydrogen. Water.

Laws of chemical combination. Atomic theory. Calculations. Equivalents.

Mixture and combination distinguished.

Chlorine. Hydrogen chloride. Chloride.

Carbon—forms. Coal—coal gas.

Carbon dioxide—carbonates.

Carbon monoxide.

Sulphur—forms. Sulphurdioxide—sulphites.

Sulphur trioxide. Sulphuric acid. Sulphates.

Sulphuretted hydrogen. Sulphides.

Nitrous and nitric oxides.

Ammonia.

Salts—their preparation, properties, and nomenclature.

Non-metals and metals.

The Lectures will be fully illustrated by experiments, apparatus, lantern slides, and models.

THEORETICAL INORGANIC CHEMISTRY (A.).

Lecturer, R. H. JONES, M.Sc., F.C.S.

Stage II., Wednesday, 7 to 8.

FEE, 7s. 6d.

Determination of the composition of water, air, hydrochloric acid, ammonia, oxides of nitrogen, carbon monoxide, carbon dioxide, hydrogen sulphide. Laws of combination. Various types of chemical calculations.

Atoms and molecules. Atomic and molecular weights. Vapour densities.

Avogadro's law. Specific and atomic heats. Valency. Dissociation. Classification of the elements.

Water: causes of temporary and permanent hardness in; modes of softening; suitability for domestic purposes.

Hydrogen peroxide. Preparation and properties.

Ozone. Air. Chlorine. Bromine. Iodine. Fluorine. Phosphones. Arsenic. Antimony. Bismuth.

Boron, silicon, and their important compounds.

Carbon and some compounds, viz.:—Methane, ethylene, acetylene, formic, and acetic acids. Alcohol, &c.

Chemistry of the metals and their important compounds.

The Lectures will be fully illustrated by experiments, apparatus, lantern slides, and models.

NOTE.—Tutorial Classes will be arranged for Stages I. and II.

PRACTICAL INORGANIC CHEMISTRY. (A).

Lecturers, R. H. JONES, M.Sc., F.C.S.; W. COWPERTHWAITE (Hons.).

Stage I., Tuesday, 8 to 9-30.

FEE, 7s. 6d.; or Free if Theoretical is also taken.

Use and fitting up of simple chemical apparatus.

Action of heat, water, and acids on various substances studied in the lectures.

Preparation of gases studied in the lectures.

Simple quantitative experiments—water of crystallisation, equivalents of magnesium, zinc, iron, silver, and copper.

Weights and volumes of gases evolved in certain chemical re-actions.

Experiments with acids and bases. Preparation of salts. Acidimetry. Alkalimetry.

Experiments for which instructions will be given.

PRACTICAL INORGANIC CHEMISTRY. (A).

Lecturers, R. H. JONES, M.Sc., F.S.C., A. BAGULEY, B.Sc., F.I.C., F.C.S., and W. COWPERTHWAITE (Hons.).

Stage II., Friday, 7 to 9-30.

FEE, 7s. 6d.; or Free if Theoretical is also taken.

Reactions of the following metals.—Silver, lead, mercurous, mercuric, bismuth, copper, cadmium, nickel, cobalt, manganese, zinc, barium, calcium, strontium, magnesium, potassium, sodium, ammonium.

Reactions of the following acids.—Sulphuric, sulphurous, thiosulphuric, hydrosulphuric, hydrochloric, hydrobromic, hydriodic, chloric, hypochlorous, hydrofluoric, nitric nitrous, carbonic, boric, silicic, phosphoric, arsenic, chromic, permanganic, hydroxides, peroxides.

Systematic analysis of mixtures containing not more than four positive and negative radicles.

Volumetric analysis.—Acidimetry and alkalimetry. Standard solutions, their preparation and uses. Use of standard permanganate, silver, nitrate, and sodium chloride solutions.

Preparation of pure salts and their crystallisation.

PRACTICAL INORGANIC CHEMISTRY. (A).

Lecturers, R. H. JONES, M.Sc., F.C.S., and A. BAGULEY, B.Sc., F.I.C., F.C.S.

Stage III., Friday, 7 to 9-30.

FEE, 7s. 6d.

Analysis of complicated mixtures and minerals.

Gravimetric and volumetric analysis.

THEORETICAL ORGANIC CHEMISTRY. (A).

Lecturer, R. H. JONES, M.Sc., F.C.S.

FEE, 7s. 6d.

Stage I., Wednesday, 8-5 to 9-5.

Organic analysis. Vapour density.

Determination of empirical and molecular formulæ.

Hydrocarbons of the methane, ethylene, and acetylene series.

Alcohols. Ethers. Aldehydes. Ketones.

Acids. Amines. Amides. Nitriles.

Amido acids. Lactic acids.

Glycol. Glycerol.

Carbohydrates. Cellulose.

Cyanogen compounds. Urea. Uric acid.

Whenever time permits, the Lectures will be illustrated by experiments.

BOTANY. (A).

Lecturer, JAS. HARRISON, A.R.C.Sc.

FEE, 7s. 6d.

Stage I., Tuesday, 7 to 8.

Stage I., Practical, Tuesday, 8-5 to 9-5.

GENERAL MORPHOLOGY, HISTOLOGY, AND PHYSIOLOGY.

I. The differentiation of the plant-body into root, stem, and leaf

II. The structure of the organs and members.

III. The functions of the various organs; the relation of their structure to their functions.

SPECIAL MORPHOLOGY AND PHYSIOLOGY OF THE ANGIOSPERMOUS FLOWERING PLANT.

The inflorescence and its modes of branching, &c. The morphology of the flower and its organs. The calyx, the sepals, the corolla, the petals, their form and arrangement.

The gynœcium. The structure of the ovule. The processes of pollination and fertilisation. The morphology of the fruit. The structure of the seed, &c.

The concise description of fresh plants, taking the organs in the following order :—

Root.	Corolla.
Stem.	Andrœcium (Stamens).
Leaves.	Gynœcium (Pistil).
Inflorescence.	Ovule.
Bracts.	Fruit.
Flower.	Seed.
Calyx.	Embryo.

A knowledge of the flora of the field, the wood, or the hedgerow is now required, and the Students are instructed with reference to the Principles of Classification.

Stage II., Class by arrangement.

GEOLOGY. (A).

Lecturer, JAS. HARRISON, A.R.C.Sc.

FEE. 7s. 6d.

Stage I., Wednesday, 7 to 8.

The crust of the globe. Rocks and their classification. Minerals and rocks, their characters and composition. Forms of stratification. Denudation, subaerial and marine. Fossils, their nature and mode of preservation. Use of fossils in distinguishing between marine and fresh water strata. The order of succession of the great geological systems, and the leading characteristics of their British representatives. Volcanic, plutonic, and metamorphic rocks. Mineral veins and ore deposits.

HUMAN PHYSIOLOGY. (A.)

Lecturer, JAS. HARRISON, A.R.C.Sc.

FEE, 7s. 6d.

Stage I., Friday, 7 to 8.
Practical, 8-5 to 9-35.

The general build of the body. The blood and its circulation. Food and its digestion. The absorption and distribution of the digested products. Respiration. The muscular system, animal mechanics, and animal heat. The senses. The nervous system.

HYGIENE. (A).

Lecturer, JAS. HARRISON, A.R.C.Sc.

FEE, 7s. 6d.

Stage I., Monday, 7 to 8.
Stage II., Monday, 8-5 to 9-5.

Elementary human physiology.
Water. Air. Food. Soil. Habitations.
Removal of waste and impurities. Personal hygiene. Clothing. Treatment of slight wounds and accidents. Prevention of disease, &c.

LATIN. (A).

Lecturer, F. W. JACKSON, B.A.

FEE, 7s. 6d.

Tuesday, 8 to 9.

Syllabus as prescribed by the Lancashire and Cheshire Union of Institutes.

MUSIC (THEORY). (C).

Lecturer, J. TOMLINSON.

FEE, 7s. 6d.

Elementary, Friday, 7 to 8.
Intermediate, Friday, 8 to 9.
Advanced, Wednesday, 8 to 9.
Syllabus as prescribed by the Lancashire and Cheshire Union of Institutes.

ENGLISH LANGUAGE AND LITERATURE. (C).

Lecturer, A W. ALLEN, M.A.

FEE, 7s. 6d.

Elementary Grade, Friday, 7 to 8.

To write a simple theme or letter—(*all candidates will be required to attempt this*)—of which the handwriting, spelling, and grammar must be good; and to know the elements of English Grammar. Questions will also be set in paraphrasing, and parsing and analysing an ordinary sentence.

Advanced Grade, Friday, 8-5 to 9-5.

(1) To write a short essay or letter. *All candidates will be required to attempt this.*
(2) Modes of making inflexional changes in English words.
(3) Formation of English words from one another.
(4) Prefixes and affixes of Latin and Greek origin.
(5) Parsing and analysis.
(6) Shakespeare's "Julius Cæsar."

Questions will be set on the plot and principal characters of the selected play, the objects being (*a*) to ascertain whether Students have intelligently perused the text, and (*b*) to test their power of expression in clear and idiomatic English.

The grammar questions in (2), (3), (4), (5) will be based upon words, phrases, and sentences which occur in Shakespeare's "Julius Cæsar," Acts I., II., and III. [Any good annotated edition may be used].

NOTE.—Special attention should be given to parsing and analysis; besides questions on the set book, questions on composition and grammar may be given.

TYPOGRAPHY. (C).

Teachers, R. AUSTIN (Medallist) and R. C. PYE (Hons.).

FEE, 7s. 6d.

Theoretical, Wednesday, 7-15 to 8-15.
Practical, Monday, 7-15 to 8-15.

The principles of type-setting and distribution; the Point System of type bodies; composing by hand and by machine; advantages of machine composition for certain classes of work; table and tabular matter; casting up and casting off.

Arrangement of display types in title pages, and in circulars, posters, and other classes of jobbing work; the construction of book work from receipt of corrected matter in galley to the completed forme for press; pagination; margination.

Press proofs; the value of well-pulled proofs; revising and correcting; stereotyping and electrotyping; inks and varnishes.

Uniformity of style for particular classes of composition; the "style of the house."

Designing and composing special catalogues, fashion and sale circulars, &c., in colours, with special attention to harmony of design and colour scheme.

The handling of paper; machine and hand-made papers and the sizes, relative weights, and the value of the same; estimating.

FRENCH. (A).

Lecturer, F. W. JACKSON, B.A.

FEE, 7s. 6d.

Elementary Grade, Tuesday, 7 to 8.
Intermediate Grade, Thursday, 7 to 8.
Advanced Grade, Thursday, 8-5 to 9-5.

Syllabus as prescribed by the Lancashire and Cheshire Union of Institutes.

GERMAN. (A).

Lecturer, H. A. JUTZI.

FEE, 7s. 6d.

Elementary Grade, Wednesday, 7 to 8.
Intermediate Grade, Wednesday, 8-5 to 9-5.

Syllabus as prescribed by the Lancashire and Cheshire Union of Institutes.

PRELIMINARY TECHNICAL COURSE—SECOND COURSE. (C).

ENGLISH.

Lecturer, A. W. ALLEN, M.A.

Wednesday, 8 to 9.

Candidates will be required to write a piece of composition on some subject selected by the Examiner.

PRACTICAL MATHEMATICS AND DRAWING.

Lecturers, JNO. E. ADAMSON and R. L. ADAMSON.

Monday, 7 to 9.

Decimals, Vulgar Fractions, Powers, and Roots, Areas, Elementary Algebra, Ratio, and Proportion, Graphs, Volume.

PRACTICAL DRAWING.

Use of various Drawing Instruments, Scales, Angles, Plane and Curved Surfaces, Triangles, Circles, Solids and Solid Geometry, Hand Sketching of Machine details.

EXPERIMENTAL MECHANICS AND PHYSICS.

Lecturer, H. WHALLEY, B.Sc.

Tuesday, 7-15 to 9-45.

Measurement, Volume, Mass, Relative Densities, Hydrostatics, Statics, Heat.

Building Trades Evening Classes.



BUILDING CONSTRUCTION CLASS ROOM,
TECHNICAL SCHOOL, PRESTON.

Building Trades.

Head of Department, F. J. PYE, A.B.I.C.C., Medallist.
Assistant Lecturer, J. A. BERTWISTLE, Honours.

Assistants :

J. VARLEY, Honours.
J. J. ALLEN, Honours.
JAS. H. BINFIELD, Wh.Ex.
A. C. M. LILLIE, Honours, Medallist.
W. TAYLOR.
R. ROBERTS, Honours.

Students will be admitted to the specialized Courses in Building Trades if they possess the Preliminary Technical Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend the preliminary Courses conducted in the Borough Continuation Schools, *or the corresponding Second Year's Technical Course, which will be conducted for the present in the Technical School.*

In exceptional cases Students may be excused the entrance examinations, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake specialized Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, will be conducted by the Preston Education Committee in their Branch Schools.

Second Year.

FEE FOR COURSE, 5/-.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Practical Mathematics and Drawing	7-0 to 9-0
Tuesday	Experimental Mechanics and Physics	7-15 to 9-45
Wednesday ...	English	8-0 to 9-0

BUILDING CONSTRUCTION.

Third Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Tuesday	Building Construction, Stage I....	7-30 to 9-30	J. A. Bertwistle J. J. Allen R. Roberts
Monday	Practical Mathematics and Mechanics	7-30 to 9-30	J. H. Binfield W. Taylor
Thursday ...	Builders' Geometry	7-30 to 9-30	J. A. Bertwistle W. Taylor

Fourth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Monday	Building Construction, Stage II...	7-30 to 9-30	J. A. Bertwistle J. Varley
Tuesday	Plan Drawing, Mechanics as applied to Building	7-30 to 9-30	F. J. Pye A. C. M. Lillie
Thursday ...	Materials, Hygiene & Sanitation..	7-30 to 9-30	F. J. Pye

Fifth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Wednesday..	Building Construction, Stage III.	7-30 to 9-30	F. J. Pye
Monday	Builders' Quantities, Ordinary Grade	7-30 to 9-30	F. J. Pye
Tuesday	Plan Drawing and Design	7-30 to 9-30	F. J. Pye A. C. M. Lillie

Sixth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Wednesday ..	Building Construction, Stage IV..	7-30 to 9-30	F. J. Pye
Monday	Builders' Quantities, Honours and Specifications	7-30 to 9-30	F. J. Pye
	Architecture or Sanitation		F. J. Pye

BRICKWORK AND MASONRY.

Third Year.

FEE FOR COUSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Friday	Brickwork and Masonry, Ordinary Grade	7-30 to 9-30	J. A. Bertwistle
Monday	Practical Mathematics and Mechanics	7-30 to 9-30	J. H. Binfield W. Taylor
Thursday ...	Builders' Geometry	7-30 to 9-30	J. A. Bertwistle W. Taylor

Fourth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Friday	Brickwork and Masonry, Ordinary or Honours	7-30 to 9-30	F. J. Pye
	Building Construction, Stage I. or II.		
Tuesday	Plan Drawing, Mechanics as applied to Building	7-30 to 9-30	F. J. Pye A. C. M. Lillie

Fifth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT,	TIME.	TEACHERS.
Friday	Brickwork and Masonry, Honours Grade	7-30 to 9-30	F. J. Pye
Monday ...	Builders' Quantities, Ordinary Grade	7-30 to 9-30	F. J. Pye
	Building Construction, Stage II. or III.		

CARPENTRY AND JOINERY.

Third Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Wednesday ..	Carpentry and Joinery, Ordinary Grade	7-30 to 9-30	J. A. Bertwistle J. Varley J. J. Allen
Monday	Practical Mathematics and Mechanics	7-30 to 9-30	J. H. Binfield W. Taylor
Thursday ...	Builders' Geometry	7-30 to 9-30	J. A. Bertwistle W. Taylor

Fourth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Wednesday..	Carpentry and Joinery, Ordinary or Honours	7-30 to 9-30	J. A. Bertwistle J. Varley J. J. Allen
	Building Construction, Stage I. or II.....		
Tuesday	Plan Drawing, Mechanics as applied to Building	7-30 to 9-30	F. J. Pye A. C. M. Lillie

Fifth Year.

FEE FOR COURSE, 7/6.

DAY.	SUBJECT.	TIME.	TEACHERS.
Wednesday..	Carpentry and Joinery, Honours Grade	7-30 to 9-30	J. A. Bertwistle J. Varley J. J. Allen
	Building Construction, Stage II. or III.		
Monday.....	Builders' Quantities, Ordinary Grade	7-30 to 9-30	F. J. Pye

BUILDING CONSTRUCTION.

Stage I.

Instruction will be given as to foundations in ordinary soils, footings for walls of moderate height; the construction of simple scaffolding; the various bonds of brickwork in plain walling, flues, arches, and fire-places; varieties of simple masonry, such as rubble and ashlar walling and the plain masons' work on sills, reveals, &c.; plain carpentry in floor joists, stud partitions, ordinary roofs of span not exceeding that for a King-Post truss; firrings of flats; simple joiners' work in floor laying, skirtings, deal-cased frames and double-hung sashes, and solid frames for simple casements, panelled doors and jamb linings, door frames and ledged and braced doors; ordinary plastering on walls, partitions, and ceilings, and the composition of the various coats; slating, including the dressing, cutting, and

nailing of the slates ; plain tiling and pan tiling and the various methods of hanging the tiles, and the treatment of valleys, hips, ridges, and eaves ; and the meaning of " lap " and " gauge " roof plumbing, including the laying of flats with rolls, drips, &c., lead gutters, and flashings, simple glazing. The nature and properties of sand, lime, and cement ; the composition of mortar or concrete, and its application in floors, walls, &c. ; the properties of bricks, stones, tiles, and slates ; the various kinds of timber in ordinary use ; the constituents of cast-iron, wrought-iron, and steel, and the essential or characteristic differences of their properties.

In all these subjects practical examples of the materials used and the various operations of dealing with them will be brought before the Student, either in the class-room or elsewhere. In as many cases as possible he ought actually to see and handle full-size examples of everything in which he is being instructed theoretically. He should also familiarize himself with the nature and use of all the tools used in the elementary building operations. Students should lose no opportunity to inspect any building operations going on in their locality. Every Student ought to examine in detail the structure of the houses in which he lives and works and attends classes.

Stage II.

Before proceeding to Stage II. Students must have a good knowledge of the subjects included in the above Syllabus for Stage I.

The Course of Instruction in this Stage will cover a more advanced knowledge of all the subjects enumerated for Stage I., together with simple exercises in calculating quantities of materials, not such calculations as a Quantity Surveyor would make, but such as would have to be made by a Foreman of Works who has to order sufficient materials for the amount of work which he knows has to be done.

The class lessons and drawing practice will include the following subjects :—Excavation in various kinds of soils, including strutting and planking, concrete foundations for walls and piers, the use of dampcourses and the materials employed for them ; gauged brickwork ; hollow walls and the various methods of bonding them together ; junctions of walls of various thicknesses and at different angles ; chimney breasts and flues ; irregular bonds ; fire-proof construction in floors and roofs ; the best known building stones, their quarrying, bedding, cutting and dressing : characteristics of timber, its conversion and seasoning. Attention will be given to the increasing use of machinery in treating timber for carpenters' and joiners' work ; advanced carpentry and joinery ; ordinary forms of staircase construction with close strings and bent strings ; two and three-light windows with cased frames and hung sashes, and also with solid frames, mullions, and transoms and casements, outside doors with bolection mouldings, sash doors and the finishings

of door and window openings ; finishing in eaves, hips, ridges, &c. ; the nature, qualities, and weights of various kinds of slates ; elementary drainage ; the laying and jointing of glazed stoneware pipes ; advanced constructional plumbers' work, including cold water supply to cisterns, and the position of the same in a house, baths, sinks, water-closets and their connections, waste pipes, soil pipes, ventilation pipes, &c. ; scaffolding for large buildings, shoring, strutting needling, and under-pinning ; centring for arches up to 15 feet span ; the general principles of loaded beams ; bending moments due to concentrated and distributed loads the use of the triangle and polygon of forces in order to practically determine the resultant force in direction and magnitude, and to resolve such a resultant into its component forces ; the determination of the stresses in simple braced structures ; elementary exercises in the calculation of strength of materials.

