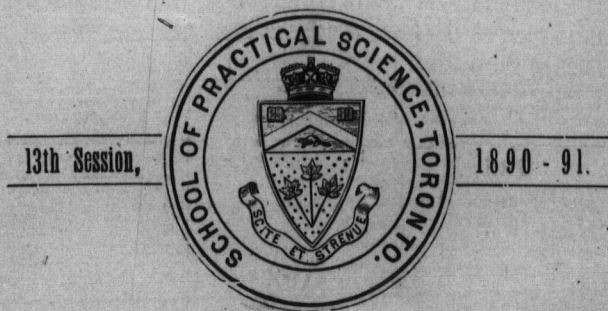


CALENDAR
OF THE
SCHOOL OF PRACTICAL SCIENCE
PROVINCE OF ONTARIO,
WITH A
SYLLABUS
OF THE

*Courses of Instruction and of the Regulations for
Diplomas.*



TORONTO:
PRINTED BY WARWICK & SONS 68 AND 70 FRONT STREET WEST.
1890.

1890.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1. **FIRST TERM** begins Supplemental Examination begins.

10. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

14. Meeting of Council.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

12. Meeting of Council.

23. **FIRST TERM** ends.

1891.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

8. **SECOND TERM** begins.

9. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

11. Ash Wednesday.

Building closed.

13. Meeting of Council.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

13. Meeting of Council.

27. Good Friday.

Building closed.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

8. Lectures and Practical Work Close.

10. Meeting of Council.

15. **Examinations** begin.



MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

1. **SECOND TERM** ends.

Faculty of the School.

J. GALBRAITH, M.A., ASSOC. M. INST. C.E., PRINCIPAL.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., ASSOC. M. INST. C.E. *Professor of Engineering (Chairman)*
 W. H. ELLIS, M.A., M.B. *Professor of Applied Chemistry.*
 L. B. STEWART, P.L.S., D.T.S. *Lecturer in Surveying. (Secretary)*
 C. H. C. WRIGHT, GRAD. S.P.S. *Lecturer in Architecture.*
 T. R. ROSEBRUGH, B.A., GRAD. S.P.S. *Demonstrator in Engineering.*
Laboratory.

ASSISTANT INSTRUCTORS.

C. J. MARANI, GRAD. S.P.S. *Fellow in Engineering.*
 W. ROSS, B.A. *Fellow in Applied Chemistry.*

MEMBERS OF THE FACULTY OF THE UNIVERSITY OF TORONTO WHOSE CLASSES ARE ATTENDED BY THE REGULAR STUDENTS OF THE SCHOOL.

E. J. CHAPMAN, PH.D., LL.D. *Professor of Mineralogy and Geology.*
 JAMES LOUDON, M.A. *Professor of Physics.*
 R. RAMSAY WRIGHT, M.A., B.Sc. *Professor of Biology.*
 W. H. PIKE, M.A., PH.D. *Professor of Chemistry.*
 ALFRED BAKER, M.A. *Professor of Mathematics.*
 W. J. LOUDON, B.A. *Demonstrator in Physics.*
 A. B. MACALLUM, B.A., M.B., PH.D. *Lecturer in Physiology.*
 J. MCGOWAN, B.A. *Fellow in Mathematics.*
 J. G. WITTON, B.A. *Fellow in Physics.*
 F. G. WAIT, B.A. *Fellow in Mineralogy and Geology.*
 J. J. MCKENZIE, B.A. *Fellow in Biology.*

For information further than that contained in the Calendar application
 may be made to the Secretary, L. B. STEWART.

4

Department of Engineering.

SESSION 1889-90.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

CIVIL ENGINEERING.

1st Year.

Alison, J. H.
Anderson, A. G.
Brown, G. L.
Dickson, A. C.
Evans, J. W.
Fairchild, C.
Forester, C.
Francis, W. J.
Goodwin, J. B.

Jones, J. E.
Laschinger, E. J.
Laing, A. T.
Langley, C. E.
Marani, V. G. F.
Macallum, A.
McEntee, B.
McLennan, R.
Mitchell, C. H.

Paterson, J. F.
Prentice, J. M.
Rolph, H.
Ross, J. A.
Russell, R.
Smith, A.
Topp, C. H.
Watson, A.

2nd Year.

Allan, J. R.
Beatty, H. J.
Deacon, T. R.
Dill, C. W.
Dunbar, M.
Hill, V.

Lane, A.
McAllister, J. E.
Moore, J. E. A.
Newman, W.
Playfair, N. L.

Robinson, J. K.
Russel, W.
Sylvester, G. E.
Symmes, H. D.
Thompson R. W.

3rd Year.

Bowman, F. M.
Bucke, M. A.
Corrigan, G. D.
Duff, J. A., (B.A.)
English, A. B.

Garland, N. L.
Hutcheon, J.
Innes, W. L.
Meade, H.
Merrill, E. B.

Pedder, J. R.
Peterson, C. E.
Wiggins, T. H.
Withrow, W. J.

MECHANICAL ENGINEERING.

1st Year.

Cotton, W. H.
Goldie, A. R.
Hanly, J. B.

Lea, W. A.
Milne, C. G.

Robertson, C. G.
White, A. V.

3rd Year.

Ross, R. A.

SPECIAL STUDENTS.

CIVIL ENGINEERING.

Russell, T. S.

MECHANICAL ENGINEERING.

Lash, N. M.

McCollum, H.

SURVEYING.

Fawcett, Adam.

DRAWING.

Mickle, A. E.

Harbert, W.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

1881.—J. L. Morris, C.E., P.L.S., Pembroke.

1882.—J. McAree, P.L.S., D.T.S., Toronto.

D. Jeffrey, Contractor, Winnipeg.

J. H. Kennedy, C.E., Architect, etc., St. Thomas, Ont.

1883.—G. H. Duggan, Dominion Bridge Co., Montreal.

J. W. Tyrrell, C.E., P. and D.L.S., Hamilton.

D. Burns, Surveyor's Office, Toronto.

1884.—E. W. Stern, Chicago Bridge and Iron Co., Chicago, Ill.

A. R. Raymer, Louisville & Nashville R. R., Cumberland Gap, Tenn.

J. Robertson, P.L.S., Coad & Robertson, Civil Engineers, P. L. Surveyors, etc., Glencoe, Ont.

W. C. Kirkland, Canadian Pacific Railway.

J. McDougall, B.A., Canadian Pacific Railway.

1885.—B. A. Ludgate, P.L.S., Peterborough, Ont.

O. McKay, P.L.S., Windsor.

E. E. Henderson, P.L.S., Canadian Pacific Railway, Brownville, Maine.

F. W. Bleakley, care of A. W. Keadie, Quincy, California.

H. J. Bowman, P. and D.L.S., Berlin, Ont.

1886.—T. K. Thomson, Bridge Engineer, N. & W. R. R. Ceredo, W. Va.

H. G. Tyrrell, Pencoyd Bridge and Construction Co., Penn.

R. Laird, P.L.S., Canadian Pacific Railway.

A. M. Bowman, P. and D.L.S., Lindsay, Ont.

E. B. Hermon, P. and D.L.S., Vancouver, British Columbia.

1887.—A. E. Lott, Atcheson, Topeka and Santa Fe Railway, Topeka, Kansas.

J. Roger, 544 Lafayette Ave., St. Paul, Minn.

J. C. Burns, Architect's Office, Toronto.

C. H. Pinhey, P. and D.L.S., 630 Wellington Street, Ottawa.

A. L. McCulloch, Galt.

F. Martin, Toronto.

1888.—J. F. Apsey, P. L. S., Toronto.

W. T. Ashbridge, City Engineer's Office, Toronto.

E. F. Ball, Niagara, Ont.

D. B. Brown, Cornwall, Ont.

C. M. Canniff, City Engineer's Office, Toronto.

H. J. Chewett, Engineer's Office, Toronto.

J. Gibbons, Renfrew, Ont.

R. McDowall, Owen Sound, Ont.

G. W. McFarlen, Surveyor's Office, Toronto.

C. J. Marani, Fellow in Engineering, S.P.S.

G. F. Mickle, B. A., Freiberg, Saxony.

J. H. Moore, Newmarket, Ont.

G. H. Richardson, Canadian Pacific Railway, Toronto.

K. Rose, Riverdale, California.

J. E. Ross, Beachburg, Ont.

C. H. C. Wright, Boston, Mass.

1889.—B. Carey, Engineer's Office, Toronto.