Stage III.

The Course of instruction will include the consideration of buildings of all kinds and sizes. In the examination the candidate will be expected to show that he has a fair knowledge of the principles of Physical Science as illustrated in relation to building construction. He should be able to design simple roof trusses and beams, and to draw their stress diagrams ; how to provide for the stresses in various parts of a building, and the methods of inspecting and testing cement, timber, iron and steel ; and the use of formulæ.

In the various sections of the Course, exercises in calculating quantities of materials will be continued as in the preceding Stage.

The class lessons and drawing practice will include the consideration of :—

Foundations—natural and artificial, upon land and under water, damp sites and their treatment. Brickwork, including all kinds of bonding, setting out bond in frontages, &c.

Terra cotta and artificial stone ; their manufacture and uses.

Principles of sanitation ; drains, traps, gulleys, disconnecting chambers, sewers, their ventilation and drain connections, iron drains. Drain testing and ventilation.

Masonry. Character of various stones used in building, and localities where found, how to test for quality and bed, fitness of various stones for different atmospheres, weight generally, approximate strength and chemical composition ; stone stairs, composite walls, arches.

More detailed knowledge of scaffolding, including gantries, elaborate centring, framing for concrete walls and modern methods of hoisting materials, roofing up to 60 feet span. Timber : its

seasoning, diseases, cause of decay, and means of preserving it. Roof timbering, open, hammer beam, and composite trusses. Modern iron trusses, including trussed purlins ; all roof finishings, including slating, tiling, plumbing, &c., sky-lights and lanterns. Wood stairs of all kinds, including handrailing.

Cast-iron, wrought-iron and steel. Properties, uses, strength, weight, and preservation. Iron and steel columns, stanchions and girders, including riveting, bolting, &c. The calculation of bending moments and shearing stresses.

Ventilating and heating ; hot water supply ; provisions for gas and electric supply, in so far as these may affect the structure of the building ; water supply ; lightning conductors ; various kinds of glass and glazing ; plastering in all its branches.

Attention will be specially directed to the increasing use of skeleton construction in steel, and to ferro-concrete construction.

HONOURS.

In addition to more advanced examples of all subjects enumerated in the above Syllabus, instruction will be given in the designing and carrying out of special construction in all classes of buildings.

BUILDERS' GEOMETERY.

The use of drawing-board, tee-square, set-squares, compasses, dividers, &c.

The drawing of parallel and perpendicular lines by the aid of compasses. The construction and measurement of angles. The bisector of an angle and the perpendicular bisector of a line.

The construction of geometrical figures from given data.

The equal and proportional division of lines. Mean proportional, &c. The enlargement and reduction of figures.

The construction and use of scales.

Complementary and supplementary angles. The principles of right-angled triangles. The construction of any triangle having given three elements. Equilateral and isosceles triangles. Triangles solved by being split up into right-angled triangles. Similar triangles.

Properties of the circle, and problems relating to lines and circles, *e.g.*, finding centres, drawing tangents, &c. Application in setting out circular arches, mouldings, simple tracery, ornament, geometrical design, &c.

The angles in a semi-circle, or in any segment of a circle, and the relations which these angles bear to the angles between the chord and the tangent at one extremity.

The area of plane figures, *e.g.*, squares, rectangles, parallelograms, triangles, &c. The length of the circumference and the area of a circle. Experimental proof.

The properties of the ellipse, and problems relating thereto, *e.g.*. drawing normals, tangents, &c. Application in setting out elliptical arches, &c.

Simple examples of geometrical loci, use of tracing paper, squared paper, &c.

The principles of orthographic projection, plans, elevations, and sections of solids, and simple common objects. Problems relating to projections of lines and surfaces, *e.g.*, finding true length and true shape, &c.

The development of the surfaces of solids.

The principles of oblique and isometric projection, with special application to builders' work.

Drawing to scale, in plan and elevation, from given isometric or oblique sketches of common objects or solids, and *vice versa*. Dimensioned freehand sketching, and making scale drawings from the same.

PRACTICAL MATHEMATICS FOR BUILDERS.

Arithmetic.—

Contracted multiplication and division whereby all unnecessary figures may be omitted. Using rough checks in arithmetical work, vulgar and decimal fractions. Square root and squares of numbers. Ratio and proportion. Percentages. Duo-decimals as used in all builders' work, expressing feet and inches as decimals of a yard ; inches as decimals of a foot ; quarters and pounds as decimals of a hundredweight.

The meaning of common logarithm ; use of logarithms in making calculations involving multiplication, division, involution, &c.

Mensuration.—

The rules for the areas of circles, triangles, parallelograms, and all irregular figures, with practical applications.

Determination of the areas of surfaces, and the volumes of solids, such as cones, cylinders, prisms, and pyramids.

Weight and cost of solids of regular form, including brickwork, timber, cost of papering rooms, painting, gravelling paths, covering floors, &c., &c.

Algebra.—

Students will be taught the use of symbols, so as to understand and use any formula. To substitute numerical values for the symbols, and to transpose and simplify algebraic formula and expressions.

Multiplication and division, factors and problems leading to simple equations.

MECHANICS AND GRAPHICS.

Relative densities of materials used in building. Calculation of weights of girders, columns, plates, &c., units of forces, measurement and balancing of forces, representation of forces by lines ; composition and resolution of forces, parallelogram and triangle of forces ; rectangular components of a force, force diagrams. Practical application of the foregoing in simple roof trusses, braced frames, &c.

Resultant of non-concurrent forces, *i.e.*, forces not meeting at a point, also of parallel forces, funicular polygon, reactions at the supports of a beam. Bows notation.

Determination of centres of gravity, by experimental and graphical methods.

The three orders of levers ; the bell crank lever. Moments of forces. Bending moments.

Beams. Relative stiffness and strength in the six standard cases of loading and supporting. Variation of deflection with span, breadth, and depth. Complete test of a beam to breaking.

Use of squared paper. Platting of curves, showing rise and fall of temperature, prices, results of experiments, *e.g.*, relation between stress and strain ; load and effort, &c. Properties and strengths of materials used in construction, *e.g.*, timber, steel, iron, &c., in tension and compression, stress, strain, elasticity, &c.

Co-efficient of friction, effects of friction on structures, &c.

Machines. Simple pulley. Pulley blocks. Cranes and lifting tackle. Lever, wedge, and screw.

PLAN DRAWING, DESIGNING, AND SPECIFICATIONS.

Inking in and colouring drawings.

Making tracings, blue prints, &c.

Detail drawings. The principles of design.

Designing. Designing buildings for various requirements. Finished drawings.

HYGIENE AND SANITATION.

Before taking this subject Students must have obtained at least a First Class in Stage I., Building Construction.

Sanitary legislation.

The site : Aspect—elevation. Hill, plain, and valley.

Winds. Rainfall. Humidity.

Soil and subsoil, and its drainage.

Pollution of soil. Sanitary precautions as to healthiness of site.

Ground air and ground water and their pollution.

Materials considered as to perviousness to moisture.

Conductivity of heat. Durability. Strength. Working. Fire resisting. Cost, &c.

Foundations in various soils.

Walls : hollow walls ; damp-courses ; partitions.

Floors : for basements or cellars ; fireproof, &c.

Roofs : covering ; gutters ; flashing, &c.

Drainage. The proper conditions of good drainage.

Construction. Laying. Traps. Ventilation. Siphonage.

Sanitary fittings.

Typical drainage plans.

Collection and disposal of refuse and sewage.

Drain testing and inspection of drainage work and appliances.

Disposal of surface and drain water.

Disinfection and disinfectants.

Water. Sources of supply.

Physical characteristics of various waters.

Requirements of supply.

Mains. Pipes. Fittings. Storage.

Sources of contamination and protective precautions.

Filtration, softening, and other purifying processes.

Ventilation. Air movements. Sources of pollution.

Principles of ventilation. Air space required in and surrounding buildings. Methods of, and appliances for ventilation.

Lighting. Angle of daylight illumination. Size of windows. Artificial lighting, advantages, and disadvantages.

Heating : Open fires, stoves, hot water, steam, hot air, &c.

Sanitary inspection. Surveys and reports.

BUILDERS' QUANTITIES.

Students will not be allowed to take up this subject unless they have at least passed in the Advanced Stage of Building Construction.

Ordinary Grade.

Taking off ; squaring dimensions, and reducing same ; abstracting ; billing.

The mode of measurement of the following :—

Earthwork and Concrete, including excavation over surface or for trenches and basements ; strutting and planking for same ; concrete flooring and walling.

Drainage, including inspection chambers, pipes, junctions, traps, connections to sewers, &c.

Brickwork, in mortar or cement, including party walls, chimney breasts, boundary walls, trimmer and relieving arches; facings; moulded courses; damp courses; battered or circular work.

Masonry, including solid steps, square and spandril hearths, thresholds, copings, templates, paving.

Slating and Tiling, straight, circular, or vertical, including ridges, hips, and valleys.

Carpentry and Joinery, including windows, doors, staircases, &c.; batten and block flooring; centring; roof, floors, and partitions.

Plumbing and Sink Work, including flats, gutters, cisterns, bath and lavatory fittings, &c.

Smiths' and Founders' Work, including joists and girders; gutters, pipes, and fittings; sashes and frames; casements; iron roofing.

Plasterers' Work, including moulded cornices, enrichments, and soffits; Keene's cement dadoes; Portland cement floors and skirtings.

Painting on iron, woodwork, or walls, external or internal, including distemper, graining, staining, and lettering.

Glazing, including lead lights, &c.

HONOURS GRADE.

To take off quantities, abstract, and bill, from scale-drawings, a section of work comprising any of the following branches of the Building Trade:—

Excavation, Concrete, and Drainage Work;
Bricklaying and Masonry;
Slating and Tiling;
Carpentry, Joinery, and Ironmongery;
Smiths' and Foundry Work;
Plasterers' Work;
Plumbing and Zinc Work;
Gas and Hot Water Fitting;
Painters' and Glaziers' Work;

and price same in accordance with local rates.

Specification for all branches of the Building Trade.

CARPENTRY AND JOINERY.

In addition to lessons in the subjects enumerated below, the student will be instructed in workshop practice, and the method of directing and carrying out the work of his trade.


WOODWORK,
TECHNICAL SCHOOL, PRESTON.
G. DEVEY.

Ordinary Grade.

1. Nature and properties of the various kinds of wood used in Carpentry and Joinery, with the ports or places from which they are obtained. Methods of seasoning and preservation of timber. Strength of timber. Mode of planning and converting materials so as to avoid waste and shrinkage, and obtain the maximum strength or stiffness.

2. Tools—their names, shapes, uses, &c.

3. Mechanical drawing as applied to Carpentry and Joinery. Drawings, full-size, showing shoulder-lines, etc., on the material before it is cut ; and the various joints in Carpentry and Joinery. Setting out rods. Working drawings of panelled and framed and braced doors, door frames and casings, double hung sashes, sliding and hanging shutters, French casements, folding shutters and boxings, rebates or linings for swing doors, etc.

4. A general knowledge of the proportion of stiles, rails, muntins, etc., in doors and windows, height of rails in doors to suit knobs or latches, the usual sizes of doors, windows, etc., and of the kind of material and strength to be used.

5. Mouldings, their forms and names. Intersection of mouldings at different angles, also of straight and circular mouldings. Enlarging and diminishing mouldings. Lines for determining the sections of moulded bars and hip rafters in skylights and lanterns. Method of determining the true section of raking mouldings over square or oblique plans, also when the given moulding is on the rake.

6. Bevels. Finding bevels for hip-rafters, jack-rafters, purlins, splayed linings, raking mouldings, and oblique work generally. Also a knowledge of the method employed to place bevel lines direct upon the work, without making a drawing of the same.

7. Newel and geometrical stairs. Proportion of riser and tread. General planning of stairs. General construction, and methods of support.

8. Technical principles. The principles required in framing roof trusses, timber partitions, trussed girders, bracing large doors, gates, etc. Drawings to scale of the same, showing the comparative strain in different parts by means of graphic statics.

9. Methods of strengthening beams and girders by " flitching " and " trussing," etc. How wood roof trusses are acted upon by cambering the tie beam, and the motive for cambering. Different methods of shoring. Flaying and raking shores.

10. Joints. Mortice and tenon, the proportion tenons should bear to the thickness and width of material. The proportion of the parts of the tusk tenon, the position of mortices with regard to the neutral axis. Joints for oblique timbers, position of the shoulder with regard to the direction of the strain. Trimming round voids in

roof, floors, etc. Different methods of scarfing. Proper position, and kind of straps and bolts used to secure joints.

11. Hinges, various kinds of, and modes of applying them, Centre-pin joint, back-flap, rule joints, etc. Working drawings. showing the path of different parts of the work so as to obtain clearance, etc.

12. A general knowledge of the use of weather boards, water bars, throating, etc., for external work. Particular attention should be paid to the form of joints and manner of hanging French casements and skylights.

13. Plumbing and slating. Preparing and fixing flashings, tilting pieces, forming drips, rolls, cistern heads, etc., for plumber and slater. Construction of flats for lead and zinc—also preparing and fixing angle beads, grounds, etc., for plasterer.

Honours Grade.

Candidates for Honours must have passed in a previous year in the Ordinary Grade.

CARPENTRY AND JOINERY.

In addition to more advanced examples in all the subjects enumerated in the Syllabus of the Ordinary Grade, lessons will be given in the following subjects :—

1. The various methods of constructing centres for segmental, eliptical, parabolic, and other arches, showing the direction of the joint lines of the arch. Fixing and striking large centres.

2. Different forms of scaffolding, staging, and gantries and their construction.

3. Circular work. Method employed to bend boards, ribs, or mouldings round circular work, by kerfing, grooving, steaming, etc. Moulds and bevels required for soffits in straight and circular walls—also for ribs in groins, domes, and nitches, circle upon circle, etc.

4. Stairs. General planning of stairs to clear windows and other obstacles, and to obtain proper head room. Method of finding the proper position of winders and diminished fliers.

5. Handrailing. The proper height of handrails over fliers, winders, and round landings. Method of describing handrail scrolls. The theory and use of tangent planes and tangent lines, as employed in the tangent system of handrailing. Method of determining the position of the face mould plane to pass through three points in the central line of rails—the moulds, bevels, length of balusters, etc.

6. Construction of fittings for churches, shops, and domestic work. Pews and stalls, shop fronts and cases, tables, fitments for butler's pantry, housekeeper's room, etc.

BRICKWORK.

The Course of instruction will include examples of construction in all the subjects given below.

Ordinary Grade.

1. Brick. The names, nature, and properties of the various kinds of bricks in general use, and the purposes for which each kind is specially fitted. The mode of preparing and tempering the clay, moulding and burning the bricks, and testing their quality.

2. Precautions to be adopted in excavations in various soils. Mode of laying drain-pipes.

3. Lime : nature and properties of the different kinds and their use. Cement : methods of making and means of testing. Sand : the relative advantages and disadvantages of pit, river, and sea sand. Proportions of the above for making good mortar. Concrete : its ingredients, method of preparation, and uses.

4. Foundations : the width and height of the footings required for walls of different thicknesses. Damp-courses : the materials used for these and their practical purpose. Air-bricks. The best method of ventilating underground floors. Dry areas, and the method of constructing them and keeping them free from wet.

5. Bond in brickwork. Plans of alternate courses at the angle of walls of different thicknesses, showing English and Flemish bond. Raking bond. Bond at acute and obtuse angles.

6. Brick walls with stone facing. Hollow walls : the methods of constructing and bonding them. Plans of openings in the same.

7. The method of constructing fireplaces, coppers, and ovens, and arrangement of flues. Bond of chimney shafts. Rendering, parging, and coring.

8. Arches. Names of the different kinds and mode of construction. Bond in arches and the description of their several parts, such as soffit, skewback, etc.

9. Paving. Pointing : the comparative merits and demerits of various kinds. Proper composition of black mortar, etc.

10. Tiling. Pantiles, plain tiles, and the method of laying the same and of finishing off the gables, hips, ridges, eaves, etc.

11. General mechanical principles involved in brickwork, the resistance to crushing, and the average weight per foot cube and per rod.

12. Method of measuring brickwork, tiling, paving, concrete, etc., and the quantities of material required per rod square, etc., etc.

Honours Grade.

In addition to more advanced examples in the subjects of the Ordinary Grade, lessons will be given in the following subjects :—

1. Management of works ; rules governing the bonding of brickwork.

2. Shoring, underpinning, house drainage, as required to be done by the bricklayer, and sewer construction.

3. Tunnelling, vaulting, the construction of circular and octagonal bays, niches, domes, etc., and drawings to illustrate the same.

4. Setting out intricate bonding in ordinary and in gauged brickwork generally.

5. Terra cotta : its application to buildings.

MASONRY.

The Course of Instruction will include examples of working, finishing and construction, on all the subjects given below :—

Ordinary Grade.

1. Stone. Description of the various kinds of building stones and their characteristics. Modes of distinguishing sandstones from limestones. Reasons for preferring one to the other in various climates. Varieties of stone suitable for internal work.

2. Description and explanation of the different stone-cutting tools.

3. Rubble work. Ashlar. Flint work. Bonding stones. Precautions to be adopted in setting stonework. Mode of ascertaining natural bed. Reason why this is important.

4. Precautions to be adopted in excavations in various soils.

5. Lime : Nature and properties of the different kinds and their use. Cement : Method of making and means of testing. Sand : The relative advantages and disadvantages of pit, river, and sea sand. Proportions of the above for making good mortar. The proper composition of putty and motar for pointing. Concrete : Its ingredients, method of preparation and uses.

6. Foundation : The width and height of the footings required for walls of different thickness. Damp-courses : The materials used for these and their practical purposes. The best method of ventilating underground floors. Dry areas, and the method of constructing them and keeping them free from wet.

7. Stone walls with brick backing. Hollow walls : The method of constructing and bonding them. Plans of openings in the same.

8. Quoins, copings, cornices, and mode of hoisting large stones, and precautions to be adopted in setting them. Heads and sills.

9. Mouldings. Names and description ; method of cutting the various mouldings ; joints.

10. The general mechanical principles involved in masonry ; the resistance to crushing, and the average weight per foot cube. The method of measuring masonry, and the material required for a given quantity of work.

Honours Grade.

In addition to more advanced examples on the subjects of the Ordinary Grade, lessons will be given in the following subjects :—

1. Management of works.

2. Shoring, underpinning, and scaffolding.

3. Full size drawings showing the proper position in various cases of joints, joggles, dovetails, tenons, etc. Geometrical stairs, and the method of setting out the curves.

4. Vaulting : Names and description of the various kinds, and method of construction, illustrated by sketches. Flying buttresses, their purpose and mode of construction ; spires, etc., etc.

5. Window tracery, generating lines, intersection of mouldings, position of joints, solid angles, &c., circular and octagonal bays, niches, domes, etc., etc.

6. Staircases : General construction and method of support. Landings and means of supporting same when consisting of more than one stone.

7. Arches : Names of the different kinds and mode of construction. Bonds in arches, and the description of their several parts, such as soffit, voussoir, etc.

8. Terra cotta and its application to buildings.

Plumbing Department.

Head of Department: R. SANDERSON.