W. J. Chalmers, Mohawk, Ont.

W. A. Clement, Niagara, Ont.

G. F. Hanning, City Engineer's Office, Toronto.

H. E. T. Haultain, Manager St. Mauritius Mines, Barringen, Bohemia.

J. Irvine, Harriston, Ont.

D. D. James, Surveyor's Office, Toronto.

F. X. Mill, Engineer's Office, Brockville.

H. K. Moberly, Virginia, U. S.

T. R. Rosebrugh, B.A., Manufacturing Works, Paterson, New Jersey.

T. Wickett, Belleville.

FELLOWSHIP IN ENGINEERING.

A Fellowship of the value of \$500 per annum, paid in eight monthly instalments, has been established, open only to Graduates in Engineering of the School.

The Fellow is required to take such portions of the work of instruction as may be assigned to him by the Professor of Engineering.

Candidates for the Fellowship are required to make written application to the Secretary on or before 20th September.

PRIZEMEN.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize.
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. H. Duggan	1st prize.
	III. Year	D. Jeffrey	1st prize.
1883.—	I. Year	B. A. Ludgate	1st prize.
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thomson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize.
	II. Year	A. E. Lott	1st prize.
1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
1888.—	I. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	II. Year	D. D. James	1st prize.
	III. Year	C. H. C. Wright	1st prize.
1889.—	I. Year	J. K. Robinson	1st prize.
	" "	G. E. Silvester	2nd prize.
	II. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	III. Year	D. D. James	1st prize.

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.

1885.....	J. L. Morris.
1886.....	J. H. Kennedy.
1889.....	J. W. Tyrrell.

Department of Analytical and Applied Chemistry.

Regular Students.*3rd Year.*

Boustead, W.

2nd Year.

James, O. S.

1st Year.

Lawson, W.

Special Student.Christie, R. J.

School of Practical Science.

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1890-91.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council, on the 3rd day of February, 1877.

By the scheme thus approved of, the government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order in Council approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :

1. Civil Engineering (including Mining Engineering).
2. Mechanical Engineering (including Electrical Engineering).
3. Architecture.
4. Analytical and Applied Chemistry.
5. Assaying and Mining Geology.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

The facilities possessed by the School for affording professional instruction are now being largely increased by additions to the building, equipment and teaching staff. An Engineering Laboratory is being formed which will be furnished with testing machines for testing the strength, elasticity and other qualities of materials of construction, and also with an experimental steam plant, consisting of engine, boiler, pumps, etc., for making experiments in the economical use of steam. It will be supplied with all necessary standard gauges, scales and measuring instruments. There will be in connection with it a machine shop for the purpose of preparing specimens to be tested, making repairs, etc.

In Surveying, Geodesy and Practical Astronomy all the necessary instruments will be provided. Among the additions in this department will be a carefully laid out 100 feet standard of length.

The Architectural Department will be supplied with a large number of models, casts and photographs.

The appliances and apparatus necessary for teaching the applications of Chemistry to the arts and manufactures and for doing the chemical work in connection with the regular departments of instruction will also be greatly increased.

These additions and improvements are now in progress and it is expected that many of them will be sufficiently advanced to enable a large amount of new work to be done next session.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

*Approved by His Honour the Lieutenant-Governor in Council the
19th day of March, 1890.*

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.
2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.
3. A Diploma will be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :—
 - (1) Civil Engineering (including Mining Engineering).
 - (2) Mechanical Engineering (including Electrical Engineering).
 - (3) Architecture.
 - (4) Analytical and Applied Chemistry.
 - (5) Assaying and Mining Geology.
4. The Regular Course for the Diploma of the School in each Department shall be three years.
5. In order to obtain the Diploma of the School in one of the above Departments a candidate must have passed the Matriculation Examination required for admission to a University in any part of Her Majesty's Dominions, or the Entrance Examination of the Law Society of Upper Canada, or of the College of Physicians and

Surgeons, or of the Royal Military College at Kingston, or of any of the Examinations prescribed for Teachers in Public or High Schools of the Province of Ontario, or must present a certificate signed by a Head Master of a High School or Collegiate Institute, or by the Principal of Upper Canada College, or the Head Master of Trinity College School, Port Hope, that he possesses qualifications equivalent to those required for such teachers.