PLUMBING—*Third Year.*

FEE FOR COURSE, 7/6

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Practical Mathematics	7-30 to 9-30
Tuesday	Experimental Mechanics and Physics	7-15 to 9-45
Thursday	Plumbing—Lecture (Preliminary Grade, City and Guilds of London)	7-0 to 8-30

SYLLABUS.

PLUMBING.

Geometry and Drawing.—The cutting out of sheet lead in various forms for covering dormers, cesspools, dome and turret roofs. Making simple plans, elevations and sections, and rough dimensioned sketches of various details in plumbers' work. Capacity of pipes, cisterns, and cylinders, etc.

Application of Elementary Physics to Plumbers' Work.—Expansion and contraction due to change of temperature. Frost-burst. Hot-water circulation. Heating apparatus. Elasticity of metals. Strength of pipes and boilers. Calculation of bursting pressure and safe load, Flow of metals, as of lead under great pressure, or in lead bossing. The principles of workshop appliances.

Alloys, Solders, etc.—Properties, composition and preparation of different kinds of solders and alloys used in plumbers' work. Fusing points. Means of purification. Fluxes, etc.

The various Tools used by Plumbers.—Their use and maintenance. Reasons for the forms and materials of given tools.

Lead Burning.—Its special advantages. Different methods in use. Precautions to be taken in their use.

The composition and use of cements used in plumbers' work.

The use of Cast and Milled Sheet-lead.—The advantages and disadvantages of each. The use of cast and drawn lead pipes, bends, traps, etc. Tinned and tin-encased pipes. Methods of protecting metals.

Roof Work.—The cutting and straightening of sheet-lead. Lead bossing. The proper formation of gutters, flats, valleys, dormers, turrets, domes, etc., in order to render them damp and water proof. The arrangement of woodwork to secure this object. Flashings, soakers, etc., for rendering weather-proof the junctions of roofs, walls, and chimneys. Methods of conveying rain water from roofs.

Practical Mathematics.

Contracted and approximate methods of multiplying and dividing numbers. Rough checks in arithmetical work, especially with regard to the position of the decimal point. Meaning and uses of logarithms. Evolution of formulæ. Simple Algebra. Problems leading to easy equations. Factors. Simple trigonometry. Meaning of sin A ; cos A ; tan A. Mensuration of the triangle, rectangle, parallelogram, circle, cylinder, cone, and sphere. Areas of irregular plane figures. Uses of squared paper. Interpolation. Probable errors of observation. Average values. Rates of increase. Simple geometry.

Experimental Mechanics and Physics.

The lectures will be freely illustrated by experiments, and the Students will have opportunities of afterwards performing most of these experiments in the Laboratory. The Course will be based on the following Syllabus :

Preliminary.—Units of length, area, mass, and volume.

1. *Volume.*—Use of graduated cylinder and burette ; capacity of a bottle. Volumes of irregular solids determined by displacement of water ; volumes of cone and sphere compared with that of the corresponding cylinder.

2. *Weight.*—Use of the balance and spring balance. Weight of lc.c. and of one pint of water. Areas and volumes determined by weighing.

3. *Relative Density.*—Weights of equal volumes of various liquids and solids. Given the volume and R.D. to find the weight.

4. *Hydrostatics.*—The U tube. The syphon ; head of water. Archimedes' principle ; determination of relative density by weighing in air and in water. The barometer ; the pump. Pressure of gases ; Boyle's law.

5. *Statics.*—The lever; movements; the steelyard; Parallelogram and triangle of forces. Parallel forces; reaction at the supports of a beam; centre of gravity. Inclined plane. Pulleys.

6. *Heat.*—Construction and use of the thermometer. Melting and boiling point; solids, liquids, and gases. Expansion of solids, liquids, and gases; expansion of water. Conduction, convection, and radiation.

TEXT BOOK.—"Elementary Practical Physics," by W. WATSON. Publisher: Longman's. 2s. 6d.

Fourth Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Tuesday	Building Construction, Stage I..... ...	7-30 to 9-30
Wednesday ...	Plumbing, Practical (Ordinary Grade, City and Guilds of London)	7-30 to 9-30
Thursday	Lead Burning, Practical	8-30 to 9-30
Friday.....	Plumbing, Theory	7-0 to 8-15

SYLLABUS.

Application of Science to Plumbers' Work.—Water; soft, hard, sea, and mineral waters, and their effects upon pipes, cisterns, etc. Temporary and permanent hardness. Contamination and purification of water. Head of water. Flow of water in channels and pipes. Calculation of velocities. The syphon, pumps, and hydraulic ram. Movement of air or gas through pipes. The oxyhydrogen and air; hydrogen blow-pipe and the use of compressed gas in cylinders, as applied to plumbers' work.

Cold Water Supply.—Connection of pipes to mains. Methods of fixing pipes. House cisterns: their construction and fittings; valves, taps, water waste preventers, flushing tanks, stop and drain locks, warning pipes, water hammer, air traps, water meters, filters, practical means of protection against frost, tracing leakage.

Hot Water Supply.—Systems of supply, storage, and arrangements for best results. Safety arrangements. The cause and prevention of collapse of cylinders. Cause and prevention of incrustation. Cause and prevention of boiler explosions, their different forms of safety valves. The relations of temperature and pressure.

Pipe Fitting.—The cutting, bending, screwing, jointing, and fixing of iron, copper, and other metal pipes used for hot and cold water supplies, waste pipes, etc.

Sanitary Appliances in common use and the Principles of their action.—Forms and materials for baths, lavatories, sinks, urinals, water-closets, and their fittings. Forms and principles of the various traps used in plumbers' work and the relative advantages. Waving out and syphonage of traps, and methods of preventing the same.

Drainage.—The fitting up and arrangement of soil and waste pipes. Laying out of drainage. Material. Size. Fall. Traps. Inspection and disconnecting chambers. Ventilation of drains, soil, and waste pipes.

PRACTICE.

Marking off and cutting out sheet lead. Pipe bending and wiping joints on lead pipes up to 3-inch diameter. Lead bossing, including internal and external angles up to 6 inches high, and how to execute simple work in leadburning.

BUILDING CONSTRUCTION, Stage I.

The Syllabus of Work is based on that prescribed by the Board of Education.

Fifth Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Hygiene	7-0 to 8-0
	or	
Monday	Building Construction, Stage II.	7-30 to 9-30
Wednesday ...	Plumbing, Practical { Honours Grade, City and Guilds of London }	7-30 to 9-30
Friday	Plumbing, Theory ... { Honours Grade, City and Guilds of London }	8-30 to 9-30

SYLLABUS.

HONOURS GRADE—THEORY.

Water.—Sources of water supply. Qualities and properties of water from deep and shallow wells, springs, and other sources. Storage, filtration, and distribution. Causes and prevention of pollution. Quantity per head required for private supply purposes. Rainfall.

Hot Water Supply and Heating.—Methods of obtaining large supplies of hot water. Calorifiers. Water heaters. Heating buildings by hot water or steam. High and low pressure systems. Sizes of pipes and boilers. Radiating surface of heaters. Heating surface of boilers.

Ventilation.—Different systems of ventilation for private dwelling-houses and public buildings. Pressure and vacuum systems.

Sanitary Appliances.—The arrangement and fitting of sanitary appliances in hospitals and other public buildings.

Drainage.—Setting out, construction, and principles of town and country house drainage. Construction of sewers. Storm overflows. Sewage gases and ventilation. Methods of sewage disposal for isolated country houses. Access to and cleansing of drains. The testing of soil-pipes, drains, etc., by smoke, water, chemicals, or air pressure.

Plans and Specification.—The preparation of specifications and quantities, and making of working drawings to scale. Measuring work. Local authorities' bye-laws and regulations.

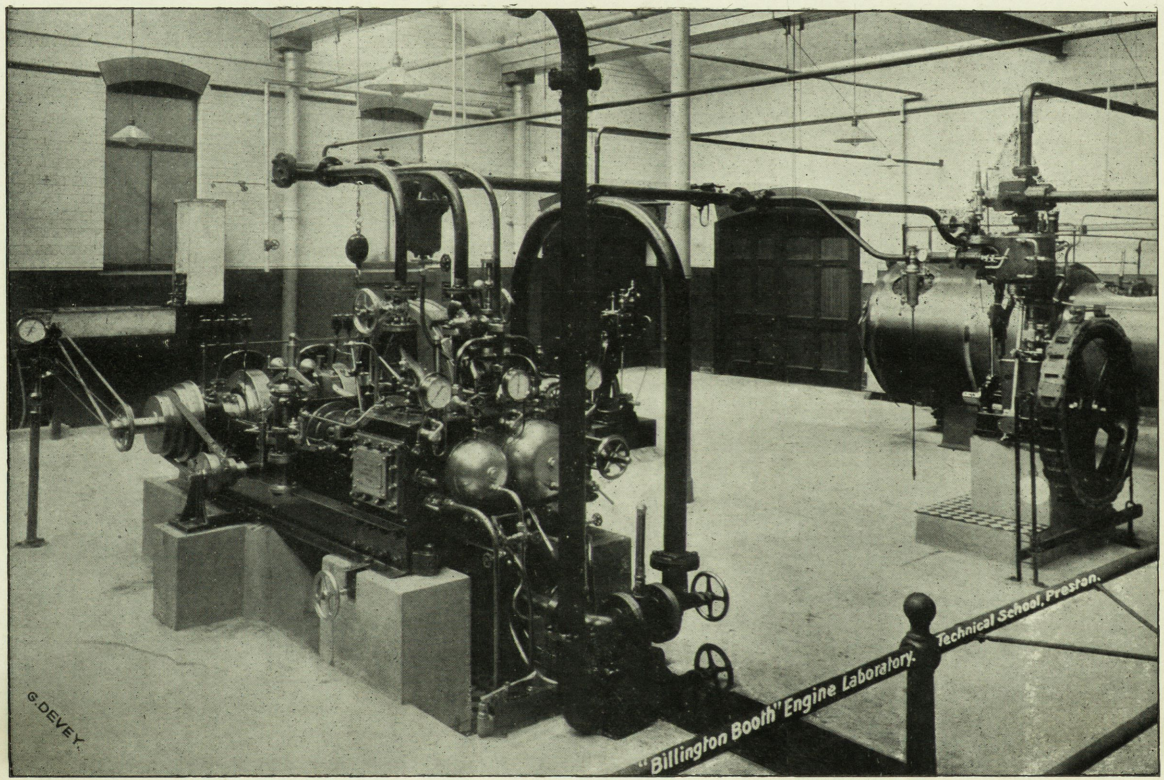
Practice.

The bending and jointing of all sizes of lead pipes. Making of rain-water pipe heads. Lead bossing. Covering of finials, etc. Lead burning as required for chemical purposes

Building Construction and Hygiene.

The Syllabus of Work is based on that prescribed by the Board of Education.

Mechanical Engineering Evening Classes.


G. DEVEY.
"Billington Booth" Engine Laboratory. Technical School, Preston.

Mechanical Engineering Department.

Head of Department, Ed. C. Moyle, A.R.C.S., A.M.I.M.E., Wh.Ex.

Assistant Lecturers, James H. Binfield, Wh.Ex.
F. W. Walker, Dip. M.E.

Assistants for Drawing Office and Laboratory Work :

W. Allsup. H. Penswick. F. Moss.
S. Heppell. P. Seed. W. Berry
D. Atherton.

Practical Engineer, J. Jenkins, late R.N.

Students will be admitted to the specialized Courses in Mechanical Engineering if they possess the Preliminary Technical Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend the Preliminary Courses conducted in the Borough Continuation Schools, *or the corresponding Second Year Technical Course, which will be conducted for the present in the Technical School.*

In exceptional cases Students may be excused the entrance examinations, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake specialized Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, will be conducted by the Preston Education Committee in their Branch Schools.

Second Year.

FEE FOR COURSE, 5s.

TIME TABLE.

SUBJECT.	DAY.	TIME.
Practical Mathematics and Drawing	Monday ...	7-0 to 9-0
Experimental Mechanics and Physics	Tuesday.....	7-15 to 9-45
English	Wednesday ...	8-0 to 9-0

MECHANICAL ENGINEERING.

Third Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

SUBJECT.	DAY.	TIME.	LECTURER.
Practical Mathematics, Section I.	Monday.....	7-30 to 9-30	J. H. Binfield
or			
Practical Mathematics, Stage I....	Monday.....	7-30 to 9-30	F. W. Walker
Machine Drawing, Stage I. ...	Tuesday or Thursday...	7-30 to 9-30	J. H. Binfield
Applied Mechanics, Stage I.— Lecture ...	Wednesday	7-15 to 8-15	F. W. Walker
,, ,, Laboratory...	,, ...	8-15 to 9-45	F. W. Walker

Syllabus for Third Year Course.

Practical Mathematics.

Section I.

This Course is intended for all categories of Technical Students, being a combination of Preliminary Practical Mathematics and Practical Geometry, forming a continuation of (and including revision of) the Course in Elementary Practical Mathematics and Drawing, which forms part of the Second Year Technical Course.

Stage I.

Contracted and approximate methods of multiplying and dividing numbers. Rough checks in arithmetical work, especially with regard to the position of the decimal point. Meaning and uses of logarithms. Evolution of formulæ. Simple Algebra. Problems leading to easy equations. Factors. Simple trigonometry. Meaning of sin A ; cos A ; tan A. Mensuration of the triangle, rectangle, parallelogram, circle, cylinder, cone, and sphere. Areas of irregular plane figures. Uses of squared paper. Interpolation. Probable errors of observation. Average values. Rates of increase. Simple geometry.

Machine Construction.

General Introduction to machine drawing, plans and elevations of simple parts. Methods and conventions of projecting views.

Freehand sketches of machine details.

Workshop processes.

Use of rivets, screws, keys, and cotters.

Elementary work connected with construction of machines. Properties of materials used in construction.

Tracing and blue printing.

Drawing of parts of engines, boilers, machine tools, &c.

Applied Mechanics.

Ideas of force and how measured. Representation of forces by lines. Resultants and components. Application to easy problems. Equilibrium. Polygon of forces. Centre of gravity.

Friction. Work. Velocity. Acceleration. Work done by varying force. Work diagrams.

Simple machines used for lifting. Hydraulic machines. Strength of materials. Stress. Strain. Elasticity. Measurement of stresses and strains. Vernier.

Elementary hydraulics.

Laboratory Work.

Uses of measuring instruments, *e.g.*, micrometer gauges, verniers, &c. Uses of squared paper in the laboratory. Verification of

fundamental principles of mechanics, *e.g.*, polygon of forces, law of moments, &c. Testing of various machines. Determination of strengths of wires and beams. Centroids of areas. Hydraulic experiments. Friction.

Fourth Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.	LECTURER.
Tuesday	Practical Mathematics, St. II...	7-30 to 9-30	F. W. Walker
Wednesday	Machine Construction, St. II. ...	7-30 to 9-30	J. H. Binfield
Friday	Heat Engines, St. I.—Lecture..	7-15 to 8-15	F. W. Walker
,, ...	,, ,, ,, Laboratory..	8-15 to 9-45	F. W. Walker

SYLLABUS.

A more extended knowledge of the work of the Third Year, together with the following :—

PRACTICAL MATHEMATICS.

Centre of gravity. Guldinus' Theorem. The x, y, and r, e, co-ordinates of a point. Plotting functions, such as $y = ax^n$, $y = ae^{bx}$. Exercises on rates of increase.

Finding $\frac{dy}{dx}$ when $y = A\,x^n$. Maximum and minimum values. Solution of equations by squared paper. Linear laws.

Tabulation of $\frac{dy}{dx}$ and $y - dx$.

Geometry and Trigonometry.

Scalar and Vector quantities.

MACHINE CONSTRUCTION.

Freehand sketching of details from models and actual machines.

Design of cotters, keys, rivetted joints.

Design of slide valves. Valve diagrams. Valve setting.

Drawing and construction of details of engines, boilers, machine tools, mill works, and general fittings.

General constructional work. Design of gearing.

Strength of stiffness of shafts, beams, boiler shells, bolts, rivets, cotters, and keys.

Straining actions due to gravity, inertia, and fluid pressure.

Design of some machine or engine detail.

Heat Engines.

Details of steam, gas, and oil engines.
The slide valve. Reversing motions.
Action of fly-wheel and governor.
Condensers. Condensing water required.
Condensation in the cylinder. Effect of drainage.
Steam jacketing. Superheating.
Types of boilers : Their construction. Boiler fittings.
Heating value of solids and gaseous fuels : Total and latent heats of steam.
Forms of energy.
Combustion and smoke prevention.
Steam turbines.

Laboratory Work.

Experiments on latent and specific heats. Boyle's law. Temperature and pressure of steam. Indicated and brake horse-power of steam and gas engines. Planimeter work. Heating values of gas and coal. Steam consumption.

Fifth Year.

Fee for Course, 7s. 6d.

TIME TABLE.

SUBJECT.	DAY.	TIME.	LECTURER.
Strengths of Materials and Theory of Structures	Monday.....	7-15 to 8-15	E. C. Moyle
or Hydraulics and Theory of Machines	Friday	7-15 to 8-15	E. C. Moyle
Heat Engines	Wednesday	7-15 to 8-15	E. C. Moyle
Mechanical Engineering—Laboratory...	Wednesday	8-15 to 9-45	E. C. Moyle
,, ,, ...	Monday.....	8-15 to 9-45	E. C. Moyle
Practical Mathematics	Tuesday	7-30 to 9-30	F. W. Walker

Syllabus for Fifth Year Course.

A more extended knowledge of the work of the Fourth Year, together with the following :—

THEORY OF STRUCTURES AND STRENGTHS OF MATERIALS.

Engineers' theory of bending. Bending and twisting combined. Torsion. Application of theory to design.

Principles of graphic statics. Moments of inertia. Bending moment and shearing force diagrams. Stresses in the various parts of a trussed structure. Girders.

Properties of materials. Testing machines. Direct and transverse stress. Fatigue. Hooke's law. Wohler's tests. Behaviour of materials under tensile, compressive, and torsional stress.

Elementary knowledge of strength of reinforced concrete.

Effect of form of cross-section and length of strut or pillar, and effect of fixing the ends.

Designs of simple cottered joints, and rivetted joints in single and double shear. Elementary knowledge of what occurs in masonry and metal arches.

Application of mathematics to easy examples on work, power, velocity, acceleration, and force.

HYDRAULICS AND MACHINES.

Changes of pressure and velocity along the steam lines in fluids, and in the various parts of a centrifugal pump or turbine. Gauge notches, Friction in pipes, Hydraulic Lifts, &c.

Machines. Velocity ratio. Mechanical advantage and efficiency. Effect of friction. Overhauling. Sliding and rolling friction. Slipping of a belt. Dynamics of the fly-wheel. Balancing.

Mechanisms. Epicyclic gears, with their applications to motor cars, spinning, &c.

Reciprocating motions and vibrations (linear and angular), measurement of torsional rigidity.

PRACTICAL MATHEMATICS.

Trigonometry.—Proofs of fundamental formulæ, as :—

$\text{Sin } A + B = \sin A \cos B + \cos A \sin B.$

Sine Rule or $\dfrac{\sin A}{\sin B} = \dfrac{a}{b}$ for triangles.

Area of a triangle $= \frac{1}{2} ab \sin C.$

Mensuration.—More advanced work. Solids of revolution.

Use of squared paper—The plotting of functions including such as $y = ax^n$; $y = ae^{bx}$; $y = \text{a sin } (cx + d)$; $y = ae^{bx} \sin (cx + \text{d})$.

Testing observed results for laws like $pv^n = c$; $y = a + bx^2$; $xy = bx + cy$.

Maximum and minimum problems. Vectors. Scalar and vector products.

Proofs of the rules for finding the differential co-efficient of y with respect to x that is, $\frac{dy}{dx}$, when y and x are related in the following ways :—

$y = ax^n$; $y = ae^{bx}$; $y = a \cos (bx + c)$; $y = a \sin (bx + c)$; $y = A \log (x + a)$.

Differentiation of a product or quotient of two functions, or function of a function.

Integration.

The expressions for the integrals of

ax^n, ae^{bx}, $A/(x + a)$, $A \sin (ax + b)$, $A \cos (ax + b)$.

Integrating by parts and by substitution and other simple devices. Finding areas of curves and surfaces and volumes requiring these integrals. The solution of easy differential equations. Illustrations of the use of the calculus in many kinds of study, more especially in physics and engineering. When x and y are tabulated, to find for a particular value of x the value of dy/dx.

Special attention to be paid to graphical methods of integration, using squared paper ; the construction by graphical methods of curves from a given law of slope, this law being given by means of a curve, or by a simple Algebraic expression, or by means of a simple differential equation.

Heat Engines.

Construction of steam boilers. Steam, gas, and oil engines, and their details.

Valve diagrams and valve setting. Reversing gears. Link motions.

Balanced valves, piston valves, and double-ported valves.

Corliss valves, drop valves, and various trip gears.

Governor and fly-wheel. Methods of governing.

Hypothetical indicator diagram.

Various forms of energy. How much leaves the boiler ; how much indicated in cylinders. Various losses.

Indicator and its errors. Combining of diagrams. Testing of steam engines. Willan's rule of law. Balancing of engines. Calorific value of fuels. Boiler efficiency ; super-heaters.

Steam turbines. Construction and theory of Rateau, Curtis-De Laval, and Parson turbine.

Binary vapour engines.

LABORATORY.

Mechanics.—Testing of machines. Determination of moduli of elasticity and rigidity, using various methods. Determination of accelerative force of gravity. Coiled friction. Strength of beams, Vibration of springs. Energy in a rotating wheel. Hydraulic experiments. Experiments on centrifugal force, fluid and solid friction, impact, &c.

Heat Engines.—Relation between temperature and pressure of steam. Heating value of coal, oil, or gas by calorimeter. Evaporation in steam boiler. Efficiency of boiler. Measurement of coal and water used.

Indicated and brake horse-power of steam engine.
Steam consumed and mechanical efficiency.
Testing of indicator springs and pressure gauges.
Indicating the steam engines under different loads.
Use of planimeters in averaging indicator diagrams.
Determination of the dryness of steam by calorimeter.
Mechanical efficiency and gas consumption of gas engines.
Heat lost in jacket and exhaust.
Experiments with injectors, feed pumps, and lubricating oils.

Sixth Year.

FEE FOR COURSE 7s. 6d.

TIME TABLE.

SUBJECT.	DAY.	TIME.	LECTURER.
Calculus for Engineers	Tuesday.....	7-15 to 8-15	E. C. Moyle
Heat Engines	,, ...	8-15 to 9-15	E. C. Moyle
Mechanical Engineering—Laboratory...	Wednesday	8-15 to 9-45	E. C. Moyle
Strength of Materials and Theory of Structures	Friday	8-15 to 9-15	E. C. Moyle
Hydraulics and Theory of Machines	,, ...	7-15 to 8-15	E. C. Moyle

Syllabus for Sixth Year Course.

CALCULUS FOR ENGINEERS.

Engineering problems involving the use of the differential and integral calculus will be specially dealt with.

Heat Engines.

Radial gears and link motions. Thermo-dynamical laws. Governors and fly-wheels. Theory of gas and oil engines. Construction and theory of steam turbines. Flexible shaft of De Laval turbine, and critical speed. Diverging nozzle. Boilers. Combustion. Binary vapour engine and exhaust steam turbines. Vibrations. Balancing. Strength of Rotating Discs.

Theory of Structures and Strength of Materials.

Graphical statics involving forces not coplanar. Testing of Materials. Beams and Girders :—Bending Moment. Shear forces and deflections. Relations between curvature, slope, and deflection. Graphical determination of deflection. Resilience of beams. Design of struts. Effect of non-axial loading. Distribution of shear stress across any section of a loaded beam. Thick cylinder theory. Principal stresses and strains. Results of recent research into the action of metals when stressed. Surcharged and non-surcharged retaining walls. Reinforced concrete. Approximate theory. Masonry and metal arches. Strain energy, method of dealing with the latter.

Hydraulics and Machines.

Friction of fluids. Whirling fluids. Bernoullis Theorem. Impulse and reaction turbines. Centrifugal pumps. Hydraulic power transmission. Mechanism. Kinematics and Kinetics of machines. Velocity and acceleration diagrams. Theory of fly-wheels. Belt transmission and effects of Centrifugal force in belts and rims of pullies. Vibrations.

Laboratory Work.

Continuation of the work of the Fifth Year with more advanced work on the testing of Heat Engines, fuels, and materials.

Exhibitions, Scholarships, and Prizes.

A Certificate or Diploma will be issued to all Students who satisfactorily complete a Five Years' Course. The award of the Diploma will depend on attendance, school and home work, and examination results. These Diplomas may be endorsed by the Board of Education.

Scholarships and Prizes will be awarded by the Institute. (See page 197, General Prospectus.)

The following advantages are open to be competed for by Students of the Institute :—

Thirty Whitworth Exhibitions of the value of £50 each are awarded annually to Students of Mechanical Engineering.

Six National Scholarships and seven Royal Exhibitions, value £50 per annum, and tenable for three years at the Royal College of Science, South Kensington, awarded on the results of the Board of Education Examinations. Full particulars and Entry Forms for these and other Prizes and Scholarships may be obtained from the Head of the Department.

Text Books, Note Books, and Instruments Required.

Third Year.

TEXT BOOKS.

	s.	d.	
"Practical Mathematics for Beginners," by F. CASTLE ...	1	11	net
"Machine Construction and Drawing," by F. CASTLE...	3	5	net
"Applied Mechanics for Beginners," by DUNCAN ...	1	11	net

NOTE BOOKS.

4 Students' Note Books, $\frac{1}{10}$ in. ruling 2 Students' Note Books, $\frac{1}{8}$ in, ,, 1 Technical Note Book, $\frac{1}{8}$ in. ,, 2 Technical Note Books, $\frac{1}{10}$ in. ,,	Total	2	0	net
1 Standard Type of Laboratory Book		0	9	net

INSTRUMENTS.

Drawing instruments, set squares, protractor, pencils (HH and HHH) and rubber.

Fourth Year.

TEXT BOOKS.

	s.	d.	
"Practical Mathematics," by SAXELBY...	4	11	net
"Machine Drawing," Part 3, by JONES...	3	0	net
"Steam Engineering," by W. PULLEN	4	11	net

NOTE BOOKS AND INSTRUMENTS.

Same as Third Year.

Fifth and Sixth Year.

TEXT BOOKS.

	s.	d.	
"Applied Mechanics," by A. LOW	... 7	6	net
"Applied Mechanics," by J. PERRY ...	... 5	8	net
"Practical Mathematics," by SAXELBY ...	... 4	11	net
"Steam, Gas, and Oil Engines," by J. PERRY ...	... 7	6	net

NOTE BOOKS AND INSTRUMENTS.

Same as Third Year.

WORKS OF REFERENCE.

Low and Bevis "Manual of Machine Drawing and Design" (Longman's); R. H. Smith's "Cutting Tools"; Hasluck's "Metal Turner's Handbook"; Shelley's "Workshop Appliances"; Crompton's "First Lessons in Metal Turning"; Northcott's "Lathes and Turning"; Cotterill's "Applied Mechanics" (Macmillan); Blaine's "Hydraulic Machinery"; Cotterill's "Steam Engine"; Ripper's "Steam Engine"; Seaton's "Manual of Marine Engineering" (Griffin); Sennett and Oram's "Marine Steam Engine" (Longman's); Wilson's "Steam Boilers"; Donkin, "The Heat Efficiency of Steam Boilers" (Griffin & Co.); Robinson's "Gas and Petroleum Engines"; Unwin's "Machine Design"; Kennedy's "Mechanics of Machinery"; Adams' "Handbook for Mechanical Engineers"; Moray and Biggs' "Mechanical Engineering"; "The Steam Engine," by Prof. Ewing; Article, "Hydraulics" ("Encyclopædia Britannica," published separately); Marks' "Hydraulic Machinery"; Mechanical Engineering," by W. S. Lineham (Chapman & Hall); "The Gas Engine," by D. Clerk; "Strength of Materials," by Prof. Ewing; "The Balancing of Engines," by W. E. Dalby (Arnold); "Strength and Elasticity of Structural Members," by R. T. Woods (Arnold); "Mechanism," by S. Dunkerley (Longman's).

All Fees must be paid in advance, and Students must obtain the official receipt and show the same to the Teacher before their names can be entered on the Register.

All Students must see the Principal prior to filling up the Form for enrolment. He can be seen for this purpose at the Technical School, Corporation Street, on Monday and Tuesday evenings, 12th and 13th September, and at the Harris Institute, Avenham, on Wednesday evening, the 14th.

The Staff will also be present on the above nights to advise Students as to Courses of Instruction, Text Books, &c.

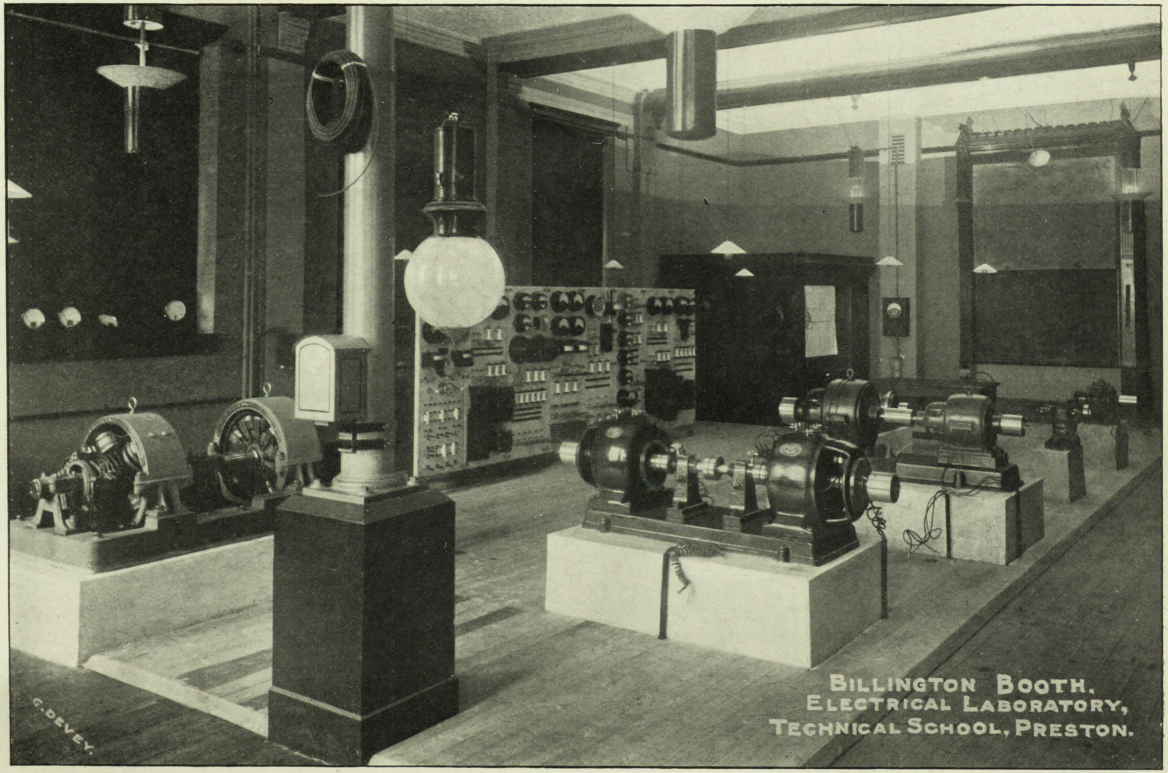
An Entrance Examination will be held on Friday evening, the 9th September.

A Student who does not desire to take a full Course and can prove to the satisfaction of the Principal and Head of Department that he can benefit by instruction in a certain subject or subjects, may be allowed to attend at a fee of 7s. 6d. per subject, lecture or practical.

Students who enter for Courses must clearly understand that they will be required to attend all the subjects regularly, otherwise they will be compelled to pay a fee of 7s. 6d. for each subject taken. *This rule will be strictly enforced.* In the case of Second Year Technical Students the fee would be 5s.

The Teachers are authorised to report periodically through the Principal as to the attendance and homework of each Student. The Council shall have power in dealing with Students who are unsatisfactory in either of these respects to remove their names from the Register without return of fee.

Physics and Electrical Engineering Department Evening Classes.



BILLINGTON BOOTH.
ELECTRICAL LABORATORY,
TECHNICAL SCHOOL, PRESTON.

Physics and Electrical Engineering Department.

Head of Department : G. E. GITTINS, A.I.E.E.

Assistant Lecturers : A. W. HOLDEN (Honours Medallist City and Guilds).
H. WHALLEY, B.Sc.

Demonstrators : A. WOODS (Honours City and Guilds).
D. ATHERTON (Honours City and Guilds).

INTRODUCTION.

The Classes in this Department fall under two heads :—

Physics and Electrical Technology.

The Classes in Pure Physics are the Elementary Course in Heat, Light, and Sound ; and the Elementary and Advanced Courses in Magnetism and Electricity. A Special Course in Experimental Mechanics and Physics forms part of the Second Year Preliminary Technical Course, obligatory for all Students entering on the study of a Trade subject.

Students will be admitted to the Specialized Course in Electrical Engineering if they possess the Preliminary Technical Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend the Preliminary Course conducted in the BoroughContinuation Schools, *or the corresponding Second Year's Technical Courses, which will be conducted for the present in the Technical School.*

In exceptional cases, Students may be excused the Entrance Examination, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake Specialised Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose arranged so as to cover two years will be conducted by the Preston Education Committee in their Branch Schools.

Second Year.

FEE FOR COURSE, 5s.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Practical Mathematics and Drawing	7-0 to 9-0
Tuesday	Experimental Mechanics and Physics	7-15 to 9-45
Wednesday ...	English	8-0 to 9-0

ELECTRICAL TECHNOLOGY.

There are Elementary, Advanced, and Honours Courses in this subject (see Organised Courses) for those who are engaged in, or preparing to enter, Electrical Trades, and for those who desire to be better acquainted with this branch of Engineering on account of the important part it plays in other trades.

No Student may take up the Advanced or Honours Grade unless he has previously obtained a success in the next lower grade. Those prepared to enter one of the Specialised Courses must take up the subjects laid down, and no deviation, except under very special circumstances, will be permitted.

A special Course of Lecture and Laboratory Work has been arranged to meet the requirements of Textile Students. *See page* 154.

The Courses of Instruction will be based on the following Syllabus :—

CITY AND GUILDS—ELEMENTARY GRADE.

1. *Electrical Measurements.* — Applications of Ohm's law. Simple methods of measuring resistance, E.M.F. and current. Chief types of ammeters, voltmeters, wattmeters, and supply meters.

2. *Electrical Properties of Materials.*—Conductors and insulators. The effect of commonly occurring conditions, such as moisture, heat, &c. Conditions which hasten deterioration.

3. *Magnetic Properties of Materials.*—The magnetisation of iron by electric currents ; permeability ; the law of ampere turns ; electro-magnets and simple applications of the principle of the magnetic circuit.

4. *Secondary Batteries.*—The various types ; their installation and practical treatment. Precautions in charging and discharging. Testing state of cell by hydrometer and voltmeter.

5. *Electric Lighting.*—Carbon and metal filament lamps. Nernst lamps. Arc lamps. Current and voltages required by the more commonly used glow lamps. Methods of testing. Photometry and illumination.

6. *Electrical Machinery.*—C.C. and A.C. motors ; general principles of action ; the practical importance of the back E.M.F. and conditions of producing it ; field windings and their connections with the armature and the supply circuit ; the more commonly occurring causes of breakdowns and their remedies ; care of commutators. Starting switches ; no voltage and overload release devices ; principles involved. Field breaking switches.

C.C. and A.C. Dynamos : their installation and running ; regulation by resistance in field circuit ; principles involved. Testing of motors and dynamos for insulation ; temperature tests under load ; testing for faults.

CITY AND GUILDS—ORDINARY GRADE.

Continuous Current.—Scientific and commercial units and measurements.

Measuring instruments and testing.

The electric and mechanical properties of materials ; conductors, insulators.

The magnetic properties of materials ; laws of the magnetic circuit and calculations thereon.

C.C. Generators and Motors ; principles of and essential parts ; elements of design and simple calculations connected therewith ; calculations of and tests for losses and efficiencies.

Secondary batteries ; principles of ; usual forms ; testing, setting up and maintenance.

Electric lamps and lighting ; glow, arc, mercury vapour, and other lamps ; principles involved, use and testing.

Power transmission and distribution by continuous currents.

Electric traction by continuous currents.

Alternate Current.—Principles of alternate current working ; elementary mathematical theory ; units and simple measurements.

Alternate current power, principles and details of measurement of.

A.C. Generators and Motors ; principles of and essential parts, elements of design and simple calculations connected therewith ; various types of motors ; circle diagrams ; testing.

Transformers and converters ; necessity for ; various types ; elements of design ; simple calculations concerning ; testing.

Power transmission and distribution by alternate currents.

Electric traction by alternate currents.

City and Guilds—Honours Grade.

Numerical and mathematical questions on the design, working and testing of electrical apparatus ; questions upon the winding of magnets and armature coils, properties of materials, losses in machinery, and the action of instruments.

Electrical Machinery Design.—Properties of materials, design, manufacture and testing of C.C. and A.C. generators and motors, transformers and regulators.

The Electrical Laboratory contains the following experimental plant, together with the necessary measuring instruments :—

Motor generator set, the generator side compound wound with the shunt field divided into sections, 5 K.W. capacity.

Two three-phase rotary converters, compound wound, direct coupled, 4 K.W. capacity.

Experimental alternator, ten pole rotating field, capable of single-phase, two-phase, or three-phase connections, direct coupled to shunt motor, 4 K.W. capacity.

Three-phase induction motor, with short circuit rotor, 3 h.p.

Single-phase induction motor, with slip-ring rotor, $1\frac{3}{4}$ h.p., $\frac{1}{2}$-h.p. shunt motor.

A new Physics Laboratory has been laid out and thoroughly equipped, and the dark room fitted with a Simmance-Abady Flicker Photometer and Spectrometer Bench.

Laboratory Note Books.

Students taking a Laboratory Course must provide themselves with a Regulation Note Book (which may be obtained from the Custodian), in which to enter an account of each experiment performed. It is imperative that Students should keep a permanent record of their work, and the Teachers have instructions to examine the Note Book before starting a Student on a new experiment.

ELECTRICAL ENGINEERING ORGANISED COURSES.

First and Second Years (See Preliminary Course).

Third Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.	LECTURER.
Monday	Practical Mathematics	7-30 to 9-30	F. W. Walker
Wednesday	Applied Mechanics, St. I.—Lecture...	7-15 to 8-15	F. W. Walker
,, ...	,, St. I.—Laboratory	8-15 to 9-45	F. W. Walker
Thursday	Magnetism and Electricity, St. I.—Lecture...	7-15 to 8-15	H. Whalley
,, ...	Magnetism and Electricity, St. I.—Laboratory.	8-15 to 9-45	H. Whalley

SYLLABUS.

PRACTICAL MATHEMATICS.

Contracted and approximate methods of multiplying and dividing numbers. Rough checks in arithmetical work, especially with regard to the position of the decimal point. Meaning and uses of logarithms. Evaluation of formulæ. Simple algebra. Problems leading to easy equations. Factors.