6. Special Students may be permitted to attend such lectures or courses of instruction or of practical work, as the Council may think proper.
7. Certificates of attendance and standing may be given upon due examination to Special Students, and such students shall not be required to pass an Entrance Examination.
8. At the end of the Academic year, examinations will be held in the different subjects taught, and prizes will be awarded for excellence in each Department. Candidates for Diplomas and Certificates are required to enter for these.
9. All Regular Students shall be in attendance at the School during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.
10. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry and Surveying, the following minimum number of drawings must be made in the respective years :

	Civil Engineering.	No. of Drawings.	Mechanical Engineering.	No. of Drawings.
I Year.—Applied Mechanics....		8	.....	13
Descriptive Geometry....		6	.....	10
Surveying		9		
II Year.—Applied Mechanics....		7	.....	11
Descriptive Geometry....		12	.....	12
Surveying		4		
III Year.—Applied Mechanics....		8	.....	12
Descriptive Geometry....		11	.....	11
Surveying		4		

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many practice sheets as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The marks allotted to the above-mentioned minimum number of drawings form two-thirds of the total marks allotted in this subject.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

The Council reserves the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission.

No drawings will be counted which have not been made in the drafting rooms and during the hours allotted to such work.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No field notes will be counted which have not been taken in the field and during the hours allotted to such work.

Vacation Work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction **only** and consist of not less than 20 nor more than 30 pages. The **sketches** must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap and consist of not less than 20 nor more than 30 pages.

The minimum percentage of marks required for practical work will be required in the case of vacation notes and theses.

No notes whatever, whether made during the session or the vacation, will be counted unless made in the standard note books of the School.

SUPPLEMENTAL EXAMINATIONS.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the *written* examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations will begin on the first day of the session.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between nine a.m. and five p.m. in the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted unless under such exceptional circumstances as may be deemed sufficient by the Council, and which must be fully set forth in a formal petition.

PRIZES.

Two prizes are open for competition in each year ; the first prize of the value of \$10.00, the second of \$5.00.

These will be awarded to the students who stand first and second in general proficiency in the subjects of the year, under the following conditions, viz. :—

The candidate must have passed in each subject and have obtained at least 75 per cent. of the total number of marks allotted to the subjects.

REGULAR EXAMINATIONS.

The following is an approximate list of the examinations to be held and of their relative values in the competition for prizes :—

DEPARTMENTS OF CIVIL AND MECHANICAL ENGINEERING (1 AND 2).

I. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Algebra.	100....	Statics.
100....	Euclid.	100....	Dynamics.
100....	Plane Trigonometry.	100....	Descriptive Geometry.
100....	Analytical Geometry.	100....	Surveying.
		100....	Chemistry, Elementary.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
30.....	Construction Notes.
100.....	†Experimental Physics.
100.....	Practical Chemistry.

*Civil Engineering only.

†Mechanical Engineering only.

II. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Calculus.	100....	Strength of Materials.
100....	*Astronomy.	100....	Rigid Dynamics.
100....	Optics.	100....	+Theory of Mechanism.
100....	Hydrostatics.	100....	Descriptive Geometry.
100....	+Magnetism & Electricity.	100....	*Surveying.
		100....	Spherical Trigonometry & Geodesy.
		100....	Chemistry, Applied.
		100....	*Mineralogy and Geology.
		100....	*Mineralogy, Practical.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).
100.....	Chemistry, Practical.

III. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Method of Least Squares.	100....	Theory of Compound Stress.
100....	+Magnetism and Electricity.	100....	*Theory of Construction.
		100....	+Mechanics of Machinery.
		100....	+Machine Design.
		100....	Hydraulics.
		100....	Thermodynamics.
		100....	Descriptive Geometry.
		100....	*Practical Astronomy and Geodesy.
		100....	*Surveying and Levelling.
		100....	Chemistry, Applied.
		100....	*Mineralogy and Geology.
		100....	*Mineralogy, Practical.

*Civil Engineering only.

†Mechanical Engineering only.

Examinations held during the Session.

Value.	Subjects.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).

*Civil Engineering only.

†Mechanical Engineering only.

NOTE.—Lists of the examinations in departments 3, 4 and 5 will be issued before the end of next session.

REGULAR COURSES FOR THE DIPLOMA.

See regulations 2, 3, 4, 5, 8, 9, 10: pp. 11 and 12.

The fees (payable through the Principal to the Provincial Treasurer) for instruction in any of the Departments, are as follows:

First Session: Thirty-four Dollars.

Second Session: Forty-four Dollars.

Third Session: Fifty-four Dollars.

These are payable in two equal instalments, one in each term. A discount of two dollars will be made on each instalment if paid before the end of the first month of the term in which it is due. There is no extra fee for Diploma.