Simple Trigonometry, meaning of sin A ; cos A ; tan A ; mensuration of the triangle, rectangle, parallelogram, circle, cylinder, cone, and sphere. Areas of irregular plane figures. Uses of squared paper. Interpolation. Probable errors of observation. Average values. Rates of increase. Simple geometry.

APPLIED MECHANICS.

Ideas of force and how measured. Representation of forces by lines. Resultants and components. Application to easy problems. Equilibrium. Polygon of forces. Centre of gravity.

Friction. Work. Velocity. Acceleration. Work done by varying force. Work diagrams.

Simple machines used for lifting. Hydraulic machines. strength of materials. Stress. Strain. Elasticity. Measurement of stresses and strains. Vernier.

Elementary Hydraulics.

Laboratory Work.

Uses of measuring instruments, *e.g.*, micrometer gauges, vernier, &c. Uses of squared paper in the laboratory. Verification of the fundamental principles, *e.g.*, polygon of forces ; law of moments, &c. ; testing of various machines ; determination of strengths of wires and beams. Centroids of area ; hydraulic experiments ; friction.

Magnetism and Electricity.

The lectures, freely illustrated by experiments, will be based upon the following syllabus :—

Magnetism.—Properties of magnets ; artificial magnets, how made ; the mariner's compass ; the earth as a magnet.

Current Electricity.—The elementary cell. Polarisation. Local action. Bunsen, Daniell, and Leclanché cells. The storage cell. Properties of a current, heating effect, chemical effect, and magnetic effect ; the measurement of currents by various methods. Resistance and its measurement.

Electrostatics.—Positive and negative electrification ; electrostatic induction ; gold leaf electroscope ; the electrophorus ; the electric field ; tubes of force ; condensers ; potential.

Text Book : "Magnetism and Electricity for Beginners," by H. E. Hadley (Macmillan), 2s. 6d.

Laboratory Work.

Magnetism.—The making of artificial magnets ; mapping lines of force ; location of magnetic poles ; determination of angle of dip ; strength of magnetic fields ; comparison of magnetic moments.

Current Electricity.—Use of galvanometers, Wheatstone's bridge, post office box, potentiometer ; verification of laws of electrolysis, Ohm's laws ; determination of specific resistances, internal resistances of cells, electro-motive forces, electro-chemical equivalent, mechanical equivalent.

Electrostatics.—Use of gold-leaf electroscope, electrophorus, and proof plane—investigation of potential ; capacity of charged conductors ; seat of charge ; distribution of charge on surface of a conductor—charging by induction ; investigation of indirect charges ; making and use of condensers.

Fourth Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.	LECTURER.
Thursday	Machine Construction, St. I. ...	7-30 to 9-30	J. H. Binfield
Wednesday	Practical Mathematics, including Electrical Calculations	7-15 to 8-15	H. Whalley
Tuesday	Electrical Engineering, Elementary Lecture (City and Guilds of London)	7-15 to 8-15	A. W. Holden
,, ...	,, Laboratory ...	8-15 to 9-45	A. W. Holden

MACHINE CONSTRUCTION.

General Introduction to machine drawing, plans and elevations of simple parts. Methods and conventions of projecting views.

Freehand sketches of machine details.

Workshop processes.

Use of rivets, screws, keys, and cotters.

Elementary work connected with construction of machines. Properties of materials used in construction.

Workshop processes. Tracing and blue printing.

Drawing of parts of engines, boilers, machine tools, &c.

PRACTICAL MATHEMATICS, INCLUDING ELECTRICAL CALCULATIONS.

Logarithms. Equations and problems involving them. Algebraic manipulation generally. Elementary trigonometry. Calculation of areas and volumes. Graphical methods and use of squared paper. Determination of laws. Use of tables of sines, cosines, and tangents. Position of a point in space. Elementary differentiation and integration.

Application of the above processes to the solution of electrical problems, including resistance of conductors. Ohm's law and its applications. Sizes of cables. Elementary problems on dynamos and motors, losses, efficiency, distribution.

TEXT BOOK : " A Course in Practical Mathematics " (Longman), F. M. Saxelby. 6s. 6d.

Electrical Engineering.

Syllabus.

Electrical units and measurements ; chief types of ammeters, voltmeters. Wattmeters, and supply meters ; conductors and insulators ; magnetic properties of materials ; cells and secondaries batteries ; carbon and metallic filament lamps ; Nernst lamps ; arc lamps ; C.C. generators and motors, their installation and running ; distribution ; fault testing ; alternating currents ; elementary principles of the A.C. motor.

Text Book : " Technical Electricity," by Davidge and Hutchinson. Publishers, U.C.C. 4s. 6d.

Laboratory Work.

Use of the straight wire bridge and P.O. box ; determination of specific resistance ; the potentiometer ; use of the ohmmeter ; insulation testing ; checking of ammeters, voltmeters, and wattmeters ; D.C. generator—open circuit curve ; speed and volts with constant field ; load characteristics of shunt series, and compound wound machines ; over compounding ; temperature tests ; running tests on transformers, converters, D.C. and A.C. motors.

Fifth Year.

Fee for Course, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.	LECTURER.
Tuesday	Practical Mechanics, St. II. ...	7-30 to 9-30	F. W. Walker
Wednesday	Electrical Engineering, Ordinary Grade—Lecture ..	7-15 to 8-15	G. E. Gittins
,, ...	Laboratory... (City and Guilds of London)	8-15 to 9-45	A. W. Holden
Friday	Heat Engines, St. I.—Lecture...	7-15 to 8-15	F. W. Walker
,, ...	Laboratory...	8-15 to 9-45	F. W. Walker

Syllabus.

A more extended knowledge of the work of the Fourth Year, together with the following :—

Practical Mathematics.

Trigonometry.—Proofs of fundamental formulæ, as :—

$$\text{Sin } (A + B) = \text{sin } A. \quad \text{Cos } B + \text{cos } A. \quad \text{Sin } B.$$

$$\text{Sine Rule or } \frac{\text{Sin A}}{\text{Sin B}} = \frac{a}{b} \text{ for triangle.}$$

$$\text{Area of a triangle} = \tfrac{1}{2}\, ab \text{ sin C.}$$

Mensuration.—More advanced work. Solids of revolution.

The plotting of functions on squared paper, including such as $y = ax^n$; $y = ae^b$; $y = a \sin (cx + d)$; $y = ae^{bx} \sin (cx + d)$.

Testing—observed results for laws like $pv^n = c$; $y = a + bx^2$; $xy = bx + cy$.

Maximum and minimum problems. Vectors. Scalar and Vector products.

Proofs of the rules for finding the differential co-efficient of y with respect to x, that is, $\frac{dy}{dx}$, when y and x are related in the following ways :—

$y = axe^n$; $y = ae^{bx}$; $y = a \cos (bx + c)$; $y = a \sin (bx + c)$; $y = \text{A} \log (x + a)$.

Differentiation of a product or quotient of two functions, or function of a function.

Integration.—The expressions for the integrals of

$$ax^n,\ ae^{bx},\ \text{A}/(x + a),\ \text{A} \sin (ax + b),\ \text{A} \cos (ax + b).$$

Integrating by parts and by substitution and other simple devices. Finding areas of curves and surfaces and volumes requiring these integrals.

The solution of easy differential equations.

Illustrations of the use of the calculus in many kinds of study, more especially in physics and engineering.

When x and y are tabulated, to find for a particular value of x the value of dy/dx.

Special attention to be paid to graphical methods of integration, using squared paper ; the construction by graphical methods of curves from a given law of slope, this law being given either by means of a curve, or by a simple Algebraic expression, or by means of a simple differential equation.

Electrical Engineering.

Text Books.

	s.	d.
"Electric Lighting and Power Distribution," Vol. II., by W. Perren Maycock. Publishers : Whittaker	7	6
"Practical Alternating Currents," by C. Smith. Publishers : Scientific Co.	6	0
"Examination Questions in Electrical Engineering." Publishers : Rentell & Co.	1	0

No Student may be a Candidate for the Ordinary Grade unless he has previously obtained a success in the Elementary Grade.

Laboratory Work.

More advanced work in the testing of D.C. generators and motors. Transformer testing and its application to the circle diagram. Paralleling of D.C. generators. Complete tests on induction motors. Testing of cables; the use of the photometer and potentiometer. Testing of arc lamps. Capacity of condensers by various methods.

Heat Engines.

Details of steam, gas, and oil engines.
The slide valve. Reversing motions.
Action of fly-wheel and governor.
Condensers. Condensing water required.
Condensation in the cylinder. Effect of drainage.
Steam jacketting. Superheating.
Types of boilers. Their construction. Boiler fittings.
Heating value of solids and gaseous fuels; total and latent heats of steam.
Forms of energy.
Combustion and smoke prevention.
Steam turbines.

Laboratory Work.

Experiments on latent and specific heats. Boyle's law. Temperature and pressure of steam. Indicated and brake horse-power of steam and gas engines. Planimeter work. Heating values of gas and coal. Steam consumption.

Sixth Year.

Fee for Course, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.	LECTURER.
Thursday	Electrical Engineering (City and Guilds of London, Honours Grade)—		
	Lecture...	7-15 to 8-15	
	Laboratory...	8-15 to 9-45	G. E. Gittins
Monday	Materials & Structures, St. II.—		
	Lecture...	7-15 to 8-15	
	or Laboratory...	8-15 to 9-45	E. C. Moyle
Friday	Hydraulics & Mechanics	7-15 to 8-15	E. C. Moyle
Wednesday	Heat Engines, Stage II.—		
	Lecture...	7-15 to 8-15	
	Laboratory...	8-15 to 9-45	E. C. Moyle

Electrical Engineering.

Syllabus.

No Student may be a Candidate for Honours unless he holds a Certificate in the Ordinary Grade.

Texts Books

	s.	d.
"Practical Alternating Currents," by C. Smith. Publishers: Scientific Co.	6	0
"Electrical Engineering," by Thomalen. Publishers: Arnold	15	0
Whittaker's Electrical Engineer's Pocket Book	3	6

Works of Reference.

"Continuous Current Dynamo Design," (*Hobart*).
"Kapp's Transformers."
"Dynamo—Electric Machinery" (*Thompson*).
"Continuous Current Dynamos" (*Fisher-Hinnen*).
"Electric Motors" (*Hobart*).
"Journals of the Institution of Electrical Engineers."

Laboratory Work.

Exhaustive tests on generators and motors; separation of losses in the transformers; core losses and frequency; Hopkinson tests on generators and transformers; paralleling of A.C. generators; synchronous motor, effect of field excitation on the P.F.; asynchronous generator, induction motor used as; testing of rotary converters; photometry; use of the potentiometer and the Kelvin balance.

Applied Mechanics.

Syllabus.

Engineers' theory of bending: Bending and twisting combined; torsion; application of theory to design.

Principles of graphic statics; moments of inertia; bending and shearing force diagrams; stresses in the various parts of a trussed structure; girders.

Properties of materials; testing machines; direct and transverse stress; fatigue; Hooke's law; Wohler's tests; behaviour of materials under tensile, compressive, and torsional stress.

Machines; velocity; ratio; mechanical advantage and efficiency; effect of friction; overhauling; sliding and rolling friction; slipping of a belt; dynamics of the fly-wheel; balancing; centrifugal force; hydraulics; gauge notches; centrifugal pumps and turbine.

Mechanisms: Epicyclic gears, with their applications to motor cars, spinning, &c.

Laboratory.

Mechanics.—Testing of machines ; determination of moduli of elasticity and rigidity, using various methods ; determination of accelerative force of gravity ; coiled friction ; strength of beams ; vibration of springs ; energy in a rotating wheel ; hydraulic experiments ; experiments on centrifugal force ; fluid and solid friction, impact, &c.

Heat Engines.

Construction of steam boilers ; steam, gas, and oil engines, and their details.

Valve diagrams and valve setting ; reversing gears ; link motions.

Balanced valves, piston valves, and double-ported valves.

Corliss valves ; drop valves, and various trip gears.

Governors and fly-wheels ; methods of governing.

Hypothetical indicator diagram.

Various forms of energy ; how much leaves the boiler ; how much indicated in cylinder ; various losses.

Cylinder condensation and its treatment.

Indicator and its errors ; combining of diagrams ; testing of steam engines ; Willan's rule or law ; balancing of engines ; calorific value of fuels ; boiler efficiency, superheaters.

Steam turbines ; construction and theory of Rateau, Curtis, De Laval, and Parson's turbine.

Binary vapour engines.

Laboratory Work.

Relation between temperature and pressure of steam ; heating value of coal, oil, or gas by calorimeter ; evaporation in steam boiler ; efficiency of boiler ; measurement of coal and water used.

Indicated and brake horse-power of steam engine.

Steam consumed and mechanical efficiency.

Testing of indicator springs and pressure gauges.

Indicating the steam engines under different loads.

Use of planimeters in averaging indicator diagrams.

Determination of the dryness of steam by calorimeter.

Mechanical efficiency and gas consumption of gas engines.

Heat lost in jacket and exhaust.

Experiments with injectors, feed pumps, and lubricating oils.

EXPERIMENTAL MECHANICS AND PHYSICS.

Lecturer : H. Whalley, B.Sc.

Tuesday—7-15 to 9-45.

This subject forms part of the Second Year Preliminary Technical Course. The lectures will be freely illustrated by experiments, and the Student will have opportunities of afterwards performing most of these experiments in the Laboratory. The Course will be based on the following Syllabus :—

Preliminary.—Units of length, area, mass, and volume.

1. *Volume.*—Use of graduated cylinder and burette ; capacity of a bottle. Volumes of irregular solids determined by displacement of water ; volumes of cone and sphere compared with that of the corresponding cylinder.

2. *Weight.*—Use of the balance and spring balance. Weight of 1c.c. and of 1 pint of water. Areas and volumes determined by weighing.

3. *Relative Density.*—Weights of equal volumes of various liquids and solids. Given the volume and R.D. to find the weight.

4. *Hydrostatics.*—The U tube. The syphon ; head of water. Archimedes' principle ; determination of relative density by weighing in air and in water. The barometer ; the pump. Pressure of gases ; Boyle's law.

5. *Statics.*—The lever ; moments ; the steelyard. Parallelogram and triangle of forces. Parallel forces ; reaction at the supports of a beam ; centre of gravity. Inclined plane. Pulleys.

6.—*Heat.*—Construction and use of the thermometer. Melting and boiling point ; solids, liquids, and gases. Expansion of solids, liquids, and gases ; expansion of water. Conduction, convection, and radiation.

TEXT BOOK : " Experimental Science, Physiography," Section I., by Gregory and Simmons. Publishers, Macmillan. 2s. 6d.

HIGHER MATHEMATICS.

Lecturer : G. E. GITTINS, A.I.E.E.

Friday—7 to 8.

The Lectures will be based on the following Branches of the Subject :—

CO-ORDINATE GEOMETRY.

Rectangular and polar co-ordinates of a point, and transformations from one system of such co-ordinates to another.

Equations of straight lines, and the treatment of questions relative to their intersection, concurrence, inclination, parallelism, perpendicularity, &c.

Equations of circles, their tangents and normals. Questions concerning the intersection of circles, and the determination of circles which satisfy given conditions.

The simpler forms of the equations of the parabola, ellipse, and hyperbola, as determined from various definitions of those curves. The equations of their tangents and normals. The principal properties of their diameters, axes, foci, conjugate diameters asymptotes.

Elementary Differential Calculus.

Limits. Differential co-efficients. Differentiation of simple and inverse functions, and of a function of a function of the independent variable. Successive differentiation of a function of one variable. Easy indeterminate forms. Maxima and minima values of one variable. Tangents and normals of plane curves.

Elementary Integral Calculus.

Elementary forms of integration ; rational fractions ; integration by parts ; integration between limits, with easy applications to areas of curves, volumes of solids of revolution, centres of gravity, and moments of inertia.

Vector Algebra and its application to alternating currents.

Students joining this class are expected to have a sound knowledge of Elementary Mathematics as far as the Third Stage of the Board of Education Syllabus.

Text Books.

	s.	d.
" The Calculus for Engineering Students " (Graham). Publishers : Spon.	7	6
" Conic Sections " (C. Smith). Publishers : Macmillan	7	6

HEAT, LIGHT, AND SOUND.

Lecturer : H. Whalley, B.Sc.

Stage I. ... Monday—Lecture ...7-15 to 8-15.
,, ... ,, —Laboratory ...8-15 to 9-45.

The Course of Instruction will cover the work required for the London Matriculation in heat, light, and sound ; the Joint Matriculation in heat and light ; and the heat, light and sound portion of the General Physics of the Preliminary Science Examination of the London School of Dental Surgery.

The Syllabus will include :—

Heat.—Temperature and its measurement ; expansion of solids, liquids, and gases ; calorimetry ; change of state ; hygrometry ; transmission of heat.

Light.—Photometry ; velocity of light ; reflection and refraction of light ; mirrors and lenses ; optical instruments ; dispersion and colour.

Sound.—Wave motion ; transmission of sound ; methods of determining its velocity ; reflection of sound ; pitch and musical intervals ; vibration of strings ; resonance.

Text Book.—" Heat, Light, and Sound," by D. E. Jones, (Macmillan). 2s. 6d.

LABORATORY WORK.

Heat.—Construction of thermometers. Determination of co-efficients of expansion, specific heats, latent heats, temperature of Bunsen flame; boiling points and melting points; dew point and relative humidity. Verification of Boyle's law.

Light.—Use of photometer. Verification of laws of reflection and refraction. Determination of focal lengths of lenses and mirrors; refractive index. Use of spectrometer.

Sound.—Verification of laws of vibrating strings (by sonometer). Comparison of frequencies of vibration of tuning forks. Determination of velocity of sound in air, and of wave length. Resonance tubes. Determination of frequency of vibration by means of syren.

MAGNETISM AND ELECTRICITY.

Lecturer: A. W. HOLDEN.

Stage II. ... Friday—Lecture ... 7-15 to 8-15
,, ... ,, —Laboratory ... 8-15 to 9-45

The Course will include Stage I., together with the following:—

Magnetism.—Inverse square law; pole-strength and field intensity; moments of magnets; terrestial magnetism.

Current Electricity.—Cells; galvanometers; ammeters; voltmeters; resistance and its measurement; measurement of current and pressure; thermo-electricity; electro-magnetic induction; dynamos and motors; alternating currents.

Electrostatics.—The electric field; tubes of force; electrostatic induction; capacity; condensers; specific inductive capacity; electro meters; influence machines; action of points; atmospheric electricity.

TEXT BOOK.—"Magnetism and Electricity," by H. E. HADLEY, (Macmillan), 6s.

LABORATORY WORK.

Magnetism.—Comparison of magnetic moments; determination of horizontal component of earth's field; magnet survey of laboratory; distribution of magnetism in a bar magnet; determination of angle of dip, and total intensity of the earth's field.

Current Electricity.—Use of galvanometers, metre bridge, potentiometers, and post office boxes. Comparison of electromotive forces; determination of electro-chemical equivalents, reduction factor of galvanometer; resistances and specific resistance, resistance of cell and galvanometer; temperature co-efficient, use of thermo-pile.

Electrostatics.—Comparison of capacities of condensers; use of electrometers; construction of capillary electrometer; specific inductive capacities.

MAGNETISM AND ELECTRICITY FOR TELEGRAPH STUDENTS.

Lecturer : G. E. GITTINS, A.I.E.E.

Friday, 8-15 to 9-15.

This Class has been arranged for those reading for the Departmental and City Guilds Examinations in Telegraphy. The Course of Instruction will be based on the following Syllabus :—

The fundamental principles of electricity and magnetism in their application to Telegraphy ; units of measurement ; standards of electro motive force, resistance, and capacity. Essential qualities of iron and steel for permanent and electro-magnets, methods of making permanent magnets, simple calculations relating to electro-magnets.