The following are the Departments in which the Diploma is granted:—

- (1) Civil Engineering (including Mining Engineering).
- (2) Mechanical Engineering (including Electrical Engineering).
- (3) Architecture.
- (4) Analytical and Applied Chemistry.
- (5) Assaying and Mining Geology.

FORM OF DIPLOMA

THE

School of Practical Science,

PROVINCE OF ONTARIO.

(ESTABLISHED 1878.)

THIS IS TO CERTIFY that

.....
of the..... in the.....
..... has completed the Regular Course
of this School for the Diploma in the.....
extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz. :
.....
.....

WHEREFORE the said
becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS whereof we have signed this Diploma at Toronto, in the Province of Ontario, this..... day of.....
..... One thousand eight hundred and.....
and have caused the seal of this School to be hereunto affixed.

[L. S.]

..... Chairman.

..... Secretary.

ESTIMATED EXPENSES IN THE DEPARTMENT OF ENGINEERING.

NOTE.—Each Student is required to furnish himself with the following drawing instruments and materials, viz. :—

One drawing-board, 23" \times 31"; 1 T square, 31 inch : 2 set squares, 60° and 45°, not less than 6" on the side ; 1 6" (or larger) protractor ; 1 12" triangular scale, containing 10, 20, 30, 40, 50 and 60 chain scales ; 1 12" triangular scale, containing $\frac{1}{16}$, $\frac{1}{8}$; $\frac{1}{4}$, $\frac{1}{2}$; 1, 2 ; $\frac{3}{8}$, $\frac{1}{2}$; $1\frac{1}{2}$, 3 ; $\frac{1}{8}$, $\frac{1}{16}$ open divided scales ; 1 drawing pen ; 1 pair dividers : 1 pair compasses with ink and pencil points, lengthening bar, etc. ; 1 set spring bows, crow-quill pens, French curves. 1 2ft. pocket rule, Arkansas oil stone, thumb-tacks. paper, tracing vellum, pencils, rubber, colors, sponge, brushes, nest of saucers, water mug, etc., and one portfolio for drawings.

The expenses for the Regular Course in the Department of Engineering are approximately as follows :—

Sessional Fees.....	\$120 00
Books, instruments, drawing materials, laboratory, fees, etc.....	120 00
Total.....	<u>\$240 00</u>

These expenses are divided equally between the three sessions.

Each student in this department is required to deposit \$1 per annum for the purpose of covering breakages and losses occurring to apparatus and furniture.

Making this deposit will, however, not free any student from the liability to make good any loss or damage to instruments or furniture, arising from want of proper care on his part, when the above fund may prove insufficient for the purpose.

DEPARTMENT OF
TIME TABLE OF REGULAR

Instruction will be given during the Session of

FIRST YEAR.

HOURS.	MONDAY.	TUESDAY.
9-10	} Elementary Chemistry.	} Drawing.
10-11		
11-12		
12-1	*Geometry	Descriptive Geometry.
1-2	Statics.	
2-3	} Drawing.	Surveying (lecture).
3-4		} Field Work.
4-5		

SECOND YEAR.

9-10	} Strength of Materials. *Physics (Hydrostatics and Optics).	} *Astronomy. *Physics (Hydrostatics and Optics). Chemistry.
10-11		
11-12		
12-1	} Drawing.	} Drawing.
1-2		
2-3	} *Experimental Physics.	} Applied Chemistry.
3-4		
4-5	El. Mineralogy & Geology.	Field Work.

THIRD YEAR.

9-10	} Drawing.	} Applied Chemistry. Astronomy and Geodesy. Constructive Design.
10-11		
11-12		
12-1	} Theory of Compound Stress { Drawing. Mineralogy (b)	} Mineralogy.
1-2		
2-3	} Constructive Design.	} Thermo-dynamics.
3-4		
4-5	} Drawing.	} Field Work.

* In the University of Toronto.

Additional lectures are given at hours not specified in above time-table and when the weather will not permit of field work.

ENGINEERING.

COURSE IN CIVIL ENGINEERING.

1890-91, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
} Drawing. Statics.	} Drawing. *Conics.	} Drawing. *Algebra & Trigonometry. Dynamics (b).
} Elementary Chemistry.	} *Trigonometry. Field Work.	} *Trigonometry. Field Work.

SECOND YEAR.

Strength of Materials. *Calculus.	*Astronomy. Descriptive Geometry. { *Physics (Hydrostatics and Optics). Spherical Trigonometry.	*Calculus. { *Physics (Hydrostatics and Optics). Practical Chemistry.
} Practical Chemistry.	Applied Chemistry.	{ Theory of Surveying Instruments.
Rigid Dynamics. Drawing.	} Practical Mineralogy (b).	{ Field Work.
El. Mineralogy & Geology.	Field Work (a).	

THIRD YEAR.

Drawing. Hydraulics (b). Descriptive Geometry. { Drawing. Mineralogy (b).	} Drawing. Practical Mineralogy.	Applied Chemistry. Astronomy & Geodesy. { Constructive Design (a), Hydraulics (b). Drawing.
} Drawing.	} Thermo-dynamics. Field Work.	{ Experimental Physics (b) Field Work (a).

(a) During First Term.

(b) During Second Term.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

DEPARTMENT OF
TIME TABLE OF REGULAR COURSE

Instruction will be given during the Session of

FIRST YEAR.

HOURS.	MONDAY.	TUESDAY.
9-10	} Elementary Chemistry.	} Drawing.
10-11		
11-12		
12-1	*Geometry. Statics.	Descriptive Geometry.
1-2	} Drawing.	Surveying (lecture).
2-3		} Drawing. *Experimental Physics(b)
3-4		
4-5		
	*Experimental Physics(b)	*Experimental Physics(b)

SECOND YEAR.

9-10	} Strength of Materials. *Physics. Drawing.	Drawing.
10-11		*Physics.
11-12		Chemistry.
12-1		Drawing.
1-2		
2-3	} Drawing.	} Applied Chemistry. Drawing.
3-4		
4-5		

THIRD YEAR.

9-10	} Drawing.	Applied Chemistry.
10-11		Machine Design.
11-12		} Drawing.
12-1	Theory of Compound Stress	
1-2	Drawing.	
2-3	} *Experimental Physics.	Thermo-dynamics.
3-4		} Drawing.
4-5		

* In the University of Toronto.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

ENGINEERING.

IN MECHANICAL ENGINEERING.

1890-91, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing. Statics. Elementary Chemistry.	Drawing. *Conics. *Trigonometry. Drawing.	Drawing. *Algebra & Trigonometry. Dynamics (b). *Trigonometry. Drawing. *Experimental Physics (b)

SECOND YEAR.

Strength of Materials. *Calculus. Practical Chemistry. Rigid Dynamics. Drawing.	Theory of Mechanism. Descriptive Geometry. *Physics. Spherical Trigonometry. Applied Chemistry. Drawing.	*Calculus. *Physics. Practical Chemistry. Theory of Mechanism. Drawing. *Experimental Physics.
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THIRD YEAR.

Drawing. Hydraulics (b). Descriptive Geometry. Drawing. *Experimental Physics.	Drawing. Mechanics of Machinery. Drawing. Thermo-dynamics. Drawing.	Applied Chemistry. Machine Design. Hydraulics (b). Drawing. *Experimental Physics.
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(b) During Second Term.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Mining Engineering).

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Mining Engineers).

Students who wish to devote themselves to the practice of Mining Engineering are allowed to take the work specially mentioned under this head, in the Third Year, and to omit the work in Experimental Physics.

They are advised, however, to take, if possible, the regular course in Civil Engineering and the special work subsequently as Special Students.

SUBJECTS FOR THE FIRST YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Analytical Plane Geometry

MECHANICS.

Statics and Dynamics (with special reference to Structures and Machines).

DRAWING.

Copying from the flat. Lettering. Topography.

Original Surveys.

Graphics.

Descriptive Geometry in its application to plane sided solids.

Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary Instruction in use of the transit and Theodolite—Plotting, Mensuration.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

SUBJECTS OF THE SECOND YEAR.

MATHEMATICS.

Differential and Integral Calculus.

Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Telescope and Microscope, and Reflecting instruments.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes.)

ENGINEERING AND SURVEYING.

Theodolite Surveying (including laying out Railway Curves).
Principles of Geodesy (considering the Earth a Sphere).
Statics and Dynamics. (Pure and applied.)
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.
Theory of the Theodolite, Transit-Theodolite, Level, and Sextant.

CHEMISTRY.

General Chemistry.
Practical Chemistry.
Chemistry (Applied).
Combustion, Fuel, and Furnaces.
Metallurgy of Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

SUBJECTS OF THE THIRD YEAR.

EXPERIMENTAL PHYSICS.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry. Principle of Least Squares.