Batteries.—Primary and secondary, as used in telegraphy ; construction and chemical action ; grouping of primary batteries, calculations of the number of cells and battery power required to work circuits ; the advantages of secondary batteries. The simpler methods of measuring electromotive force and resistance.

Galvanometers : The principles and construction of the following types—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 ; their uses in the simpler telegraph systems.

Faults in Lines : Their nature and general principles of localisation.

Methods of protecting lines and apparatus from lightning and power circuit currents.

TEXT BOOK.—" Telegraphy," by T. E. HERBERT. Publisher, Whittaker, 6s. 6d.

ELECTRICITY FOR TEXTILE STUDENTS.

Lecturer : G. E. GITTINS, A.I.E.E.

Monday—Lecture, 7-15 to 9-15.

This Course has been arranged to meet the requirements of Textile Students who are taking up the study of Electricity in its application to the Electrical Drive in Textile Factories. The subject will be dealt with in a practical manner, and the lectures freely illustrated by experiments and lantern slides.

The Syllabus will include :—

Units (primary and derived).

Magnets (natural and artificial).

The electro-magnet.

The production of a current (chemically and magnetically).

Ohm's Law.

Some properties of an electric current.

Magnetic materials and their use in the construction of generators and motors.

Elementary principles of D.C. dynamos and motors.

Alternating current motors.

The connecting up of motors.

Methods of speed variation.

Methods of testing B.H.P.

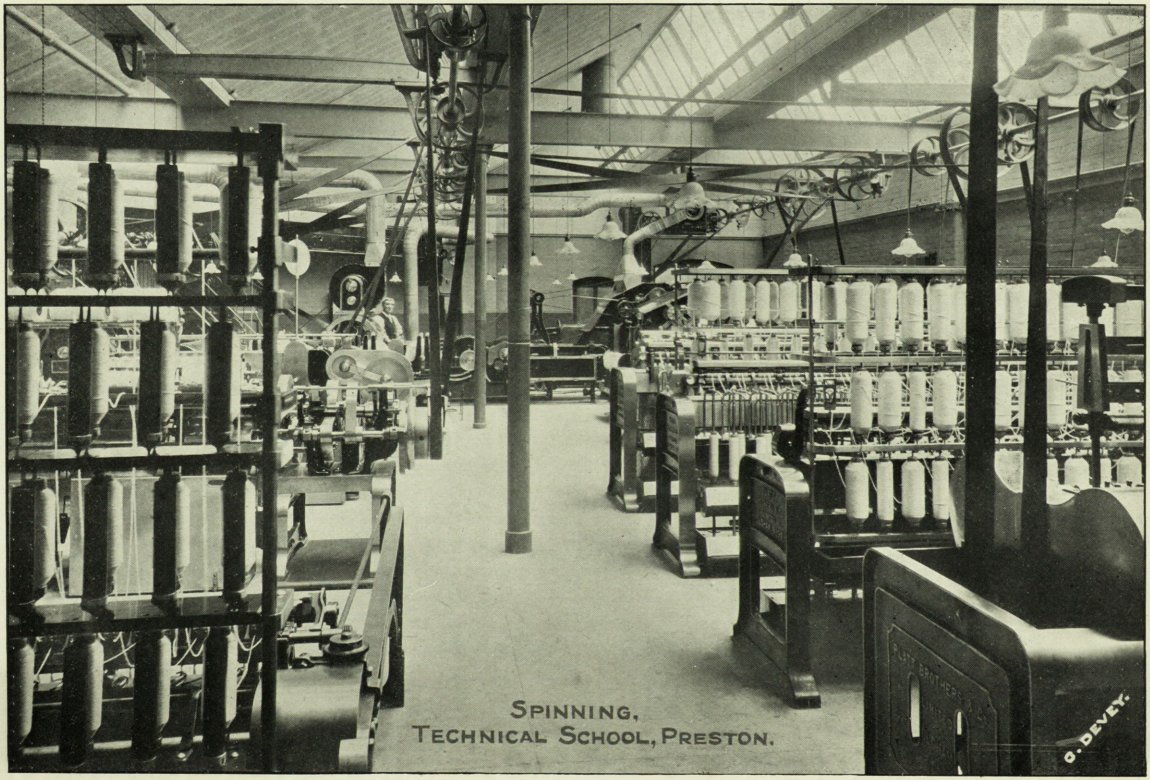
Efficiency.

Suitability of the motor drive for factories.

Speed and losses in shafting.

Factory lighting.

Cotton Spinning Evening Classes.



SPINNING,
TECHNICAL SCHOOL, PRESTON.

Cotton Spinning.

Head of Department, JAMES TASKER, Wh. Sch.

Practical Demonstrator, ROBERT BILLINGTON.

Students will be admitted to the Specialized Courses in Cotton Spinning if they possess the Preliminary Technical Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend the preliminary Courses conducted in the Borough Continuation Schools, *or the corresponding Second Year's Technical Course, which will be conducted for the present in the Technical School.*

In exceptional cases Students may be excused the entrance examinations, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake Specialized Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, will be conducted by the Preston Education Committee in their Branch Schools.

Second Year.

FEE FOR COURSE, 5/-.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Practical Mathematics and Drawing.....	7-0 to 9-0
Tuesday	Experimental Mechanics and Physics	7-15 to 9-45
Wednesday ...	English	8-0 to 9-0

COTTON SPINNING.

Third Year.

FEE FOR COURSE, 7/6.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Tuesday	Practical Mathematics	7-15 to 8-15
Tuesday	Hand Sketching	8-15 to 9-15
Thursday	Cotton Spinning (First Year, City and Guilds of London)	7-30 to 9-30
Wednesday ...	Applied Mechanics, Theoretical and Practical...	7-15 to 9-45

COTTON SPINNING.

SYLLABUS.

1st.—The Geographical position of the Cotton Fields of the world. The area within which Cotton can be commercially cultivated. New Cotton Fields. The chemical and physical properties of the soil and atmosphere necessary for the full development of the plant, and their influence upon the character of the fibre. The general method of cultivating and harvesting Cotton.

2nd.—The chemical, physical, and commercial properties of Cotton. Cotton and impurities examined under the miscroscope. The structure, length, colour, and adaptation of Cottons—Sea Island and Egyptian.

3rd.—Brazilian, Peruvian, American, East Indian, and other Cottons. Various notes on defects and working of cottons.

4th.—The picking and preparing of Cotton for the market. Grading Cotton, testing Cotton for moisture, &c.

Ginning and Baling.

5th.—Object of Ginning. The construction and operating of the bow, foot roller, churka, and saw gins.

6th.—Macarthy and knife-roller gins. Main difference in the principle of their action on the Cotton and their adaptation for different Cottons. Productions, speeds, defects. Proportion of seed and lint.

Different methods of baling Cotton—Square, Salamander, and Lowry Bales. Dimensions, weights, and density of bales.

Mixing and Mixing Machinery.

7th.—Object of mixing Cotton in the stack. Rules governing the operation. Method of mixing by hand and machine. Testing mixings for loss and strength. Construction and operation of the roller-bale breaker, with mixing lattices, speeds, drafts, &c.

8th.—Hopper bale breaker, speed setting and working of same. Various notes.

Hopper-feeding Machines and Openers.

9th.—Object, construction, and working of hopper-feeder.

10th.—Object of Cotton Openers. The principle upon which Cotton is cleaned. Crighton opener.

11th.—Exhaust opener with porcupine feed and trunks.

12th.—Various types of openers. Notes on setting and working of openers. Productions, percentage of waste, speed calculations

Scutchers.

13th.—Object of scutching. Single and double scutchers. Configuration of the nose of the pedals. Pedal fulcrum. Striking from feed rollers. Tandem Regulator. Setting of feed rollers to beaters for various cottons.

14th.—Piano feed motion. Setting of same. Method of reducing friction in the regulator.

15th.—Two and three bladed beaters. Striking energy of same. Construction of beater blade. Combing beaters. Construction angle and spaces for dirt bars. Beater stripping plate. Reason for cone drums being concave and convex.

16th.—Single and compound lever weighting of calendar rollers. Lap compression motion. Dust cages, dampers, irregular laps, bad selvedges, licking and splitting laps, air currents, back draughts, area and construction of flues, &c.

17th.—Gearing and driving of parts. Connection of feed and delivery. Drafts, change places, productions, percentage of waste made, knocking-off motions, cleaning scutchers.

18th.—Various notes and calculations on scutchers.

Carding.

19th.—Object of Carding. How the object is accomplished. Roller and clearer card. The Wellman card. Single and double carding.

20th.—Revolving flat card. Construction of cylinder. "Licker in" and mote knives; action of parts. Variation in the shape and length of the nose of the dish feed plate for different varieties of Cotton. Object of undercasings and method of setting same.

21st.—Filling in plates and covers, action and adjustment of stripping plate, coiler motion, slow motion for doffers, disengaging wheel, drop lever, &c.

22nd.—Rigid and flexible bends. Revolving disc. Various methods of setting flats. Adjustment of cylinder bearing. Setting of cards.

23rd.—Burnishing. Stripping out. Receding motions. Doffer combs and comb box. Grinding cylinder and doffer. Grinding flats from their back and working surfaces. Horsfall and long grinding rollers; traverse motions for same. Deflection of flats. Slow motion grinding. Setting of grinding rollers.

24th.—Objects of different sections of card wire. Shape of tooth. Construction of foundation for card clothing. Arrangement of wire foundation (ribbed, twilled, plain). Counts of wire. Method of fastening flats on tops.

25th.—Clothing cylinder and doffer. Driving of parts, drafts, speeds, defects in carding (neppy, cloudy, and dirty webs) various notes, &c.

The remaining lessons will be spent in revision, examination, practical work, &c.

Practical Mathematics.

Abbreviated methods of decimal calculation. Numerical substitution in formulæ used in Mechanics and Physics. Application of arithmetic and of algebraic equations to problems of a technical character. Graphs. Plotting. Weights, density, and volume of solids, and their relation to each other.

Hand Sketching.

The use and care of drawing instruments. Hand sketching of simple machine details. Exercises in drawing to scale, in pencil, some of the following machine details, from dimensioned hand sketches and from actual measurements:—Nuts, bolts, rivets, screw-threads, keys, shafting, couplings, bearings, cranks, and eccentrics.

The setting out of cams to give various motions.

The examples will be selected almost exclusively from textile machinery.

Applied Mechanics.

Ideas of force and how measured. Representation of forces by lines. Resultants and components. Application to easy problems. Equilibrium. Polygon of forces. Centre of gravity.

Friction. Work. Velocity. Acceleration. Work done by varying force. Work diagrams.

Simple machines used for lifting. Hydraulic machines. Strength of materials. Stress. Strain. Elasticity. Measurement of stresses and strains. Vernier.

Elementary hydraulics.

Laboratory Work.

Uses of measuring instruments, *e.g.*, micrometer gauges, verniers, &c. Uses of squared paper in the laboratory. Verification of fundamental principles of mechanics, *e.g.*, polygon of forces, law of moments, &c. Testing of various machines. Determination of strengths of wires and beams. Centroids of areas. Hydraulic experiments. Friction.

Fourth Year.

Fee for Course, 7/6.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Cotton Spinning, Theoretical and Practical..... (Second Year, City and Guilds of London)	7-30 to 9-30
Thursday	Machine Drawing	7-30 to 9-30
Friday	Heat Engines	7-15 to 9-45

Syllabus.

Drawing Frame.

1st.—Object and duties of the machine. General arrangement of parts.

2nd.—Stop motions—mechanical and electric.

3rd.—Weighting arrangements. Loose boss top rollers. Roller setting defects and irregularities. Production.

4th.—Roller and coiler mechanism. Calculations—normal, intermediate, and total draft.

Slubbing—Intermediate and Roving Frames.

5th.—Objects and duties of the machines. Drawing, twisting, winding. Bobbin and flyer to lead. Centrifugal flyers. Standard twist.

6th.—Lifts, gauges, and drafts for different hanks. General arrangement of gearing.

7th.—Changing and tapering motion. Houldsworth's differential motion.

8th.—New differential motions. Swing arrangements.

9th.—Concave and convex cone drums. Centrifugal flyers. Long and short collars. Irregularities and defects.

10th.—Weighting of top rollers. Production. Calculations for draft and twist. Roller setting.

Ring and Flyer Spinning.

11th.—Objects and duties of the machine. Drafts. Standard turns per inch for various kinds of yarn. Comparison of the different spinning machines. Roller setting. Temperature and humidity.

12th.—Arrangement of the flyer throstle. General arrangement of the ring throstle.

13th.—Arrangements of weighing rollers. Sizes of rollers. Successful working of ring frames. Gearing and lifting arrangements.

14th.—Calculations for draft and twist, with changes of travellers required for different counts and speeds.

Self-acting Mule.

15th.—Object and duties of the machine. Gauges for different kinds of work. Periods into which the various movements of the machine may be divided.

16th.—Arrangement of carriage, draw rollers, and creel. Inclination of spindles. Spindle driving, roller driving, and drawing-out arrangements.

17th.—Driving for back-off and drawing-in. Arrangement of cam shaft, and how changes are effected.

18th.—Separate driving. Twisting at the head. Winding click. Holding-out catch. Drawing-in friction and connections.

19th.—Quadrant and shaper.

20th.—Cop formation. Defects in cops.

21st.—Roller delivery motion. Jacking or ratching motion. Receding or turning motion, and general arrangements of fine spinning mules.

22nd.—Production, power, calculations for draft, twist, and drag or stretch.

Heat Engines.

Details of steam, gas, and oil engines.
The slide valve. Reversing motions.
Action of fly-wheel and governor.
Condensers. Condensing water required.
Condensation in the cylinder. Effect of drainage.
Steam jacketting. Superheating.
Types of boilers : Their construction. Boiler fittings
Heating value of solids and gaseous fuels : Total and latent heats of steam.
Forms of energy.
Combustion and smoke prevention.
Steam turbines.

Laboratory Work.

Experiments on latent and specific heats. Boyle's law. Temperature and pressure of steam. Indicated and brake horse-power of steam and gas engines. Planimeter work. Heating values of gas and coal. Steam consumption.

Machine Drawing.

General introduction to machine-drawing plans and elevations of simple parts. Method and convertions of projecting views. Freehand sketches of machine details. Drawing of part of machine. Elementary work connected with construction of machines.

Properties of materials used in construction.

Sliver Lap Machine.

23rd.—Ribbon lap machine.

Comber.

24th.—Objects and duties of the machine. General particulars of production and loss in working.

25th.—General arrangements of parts. Top comb and nipper mechanism. Piecing and detaching arrangements.

26th.—Settings, various details. Defects, and how to remedy same.

27th.—Winding, beaming, and warping.

28th.—Calculations, &c.

The remaining lessons will be spent in revision, examinations, practical work, &c.

Fifth Year.

FEE FOR COURSE, 7/6.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Textile Electricity	7-15 to 9-15
Thursday	Heat Engines, Stage II.	7-15 to 9-45
Friday	Cotton Spinning, Theory and Practical ..... (Honours Grade, City and Guilds of London) And other Classes to be arranged.	7-30 to 9-30

COTTON SPINNING.

SYLLABUS.

1st.—Character of waste and quantity made at the different processes.

2nd.—Machine for separating hard ends. Classification of soft waste. Hard waste and its use.

3rd.—Four coiler and condenser system. Oldham willow. Breaking-up machine. Soaping arrangements. Scutcher, with hopper-feeder and lap machine. Breaker carding engine.

4th.—Derby doubler. Quadruple coiler carding engine, Slubbing frame. Self-acting mule.

5th.—Condenser carding engine. Condenser mule — Scotch feed. Wadding cards. Character of yarns produced. Condenser and preparation yarns, and the purpose for which they are suitable.

6th.—Defects in Cotton fibre and their effects upon the value. Microscopic and other tests used in testing Cotton. Bad ends.

7th.—Arrivals, sampling, grades. Tests for moisture and the permissible limit.

8th.—Brokers. Terms for "Spot" and "Future" Cottons. "Bulls." "Bears." Fluctuations in price.

9th.—Bobbin and cop winder. Drum winder.

10th.—Thread making—soft finished and glacé.

11th.—Singling, twisting, re-winding, cabling, reeling, hank winding, spooling, and ticketing.

12th.—Ring doubling—English and Scotch systems. Gearing.

13th.—Fancy doubling. Knop yarns. Flame and random yarns.

14th.—Twiner doubling.

15th.—Conditioning yarns

16th.—Reeling.

17th.—Beaming.

18th.—Ball warping.

19th.—The various uses of Cotton yarn.

20th.—Testing yarns for strength, regularity, elasticity, and twist. Selling yarns, and the terms and conditions of sale.

21st.—Arrangements of motive power in mills. Engines, boilers, rope driving.

22nd.—Summary of machinery required, and schemes of drafts, speeds, &c., for a new mill.

23rd.—Calculations of productions, &c.

24th.—Planning of Spinning Mills.

25th.—Humidification in Cotton Mills.

26th.—Heating, lighting, ventilation, and protection from fire.

The remaining lessons will be spent in revision, examinations, and calculations.

Heat Engines.

Construction of steam boilers. Steam, gas, and oil engines, and their details.

Valve diagrams and valve setting. Reversing gears. Link motions.

Balanced valves, piston valves, and double-ported valves.

Corliss valves, drop valves, and various trip gears.

Governor and fly-wheel. Methods of governing.

Hypothetical indicator diagram.

Various forms of energy. How much leaves the boiler ; how much indicated in cylinders. Various losses.

Indicator and its errors. Combining of diagrams. Testing of steam engines. Willan's rule or law. Balancing of engines. Calorific value of fuels. Boiler efficiency ; super-heaters.

Steam Turbines. Construction and theory of Rateau, Curtis, De Laval, and Parson turbine.

Binary vapour engines.

Laboratory.

Mechanics.—Testing of machines. Determination of moduli of elasticity and rigidity, using various methods. Determination of vibration of springs. Energy in a rotating wheel. Hydraulic accelerative force of gravity. Coiled friction. Strength of beams, experiments. Experiments on centrifugal force, fluid and solid friction, impact, &c.

Heat Engines.—Relation between temperature and pressure of steam. Heating value of coal, oil, or gas by calorimeter. Evaporation in steam boiler. Efficiency of boiler. Measurement of coal and water used.

Indicated and brake horse-power of steam engine.
Steam consumed and mechanical efficiency.
Testing of indicator springs and pressure gauges.
Indicating the steam engines under different loads.
Use of planimeters in averaging indicator diagrams.
Mechanical efficiency and gas consumption of gas engines.
Heat lost in jacket and exhaust.
Experiments with injectors, feed pumps, and lubricating oils.

Electricity for Textile Students.

This Class has been arranged to meet the requirements of Textile Students who are taking up the study of Electricity in its application to the Electrical Drive in Textile Factories. The subject will be dealt with in a practical manner and the lectures freely illustrated by experiments and lantern slides.

A Certificate or Diploma will be issued to all Students who satisfactorily complete a Five Years' Course. The award of the Diploma will depend on attendance, school and home work, and examination results. These Diplomas may be endorsed by the Board of Education.

Text Books, Note Books, and Instruments Required.

TEXT BOOKS.—"Students' Cotton Spinning," by Joseph Nasmith, 6s. "Cotton Spinning Calculations," by Thomas Thornley, 1s. 6d.

NOTE BOOKS.

Exercise Books are preferred in which large size sketches can be made.

WORKS OF REFERENCE.

A large number of books have been published, but the following are of recent date, and will be found very useful for reference :—

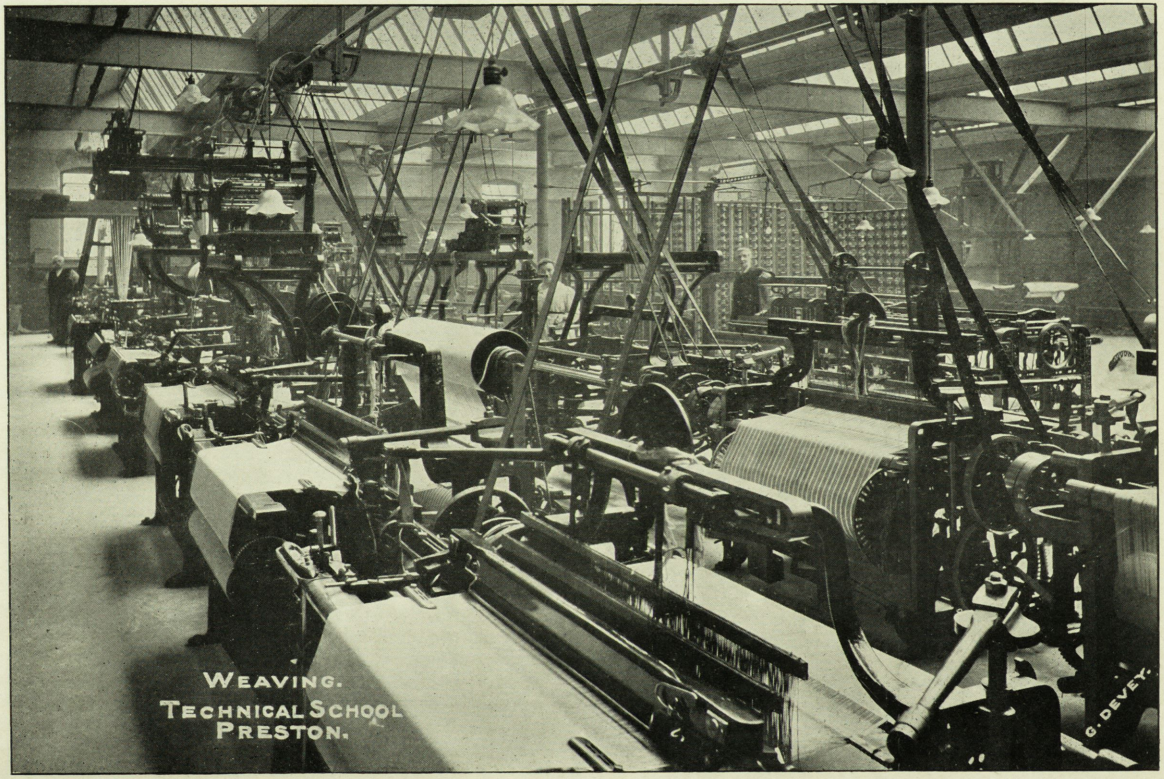
	s.	d.
"Students' Cotton Spinning" (*J. Nasmith*)	6	0
"Cotton Spinning" (*R. Marsden*)	6	6
"Cotton Spinning" (*Prestwich*)	4	6
"Cotton Spinning," by W. S. TAGGART. Vol. 1 (*Macmillan & Co.*)	4	0
Ditto, Vol.2, ditto	4	0
Ditto, Vol. 3, ditto	10	0
"Cotton Machinery Sketches" (*W. S. Taggart*)	2	6
"Handbook to Cotton Spinning—Calculations" (*J. E. Holme*)	3	0
"Practical Cotton Spinner—Calculations" (*W. Leigh*)	2	0
"Cotton Combing Machines," by T. THORNLEY	7	6
"Draw & Fly Frames," by T. THORNLEY (*A. Heywood & Sons*)	6	0
"Cotton Spinning Calculations," by T. THORNLEY (*John Heywood*)	1	6
"Practical Treatise on Self-Acting Mules." Vol. 1, by T. THORNLEY	4	6
Ditto, Vol. 2, ditto	6	6
"Ten Articles on Cotton Spinning" (*T. Thornley*)	0	6
"The Cotton Fibre, its structure, &c." (*H. Monie, Jun.*)	3	6

Also the monthly periodicals, such as the "Textile Manufacturer," "Textile Recorder," "Textile Journal," and the "Textile Mercury" (Weekly), &c.

Cotton Weaving and Designing Evening Classes.

Cotton Weaving and Designing

Evening Classes.


WEAVING.
TECHNICAL SCHOOL
PRESTON.
G. DEVEY.

Weaving Department.

Head of Department, Wm. Mellor (Honours Medallist).

Assistant, Ed. Blinkhorn.

Students will be admitted to the specialized Courses in Cotton Weaving if they possess the Preliminary Technical Certificate of the Union of Lancashre and Cheshire Institutes, or its equivalent. Other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend the preliminary Courses conducted in the Borough Continuation Schools, *or the corresponding Second Year's Technical Course, which will be conducted for the present in the Technical School.*

In exceptional cases Students may be excused the entrance examinations, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

ORGANISED COURSES.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake specialized Courses unless they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, will be conducted by the Preston Education Committee in their Branch Schools.

Second Year.

Fee for Course, 5s,

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Practical Mathematics and Drawing	7-0 to 9-0
Tuesday	Experimental Mechanics and Physics	7-15 to 9-45
Wednesday ...	English	8-0 to 9-0

WEAVING AND DESIGNING.

Third Year.

FEE FOR COURSE, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Weaving and Designing—Theory (First Year—City and Guilds of London)	7-15 to 8-15
,, ...	Weaving and Designing—Practice	8-15 to 9-15
Tuesday	Practical Mathematics	7-15 to 8-15
Wednesday ...	Applied Mechanics for Textile Students	8-15 to 9-45
Tuesday	Freehand Drawing and Colour Study.....	8-15 to 9-45

SYLLABUS.

WEAVING AND DESIGNING.

How to distinguish threads made from cotton, wool, linen, or silk; and the methods of testing the same to determine the counts and strength.

The reasons why yarns are bought and sold in various forms, such as cops, beams, chains, ball-warp, &c.

The different methods of counting reeds in various manufacturing districts.

The system of making plans for knitting fancy healds, pegging plan, and drawers' instructions.

Calculations necessary in order to determine the weight of warp and weft required for a piece of cloth of specified particulars.

The method of making original designs for dobby cloth up to 20 staves, such as spots, stripes, honeycombs, Bedford cords, diapers, oatmeals, &c.

How to dissect cloth in order to find the necessary particulars required to reproduce the same class of fabric.

The Power-loom.—Shedding by means of tappetts and dobbies. Methods of picking; under-pick, over-pick, and scroll-pick. The take-up and weft fork motions, and the timing of the various parts.

PRACTICAL MATHEMATICS.

Abbreviated methods of decimal calculation.

Numerical substitution in formulæ used in Mechanics and Physics.

Application of Arithmetic and of Algebraic Equations to problems of a technical character.

Graphs. Plotting.

Weight density and volume of solids, and their relation to each other.

Applied Mechanics.

Ideas of force and how measured. Representation of forces by lines. Resultants and components. Application to easy problems, Equilibrium. Polygon of forces. Centre of gravity.

Friction. Work. Velocity. Acceleration. Work done by varying force. Work diagrams.

Simple machines used for lifting. Hydraulic Machines. Strength of materials. Stress. Strain. Elasticity. Measurement of stresses and strains. Vernier.

Elementary hydraulics.

Laboratory Work.

Uses of measuring instruments, *e.g.*, micrometer gauges, verniers, &c. Uses of squared paper in the laboratory. Verification of fundamental principles of mechanics, *e.g.*, polygon of forces, law of moments, &c. Testing of various machines. Determination of strengths of wires and beams. Centroids of areas. Hydraulic experiments. Friction.

Fourth Year.

Fee for Course, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Tuesday	Textile Art	7-15 to 9-15
Wednesday ...	Weaving and Designing—Theory (Second Year—City and Guilds of London)	7-15 to 8-15
,, ...	Weaving and Designing—Practice	8-15 to 9-15
Thursday	Machine Construction and Drawing. Special Course for Textile Students	7-30 to 9-30

Syllabus.

Weaving and Designing.

The Syllabus consists of more advanced instruction in the various particulars of the First Year's Course, also :—

The principle of the Jacquard machine.

The various kinds of Jacquards in use, such as single-lift, double-lift, single-cylinder, double-cylinder, open-shed, centre-shed, &c., and their relative advantages.

The mechanical contrivances for producing lappett and swivel cloths.

The methods of making lenos, gauze, loops, velvets, Turkish towels, &c.

The structure of various fabrics requiring more than one warp and weft, such as extra warp and weft figures, piques, toilets, quiltings, &c.

The methods of dissecting the above kinds of cloth for purposes of reproduction.

The mechanism of standard makes of drop-box and circular-box looms.

Calculations for determining the cost of producing the above and similar cloths.

Machine Construction.

General introduction to machine drawing. Plans and elevations of simple parts. Methods and conventions of projecting views. Freehand sketches of machine details. Drawing of parts of machine. Elementary work connected with construction of machines. Properties of materials used in construction.

Textile Art.

The making of designs for woven fabrics. Lectures will be given on the following :—The planning of ornament, the history of weaving, the treatment of natural forms, and colour harmony and contrast.

Fifth Year.

Fee for Course, 7s. 6d.

TIME TABLE.

DAY.	SUBJECT.	TIME.
Monday	Textile Electricity	7-15 to 9-15
Tuesday	Weaving and Designing. Lecture, &c..... (Honours—City and Guilds of London).	7-15 to 9-15
Thursday	Practical Pattern Weaving	7-15 to 9-15
Friday	Heat Engines	7-15 to 9-45

Syllabus.

Weaving and Designing.

There are two examinations in connection with this Grade. Students may sit at either or both. Section A, upon designing and colour, as applied to woven cloth. Section B, on the machinery and manufacturing processes.

The Syllabus of Section A will comprise :—

The nature and properties of different fibres used in manufacturing, and the methods of distinguishing them, or the proportion of each, when different fibres are twisted together.

The elementary principals of colour, and the practical application of colour in weaving.

The various qualities of dyed yarn, such as fast, loose, washing, and direct colours.

Methods of preparing pencil drawings and sketch deisgns, and the transfer of the same to design paper.

Card-cutting, lacing, and repeating.

Various methods of tieing up Jacquard harness to produce cloths of a special character.

The Analysis of all classes of fabrics.

The selection of suitable yarns, reeds, and picks for fabrics mentioned in this and the preceding Courses.

Section B.

The various types of machines in use for winding, warping, and sizing.

Sizing ingredients, their properties and uses in the manufacture of cotton goods.

The relative advantages of coloured yarns, dyed before and after being spun.

Jacquard machines for special purposes, such as cross-borders, lenos, compound, and pile cloths.

The uses of the split, pressure, and scale harness.

Calculations relating to every departmental cost of producing cloth.

The causes and remedies for common defects in various kinds of fabrics.

Cloth testing to ascertain pattern, reed, pick, counts of yarn, percentage of size, &c.

The quantity of preparatory machinery required, relative to the number of looms, for producing different classes of cloths.

Weaving-shed ventilation and humidity.

N.B.—The Examiners require that all Honours Students shall design and weave a number of original patterns. To do this, the Students meet in the Weaving Shed at the school on Thursday evening, from 7-15 to 9-15.

Heat Engines.

Details of steam, gas, and oil engines.

The slide valve. Reversing motions.

Action of fly-wheel and governor.

Condensers. Condensing water required.

Condensation in the cylinder. Effect of drainage.

Steam jacketting. Superheating.

Types of boilers : Their construction. Boiler fittings.

Heating value of solids and gaseous fuels : Total and latent heats of steam.

Forms of energy.

Combustion and smoke prevention.

Steam turbines.

Laboratory Work.

Experiments on latent and specific heats. Boyle's law. Temperature and pressure of steam. Indicated and brake horse-power of steam and gas engines. Planimeter work. Heating values of gas and coal. Steam consumption.

Electricity for Textile Students.

This Class has been arranged to meet the requirements of Textile Students who are taking up the study of Electricity in its application to the Electrical Drive in Textile Factories. The subject will be dealt with in a practical manner and the lectures freely illustrated by experiments and lantern slides.

Text Books for Third and Fourth Years' Courses :—Cotton Weaving and Designing, by J. T. Taylor ; Cotton Cloth Designing, by James Holmes.

Honours Grade.—The Mechanism of Weaving, by T. W. Fox ; the Chemistry and Practice of Sizing, by Percy Bean.

Commercial Evening Courses.

Commercial Department.

STAFF.

Subject.	Lecturer.
Arithmetic (Commercial)	J. RENWICK.
Accountancy	R. E. SMALLEY, F.C.A.
Book-keeping	R. E. SMALLEY, F.C.A. H. SOUTHWORTH, A.C.A.
Commercial English, Correspondence, and Business Methods	V. E. COLLINGE, A.C.I.S.
Commercial Law	V. E. COLLINGE, A.C.I.S.
French	F. W. JACKSON, B.A.
Geography (Commercial)	J. RENWICK.
German	H. A. JUTZI.
Shorthand (Speed)	E. H. SMIRK, F.Inc. S.T.
Shorthand (Ad. Theory)	V. E. COLLINGE, F.Inc. S.T.
Typewriting	JAMES HILTON.

INTRODUCTION.

Classes in preparation for the Examinations of the Union of Lancashire and Cheshire Institutes, and, in some cases, of the Royal Society of Arts, will be held in the above subjects, syllabuses of which, for the respective Courses, follow the Time Tables.

ORGANISED COURSES.

No Student will be admitted to the specialized Courses in Commercial subjects unless he possesses the Preliminary Commercial Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent ; all other Students will be examined by the Institute before admission, and if they fail to reach the prescribed standard, they will be advised to attend for a time the preliminary Courses conducted in the Borough Branch Schools.

In exceptional cases Students may, on account of age, or other special circumstances, be excused the entrance examinations, provided they can satisfy the Principal of the Institute that they are able to benefit by the Courses to which they seek admission.

Except under very special circumstances, all Students joining the Institute will be expected to undertake a complete Course of Work, and Students will not be regarded as fulfilling this condition unless they attend regularly each subject of the Course, and perform the homework set to the satisfaction of the Lecturer.

Students from Elementary Day Schools will not, as a rule, be ready to undertake specialized Courses until they have been prepared by two years' preliminary instruction. Courses for the purpose, arranged so as to cover two years, will be conducted by the Preston Education Committee in their Branch Schools.

Third Year.

FEE FOR COURSE, 7s. 6d.

JUNIOR COURSE.

The Course comprises three or four of the following subjects, one of which must be Arithmetic or Commercial English and Business Methods :—

Subjects.	Examination.	P.M.
(1) Arithmetic (junior grade)	March 28th, 7-15 to	9-45
(2) Book-keeping (junior grade)	,, 23rd, 7-15 to	10-15
(3) Commercial English and Business Methods (junior grade)	,, 27th 7-15 to	9-45
(4) Geography	,, 29th, 7-15 to	9-45
(5) Shorthand (junior grade)	,, 22nd, 7-15 to	8-15
(6) Typewriting (junior grade)	,, 30th, 7-15 to	8-45
(7) Modern Language (intermediate grade), *either* (*a*) French, *or*	April 4th,	2½ hours.
(*b*) German	March 21st,	do .
(8) Second Modern Language (elementary grade), (*a*) French *or* (*b*) German ..	(as above.)	

To qualify for the certificate, Students must be successful (in the one year) in the four subjects taken—at least two of the successes being in the first class, and the other successes in the second class—but, for the year 1911, *qualifying successes obtained in* 1910 *will be accepted.*

TIME TABLE.

DAY.	TIME.	SUBJECT.
Monday	7-15 to 8-15	(4) Geography.
,,	7-15 to 8-15	(5) Shorthand (Junior Grade).
,,	8-15 to 9-15	(5) ,, ,, (Students take one class only).
,,	8-15 to 9-15	(1) Arithmetic (Junior Grade).
Tuesday	7 to 8	(8) French (Second Language—Elementary Grade).
,,	7-15 to 8-15	(3) Commercial English and Business Methods (Junior Grade). (Or Friday).
,,	7-15 to 8-15	(6) Typewriting (Junior Grade). (Or Friday).
,,	8-15 to 9-15	(6) ,, ,, (Or Friday).
Wednesday	7-15 to 8-15	(2) Book-keeping (Junior Grade).
,,	7 to 8	(8) German (Second Language—Elementary Grade).
,,	8 to 9	(7) German (Intermediate Grade).
Thursday	7 to 8	(7) French (Intermediate Grade).
Friday	7-15 to 8-15	(6) Typewriting (Junior Grade). (Or Tuesday).
,,	8-15 to 9-15	(6) ,, ,, (Or Tuesday).
,,	8-15 to 9-15	(3) Commercial English and Business Methods (Junior Grade). (Or Tuesday).

CLASS AND EXAMINATION.

Syllabuses.

(1) *Arithmetic* (*Commercial*).—

Applications of Arithmetic, such as practice, percentages, discount, interest, stocks, profit and loss, exchange, averages, areas, simple solid contents. The metric system (values, weights, and measures)—one problem at least in the metric system must be attempted at the examination. The coinage of France, Germany, United States, and India.

(2) *Bookeeping.*—

Bookkeeping by double entry, including the opening and keeping of the following books taken in the order mentioned : Journal, bought day book, sold day book, returns book (inwards and outwards), cash book and petty cash book, ledger (sold and bought).

Taking stock : The balancing of the accounts and the testing of the correctness of the postings by a trial balance, the preparation of an account of profit and loss and a balance-sheet in such forms as to shew the exact position of the business at date of stock-taking. To dissect or summarise the subsidiary books.

The meaning and use of mercantile terms, *i.e.*, bills of exchange, shipping, insurance, joint stock company, &c.

The examination test will comprise questions on mercantile terms and definitions, the preparation of a trial balance, profit and loss account, and balance sheet.

(3) *Commercial English and Business Methods.*—

1. The writing of essays, having reference to commercial matters. (*All examination candidates will be required to attempt an essay*).
2. The condensing of market reports into telegrams.
3. Indexing and précis writing.
4. The drafting of business letters, advertisements, and circulars, and the preparation of commercial forms and accounts, such as accounts current, account sales, foreign bills of exchange, statements of receipts and payments, &c.
5. Definition of commercial terms and phrases.

Examination Note.—In writing the letter and the essay the candidate should endeavour to be clear and to the point, and should use simple English, without waste of words and without faults of grammar.

(4) *Geography.*—

The geographical distribution of commercial commodities—chiefly food products, raw products, and manufactured products. A knowledge of (1) The localities where, and the geographical and local conditions under which these are produced ; quantites available for export ; colonisation and the conditions of successful industry in the British possessions generally. (2) Various facilities and hindrances to trade—as languages, tariffs, currencies, weights and measures ; communications by land and sea, *i.e.*, transports, telegraphs, postal arrangements ; the distances, trade routes, and ordinary modes of conveyance to important markets ; ports, harbours, coaling stations, harbours of refuge. The special subject of examination for 1911 will be " The Monsoon and Mediterranean Lands of Asia (excluding the East Indies) to be studied, with special reference to (*a*) geographic control, and (*b*) contrasts of summer rain and summer drought."

The examination test will consist of two parts, *i.e.* :—(i.) general geography of products, trade routes, &c., and (ii.) the special subject.

(5) *Shorthand* (*Advanced Theory*).—

Instruction will be given in the principles of Phonography set forth in the "Manual of Phonography" (Instructor, pt. 1). Advanced principles will be introduced early, and application made especially to commercial phraseology. The examination will consist of the neat and correct transcription into Shorthand of about 200 words, partly in single words and partly in simple sentences, a short passage of which will be slowly dictated. Candidates must be familiar with the main principles and resources of Pitman's Shorthand as applied to commercial and general work, but will *not* be required to shew any knowledge of principles or resources applicable especially to reporting.