DRAWING.

Subjects of previous years continued.

Descriptive Geometry.

Shades and Shadows.

Stone cutting.

Perspective Projection.

Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Subjects of previous years continued.

Levelling. Setting out Excavation, Cross-sectioning, Calculation of Quantities.

Applied Mechanics.

Thermodynamics and Theory of the Steam Engine.

Hydraulics.

Application of Principles to practical problems connected with the design and construction of various Structures and Machines, *e. g.*, Foundations, Retaining Walls, Arches, Roofs, Bridges, Roads, Railways, Canals, Sewers, Water Wheels, Steam Engines, Hydraulic Machinery, Mining Machinery, etc.

Practical Astronomy.

Geodesy (Considering the Earth a Spheroid).

CHEMISTRY (APPLIED).

Artificial Lighting.

Photography.

Explosives.

Mortars and Cements.

Bricks and Artificial Stones.

Preservation of Wood, Iron and Stone.

Water, Air and Sewage.

*Metallurgy, with special reference to Copper, Lead, Silver and Gold.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.

Blowpipe Analysis and Determinative Mineralogy.

*Assaying and Mining Geology, Mining Calculations.

*Crystallography and Palaeontology.

An option will be allowed between Thermodynamics and advanced Practical Astronomy and Geodesy.

*Mining Engineering only.

II. DEPARTMENT OF MECHANICAL ENGINEERING.

(Including *Electrical Engineering*).

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical Engineers (including under this term Electrical Engineers.)

SUBJECTS OF THE FIRST YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to Structures and Machines).

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope.
Experiments with Lenses and Mirrors.
Theory of the Microscope and Reflecting Instruments.

DRAWING.

Copying from the Flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

SUBJECTS OF THE SECOND YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Optics.
Magnetism.
Electricity.

EXPERIMENTAL PHYSICS.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry.
Principle of Least Squares.

DRAWING.

Subjects of first year continued.
Coloring and Shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and Structures. (Drawings made from both copies and original notes.)

ENGINEERING.

Statics and Dynamics (Pure and Applied).
Theory of Mechanism.
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.

CHEMISTRY.

Theoretical Chemistry.
Practical do
Applied do
Combustion, Fuel and Furnaces.
Metallurgy of Iron and Steel.
Laboratory Practice.

SUBJECTS OF THIRD YEAR.

EXPERIMENTAL PHYSICS.

Acoustics.
Electrical Measurements and Testing.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry:
Shades and Shadows.
Stone cutting.
Perspective Projection.

ORIGINAL DESIGNS.

Engines, Water Wheels, Shafting, Belting and Gearing,
Machines, etc.

ENGINEERING.

Subjects of previous years continued.

Applied Mechanics:

Mechanics of Machinery.

Machine Design.

Thermodynamics and Theory of the Steam Engine.

Hydraulics.

Application of Principles to Practical Problems connected with the design, construction and testing of various Prime Motors and Machines.

CHEMISTRY (APPLIED).

Artificial Lighting.

Photography.

Explosives.

Preservation of Wood, Iron and Stone.

Metallurgy.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam-engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

III. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

1 YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

MECHANICS.

Statics (with reference to Structures).
Dynamics (preliminary to the study of Hydraulics).

DRAWING.

Instrumental and Free-hand, Copying from the Flat, Lettering.
Descriptive Geometry, (Plane Surfaces).

HISTORY OF ARCHITECTURE.

ORDERS AND ELEMENTS OF ARCHITECTURE.

SURVEYING.

Principles, Chain Surveying, Mensuration.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

II YEAR.

MATHEMATICS.

Differential and Integral Calculus.

PHYSICS.

Hydrostatics.
Optics.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and
Water Color.
Descriptive Geometry, (Curved Surfaces).

SURVEYING.

Use of Transit and Level,
Mensuration.

MECHANICS.

Statics Pure and Applied.
Theory of Strength and Elasticity of Materials.
Materials of Construction.

HISTORY OF ARCHITECTURE.

HISTORY OF ORNAMENT.

PRINCIPLES OF DECORATION.

CHEMISTRY.

General Chemistry.
 Practical do
 Applied do
 Combustion, Fuels and Furnaces.
 Metallurgy, Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements.

III YEAR.

DRAWING.

Descriptive Geometry.
 Shades and Shadows.
 Perspective.
 Stone Cutting.
 Water Color Sketching.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

PHYSICS.