(6) *Typewriting*.—

The syllabus is shown by the examination test, which will comprise the following items :—

(1) The typing of a carelessly written letter, not to exceed 120 words in length.

(2) The composition and typing of a reply to the letter given in paragraph 1.

(3) Questions on the care, oiling, &c., of a typewriter, including the use of the variable spacer, the adjustment of margins for different kinds of work, line spacing, &c.

(4) The indication of correct fingering and correct division of words.

(5) The copying of an arranged tabulation or specification.

(6) The typing of an invoice, or other commercial statement, from unarranged details given.

Candidates will be required to attempt the whole of the questions.

(7) *Modern Language* (*Intermediate Grade*).—

(*a*) *French*.—

(*a*) Questions in grammar ; (*b*) translation either of a passage from Laboulaye "Yron et Finette" [Siepmann's Series, *Macmillan & Co.*, 6d.], or an easy unprepared passage from a modern French writer ; (*c*) a short piece of unprepared translation for all candidates ; (*d*) a simple piece of English prose.

(*b*) *German*.—

(*a*) Questions in grammar ; (*b*) translation either of a passage from Wildenbruch "Vergnügen auf dem Lande" [Hachette's

Popular German Authors, 6d.], or an easy unprepared passage from a modern German writer; (*c*) a short piece of unprepared translation for all candidates; (*d*) a simple piece of English prose.

(8) *Second Modern Language* (*Elementary Grade*).—

(*a*) *French.*—

Questions in grammar, and simple sentences for translation into English, and *vice versa*.

(*b*) *German.*—

Questions in grammar, and simple sentences for translation into English, and *vice versa*. The questions will be printed in Gothic characters, but candidates may use either Gothic or English characters in answering.

Fourth Year.

FEE FOR COURSE, 7s. 6d.

SENIOR COURSE.

The Course comprises any three or four of the following subjects :—

Subjects.	Examination.	P.M.
(1) Arithmetic (senior grade)	March 28th,	7-15 to 9-45
(2) Book-keeping (senior grade).....	,, 23rd,	7-15 to 10-15
(3) Commercial English and Business Methods (senior grade)	,, 27th,	7-15 to 9-45
(4) Shorthand (Speed at least 60 words per minute)	,, 22nd,	8-30 to 10-5
(5) Typewriting (senior grade)	April 3rd,	7-15 to 9-15
(6) Modern Language (advanced grade), *either* (*a*) French, *or*	,, 4th	2½ hours.
(*b*) German	March 21st,	do.
(7) Second Modern Language (intermediate grade), (*a*) French *or* (*b*) German ..	(as above.)	

To qualify for the certificate, Students who hold the Junior Commercial Certificate must be successful in three subjects, and other Students in four subjects, and two of the successes must be equal to first-class passes.

Students who do not meet this requirement may present themselves for the examinations in the succeeding year, and if successful in at least three subjects any first-class successes obtained at the previous examinations will be counted for the purposes of the certificate. For the year 1911, *qualifying successes obtained in* 1909 *and* 1910 *will be accepted.*

TIME TABLE.

DAY.	TIME.	SUBJECT.
Tuesday	7-15 to 8-15	(5) Typewriting (Senior Grade). (Or Friday).
,, ...	8-15 to 9-15	(5) ,, ,, (Or Friday).
,, ...	8-15 to 9-15	(3) Commercial English and Business Methods (Senior Grade).
Wednesday	7-15 to 8-15	(1) Arithmetic (Senior Grade).
,, ...	8 to 9	(6) German (Advanced Grade).
,, ...	8 to 9	(7) German (Second Language—Intermediate Grade).
,, ...	8-30 to 9-30	(2) Book-keeping (Senior Grade).
Thursday	7 to 8	(7) French (Second Language—Intermediate Grade).
,, ...	7-30 to 8-30	(4) Shorthand (Speed, 50-90 words per minute).
,, ...	8 to 9	(6) French (Advanced Grade).
,, ...	8-30 to 9-30	(4) Shorthand (Speed, 90-150 words per minute).
Friday	7-15 to 8-15	(5) Typewriting (Senior Grade). (Or Tuesday).
,, ...	8-15 to 9-15	(5) ,, ,, (Or Tuesday).

CLASS AND EXAMINATION.

Syllabuses.

(1) *Arithmetic (Commercial).*—

Proportional parts, banker's discount, stocks and shares (ordinary stock, preference stock, debentures), profit and loss. Compound Interest, with special reference to repayment of loans. The use of logarithms (more particularly for problems on compound interest, insurance, and annuities). Rates of exchange and transactions with home and foreign bills. The money market column of a daily newspaper. Metric system. Coinage. [*Tables of logarithms and currencies will be given on the examination paper*].

(2) *Bookkeeping.*—

The theory and practice of double entry; conversion of single entry accounts into double.

The application of double entry to home trade, manufacturing, and foreign trade.

Variations in the principal and subsidiary books to suit different requirements ; self-balancing ledgers.

Joint stock accounts, explanation of terms of the different kinds of shares and debentures, forms, statistical and other books and accounts.

Partnership and bankruptcy accounts, statements of affairs and deficiency accounts.

Income-tax charges and deductions, and preparation of statements for the Commissioners.

Preparation of income and expenditure, receipts and payments accounts.

The examination test will consist of (1) an examination in theory —candidates will be required to attempt not more than four questions dealing with the above syllabus ; (2) from a given summary of transactions to make the necessary reserves and adjustments, and furnish final accounts ; (3) candidates will also be expected to work an exercise on partnership accounts.

(3) *Commercial English and Business Methods.*—

1. The condensation of messages or reports for telegraphic purposes.

2. Banking : Drafts, letters of credit, hypothecations, monetary exchanges between Great Britain and the countries named in paragraph 5.

3. A general knowledge of :—

(*a*) Insurance : Fire, life, marine, and other forms, Lloyd's.

(*b*) Shipping : Duties, exports, imports, consignments, consular invoices, certificates of origin, advice notes, bills-of-lading, dock and custom house work, cubic and superficial measurements of packages.

(*c*) Leading Markets for British goods, products of the chief industrial centres, customs tariffs.

4. Joint stock companies (different kinds of share and loan capital, prospectuses, limited liability), and dealings on the stock exchange.

5. The metric system : Calculations for prices based on f.o.b., c.f. and i., and franco terms ; commissions, discounts, interest ; currencies of the United Kingdom, the United States, France, Germany, Belgium, Holland, Scandinavia, Spain, Italy, Russia, Egypt, India, China, Japan, the Argentine Republic, and Brazil. [*Tables of currencies will be given on the examination paper*].

5. Terms and abbreviations generally used in commerce, banking, insurance, shipping, and joint stock companies, and on the stock exchange.

(4) *Shorthand* (*Speed*).—

Instruction will be given in the special principles of abbreviation, phrasing, intersection, &c., set forth in the " Reporter " (Instructor,

pt. 2), and dictation of a great variety of matter relating to commerce, politics, science, religion, &c., will be given at rates varying from 50 to 150 words per minute. For Examination the Student may take one of four tests :—3 minutes at 60, 80, or 100 ; or 4 minutes at 120 words per minute, and the following points will be specially noticed :—(1) Shorthand note. (2) Accuracy of transcription. (3) Spelling and punctuation. (4) Reasonable neatness. The main consideration, however, will be accuracy in the transcript.

(5) *Typewriting.*—

The syllabus is shown by the examination test, which will comprise the following items in addition to those specified in the Junior Grade syllabus :—

(1) Typing appropriate replies to given letters.
(2) Questions on correct forms of address.
(3) Punctuating, paragraphing, and capitalising a passage.
(4) Typing of meanings of abbreviations.
(5) Typing from badly spelled, unpunctuated, abbreviated, and confused manuscripts.
(6) Questions on duplicating processes.
(7) The display of titles and headings.
(8) Typing an invoice or statement from printed or manuscript copy.

Candidates will be required to attempt the whole of the questions.

NOTE.—Accuracy and neatness being of the greatest importance, *the quality of the work will be noticed, rather than the speed.*

It is not desirable that candidates should take this examination unless they have a fair knowledge of English.

(6) *Modern Language* (*Advanced Grade*).—

(*a*) *French.*—

Dictation from the work of a modern author, supplemented by two readings of a short story or simple passage in French, the substance of which has to be afterwards reproduced in English.

COMMERCIAL.—In lieu of grammatical questions, a passage for translation with a commercial bearing will be set, and also, business phrases in fairly common use will be given for translation *from* and *into* French. Whilst formal questions in grammar will be dispensed with, the Examiner will be instructed to pay special attention to the grammatical accuracy of the composition, and any serious deficiency in this respect will be held to justify the failure of the candidate. Translation of an English commercial letter or document into French, and *vice versa* ; ability to write a commercial letter or market report in French. The headings of an original letter may be given to the candidates, who will be required to express it in good English, and then translate it into French.

(*b*) *German.*—

Dictation, &c., in German similar to (*a*) above.

(2) COMMERCIAL.—In lieu *of* grammatical questions, a passage for translation with a commercial bearing will be set, and also, business phrases in fairly common use will be given for translation *from and into* German. Whilst formal questions in grammar will be dispensed with, the Examiner will be instructed to pay special attention to the grammatical accuracy of the composition, and any serious deficiency in this respect will be held to justify the failure of the candidate. Translation of an English commercial letter or document into German, and *vice versa* ; ability to write a commercial letter or market report in German. The headings of an original letter may be given to the candidates, who will be required to express it in good English, and then translate it into German. Neatness and handwriting will be taken into account.

NOTE.—Advanced grade candidates must be prepared to read and write Gothic characters at the examination in this subject.

DICTATION TEST.—Candidates may follow either the older or the modernised " official " spelling, but they are expected to be consistent in the use of the system they adopt.

(7) *Second Modern Language* (*Intermediate Grade*).—

(*a*) *French.*—See (7a) Junior Course.
(*b*) *German.*—See (7b) Junior Course.

Fifth Year.

For Students who have obtained the Senior Commercial Certificate of the Union of Lancashire and Cheshire Institutes, or its equivalent, a Course comprising the following subjects, is arranged :—

Commercial Law—Friday, 7-15 to 8-15.

A.—Subjects in which all students must satisfy the examiner :

1.—The general principle of the law of contract.
2.—(*a*) The contract of sale.
(*b*) Negotiable instruments.
(*c*) Contracts of carriage and affreightment.

B.—Subjects in one of which students will have to satisfy the examiner in order to obtain a First-class certificate :

3.—Mercantile persons : including
(*a*) Partnership.
(*b*) Company Law.
4.—Principal and agent (including mercantile agents and contracts of hiring and service).
5.—Mercantile property (including goodwill, trade-marks, and patents).
6.—Guarantees.
7.—Insurance.
8.—Contracts on the Stock Exchange.
9.—The Elements of the Law of Bankruptcy.

In every case the greatest weight will be given to Subjects 1 and 2, and a wider knowledge in these subjects will be expected than in Subjects 3 to 9 ; but an opportunity will be given in each paper to students to display some familiarity with the latter subjects.

Accounting and Banking—Friday, 8-15 to 9-15.

Candidates must satisfy the Examiner in both divisions of this subject.

A.—ACCOUNTING.

1.—" Single " and " Double Entry," " Double Account " and " Single Account " methods ; their adaptation to the varying needs of commercial enterprises, public undertakings, charities, &c.

2.—Methods of balancing ; " Closing Entries " ; the " Trial Balance " ; " Trading " or " Working Accounts " ; " Revenue " or " Income and Expenditure " or " Profit and Loss " Accounts ; the " Balance Sheet."

3.—" Capital " Accounts in private undertakings, in limited companies, and in companies created by special Acts of Parliament.

4.—" Provision " and " Reserve " Accounts ; " Depreciation " ; " Sinking Funds " ; " Marine Insurance Funds " ; " Secret Reserves " ; " Goodwill " ; " Suspense " Accounts ; " Consignment " Accounts ; " Departmental " Accounts."

5.—Detection and rectification of error ; Adjustments, as between the Capital and Revenue, and as between Partners ; " Annual Returns " ; " Cost " Accounts ; Stores and Stock Accounts ; Bases of valuation of Assets ; Income Tax Accounts for Assessment and Appeal.

B.—BANKING.

1.—Its connection with trade ; a banker's duties to customers ; the source of his profits ; the Bank of England, its relation to the banking world, the Government, and the public ; the " Bank Rate."

2.—Definitions of banking and mercantile terms and usages.

3.—Current and Deposit and Loan Accounts ; Overdrafts ; Advances ; " Money at Call."

4.—Cheques ; definitions and essentials ; collection and negotiability ; rights and responsibilities of the parties ; duties and responsibilities of the bankers in this connection ; crossed cheques ; various methods of crossing and their effect ; endorsation ; dishonoured cheques, and the meaning of bankers' remarks thereon.

5.—Bills of Exchange ; definitions and essentials ; their discount and collection ; rebate ; stamp duties ; acceptances ; endorsation ; negotiability ; time of payment ; dishonour by non-payment ; noting and protesting ; rights and liabilities of parties ; foreign bills ; bills in a set ; accommodation bills ; promissory notes ; circular notes and letters of credit ; exchanges ; operation and method of calculation.

6.—Bankers' charges and how to check them ; the pass-book ; correspondence ; record of securities ; securities held for safe custody.

7.—The outlines of bank book-keeping ; slips and dockets ; ledger posting on the slip system ; the record of cash and cash articles ; " on the balance," how effected ; the profit and loss ledger ; the general ledger ; bank balance sheets.

The Fee for both subjects will be 7s. 6d.

PRIZES OF THE UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

Senior Commercial Course Certificate.

Lord Derby Exhibition of £10 per annum for three years (qualifying successes in 1910 and 1911) to be awarded in 1911 to the candidate who, in the opinion of the Council, stands highest. For 1911, first prize, 30s. ; second prize, 25s. ; third prize, 20s. ; fourth prize, 15s. ; extra prize for grammar and literary power, 15s.

Junior Commercial Course Certificate.

For 1911, first prize, 25s. ; second prize, 20s. ; third prize, 15s. ; fourth prize, 10s.

In both Courses there are also valuable prizes offered in each subject.

LOCAL PRIZES.

Prizes for each First Class Advanced success in the Examination of the Royal Society of Arts, and the Union of Lancashire and Cheshire Institutes will be awarded to Students who have attended a complete Course, as follows :—

Third Year's Course, 5s.
Fourth Year's Course, 7s. 6d.
Fifth Year's Course, 10s.

All Fees must be paid in advance, and Students must obtain the official receipt and show the same to the Teacher before their names can be entered on the Register.

All Students must see the Principal prior to filling up the Form for enrolment. He can be seen for this purpose at the Technical School, Corporation Street, on Monday and Tuesday evenings, the 12th and 13th September, and at the Harris Institute, Avenham, on Thursday evening, the 14th.

The Staff will also be present on the above nights to advise Students as to Course of Instruction, Text Books, &c.

An Entrance Examination will be held on Friday evening, the 9th September.

A Student who does not desire to take a full Course and can prove to the satisfaction of the Principal and Head of Department that he can benefit by instruction in a certain subject or subjects, may be allowed to attend at a fee of 7s. 6d. per subject, lecture or practical.

Students who enter for Courses must clearly understand that they will be required to attend all the subjects regularly, otherwise they will be compelled to pay a fee of 7s. 6d. for each subject taken. *This rule will be strictly enforced.* In the case of Second Year Technical Students the fee would be 5s.

The Teachers are authorised to report periodically through the Principal as to the attendance and homework of each Student. The Council shall have power in dealing with Students who are unsatisfactory in either of these respects to remove their names from the Register without return of fee.

Scholarships and Prizes.

SCHOLARSHIPS AND PRIZES.

CONDITIONS ON WHICH SCHOLARSHIPS AND PRIZES WILL BE AWARDED.

Two Scholarships of £45 a year each may be offered on the following conditions :

One Scholarship, tenable for one year, at the Manchester or Liverpool Universities ; School of Science, London, or other place of higher education approved by the Council, to be competed for at an Examination to be held for that purpose, open to all Students who obtain a First-Class Advanced Certificate in any subject of Science at the May Examination, 1911, and who have attended the Classes at the Harris Institute for two years preceding that Examination, and reside within a radius of seven miles from the Preston Town Hall during that period.

One Scholarship, tenable for one year, at the National Art Training School, South Kensington, to be competed for at an Examination held during the fortnight preceding the Summer Vacation, 1911, open to all Art Students who have sat for the Government Examinations connected with the Art Class Teacher's Certificate, and have attended the Art School at the Harris Institute for two years preceding the Examination, and resided within a radius of seven miles from the Preston Town Hall during that period.

The Council reserve the right of witholding the Scholarships if the drawings or work submitted do not, in the opinion of the Examiners, possess sufficient merit.

SCIENCE, TECHNOLOGY, AND COMMERCIAL.

A Scholarship will be awarded to each Student who obtains a First-Class Pass in any subject at the Examinations of the Board of Education, City and Guilds of London, Society of Arts, and an Advanced First-Class Pass in connection with the Union of Lancashire and Cheshire Institutes, conditionally on attendance and home work being satisfactory, and with the distinct understanding that the Student takes a complete Course the following Session.

Scholarships will also be awarded to Students who have obtained a First-Class Pass in cases where Courses are not arranged.

Prizes for each First-Class Advanced success in the Examination of the Board of Education, City and Guilds of London, Society of Arts, and the Union of Lancashire and Cheshire Institutes will be awarded to Students who have attended a complete Course, as follows :—

Third Year's Course, 5s.
Fourth Year's Course, 7s. 6d.
Fifth Year's Course, 10s.

Prizes will also be awarded to Students obtaining First-Class Advanced Passes on the same conditions as Third Year Course Students in cases where Courses are not arranged.

SCHOOL OF ART.

A Scholarship to the Evening Classes will be given to all Students obtaining a First-Class Certificate ; and a Scholarship and Prize, value 3s. 6d., to each Student who shall obtain two First-Class Certificates.

DAY ENGINEERING.

Scholarships for Boys Attending Elementary Schools.

A limited number of Scholarships are offered to boys residing within seven miles of the Preston Town Hall. They must be over 15 years of age. A Test Examination will be held in July, 1911. These Scholarships cannot be competed for by anyone who is, or has been, a Student of the Institute.

Scholarships and Prizes will be awarded only to Students who have made at least 75 per cent. of possible attendances during the Session, and worked satisfactorily.

No Student who has been awarded a Prize or a Scholarship will be elegible for a Prize for a similar success a second time.

All Prizes will be in the form of books, instruments, or materials.

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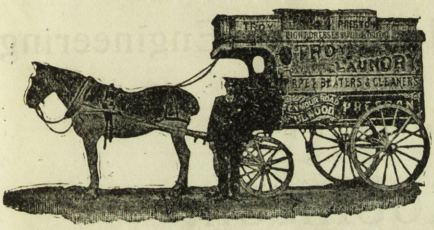

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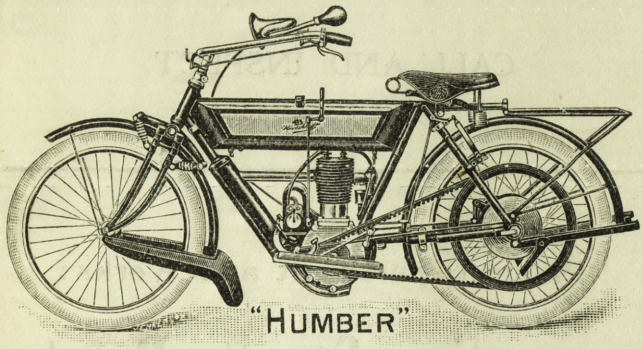

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