Acoustics, Electricity, Heat.

HISTORY OF ARCHITECTURE.

HISTORY OF ORNAMENT.

DECORATION.

SPECIFICATIONS.

CHEMISTRY (APPLIED).

Artificial Lighting, Photography, Mortars and Cements, Bricks,
 and Artificial Stone.
 Preservation of Wood, Iron and Steel.
 Water, Air, and Sewage.

THEORY OF CONSTRUCTION.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.

A time table will be arranged at the beginning of next term.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and the Survey of Lands.

12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study, of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service; or, in case he has only received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with the land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause,

The fee for special students in Surveying is \$30 per session.

The attention of Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

 DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884:—

DEGREE OF C. E.

BY THE SENATE OF THE UNIVERSITY OF TORONTO.

Be it enacted:

- I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.
- II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations:—
 1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.
 2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3 (C.)

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.
 4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.
 5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.
 6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.
 7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate, not later than the first day of February.
 8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.
 9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.
 10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.
 11. The fee for the degree of C.E. shall be \$20, and shall be paid to the Registrar not later than the first day of May.
 12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.
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IV. DEPARTMENT OF ANALYTICAL AND APPLIED
CHEMISTRY.

This Department is under the charge of the Professor of Applied Chemistry.

The regular course is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists, industrial chemists, or teachers, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

Honor graduates in Natural Science of the University of Toronto will be admitted to the examination for the Diploma after taking a course of one year in the School of Science in such of the following subjects as may be determined by the Council.

SUBJECTS OF THE FIRST YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

MECHANICS.

Statics and Dynamics.

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Microscope and Reflecting Instruments.

DRAWING.

Descriptive Geometry.

BIOLOGY.

MODERN LANGUAGES.

French.
German.

CHEMISTRY.

Inorganic Chemistry with Laboratory work.

SUBJECTS OF THE SECOND YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Optics.
Magnetism.
Electricity.

EXPERIMENTAL PHYSICS.

Heat : Use of the Cathetometer, Dividing Engine, and Spherometer. Thermometry and Calorimetry. Principle of Least Squares.

MODERN LANGUAGES.

French.
German.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Paleontology and Geology.

CHEMISTRY.

Organic Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

SUBJECTS OF THE THIRD YEAR.

PHYSICS.

Thermodynamics.
Electricity.
Laboratory work.

PHYSIOLOGY.

MINERALOGY AND GEOLOGY.

CHEMISTRY.

Inorganic Chemistry, including Thermo-Chemistry ; the Study of Mendelejeff's Periodic Law.
Advanced Organic Chemistry.
Historical Development of Chemical Theory.
Physiological Chemistry.
Applied Chemistry.
Laboratory work.

Students in the Third Year may select either of the following courses :

(a) INDUSTRIAL CHEMISTRY.

Physics, Chemistry Pure and Applied, with Laboratory work in General and Technical Analysis.

(b) METALLURGY.

Including Mineralogy and Geology, Chemistry Pure and Applied with Laboratory work in Mineral Analysis and Assaying.

(c) SANITARY CHEMISTRY.

Including Physiology and Bacteriology, Chemistry Pure and Applied, with Laboratory work in Toxicology, and the Analysis of Food, Water and Air.

V. DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this Department the student is fully prepared in all the methods of analysis necessary to render him a competent Assayer. He is also qualified to survey and report upon the value of mineral lands.

SUBJECTS OF FIRST YEAR :

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics and Hydraulics.
3. Inorganic Chemistry.
4. Elementary Mineralogy and Blowpipe Practice.
5. Elementary Biology.
6. Physical Geography, Palaeontology and Geology.
7. Drawing.

SUBJECTS OF SECOND YEAR :

1. Higher Mathematics, including Spherical Trigonometry, etc.
2. Chemistry, with Laboratory practice in Qualitative Analysis.
3. Blowpipe Analysis and Determinative Mineralogy.
4. Geology and Economic Minerals of Canada.
5. Surveying and Levelling.

SUBJECTS OF THIRD YEAR :

1. Quantitative Chemical Analysis.
2. Metallurgy.
3. Assaying.
4. Study of Metallic Veins and other Mineral Deposits, Mining Calculations, Examinations of Mineral Lands.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT,

WITH FEES FOR SPECIAL STUDENTS.

The same discounts for prompt payment will be allowed as in the case of Regular Students. See p. 17.

Special Students are advised to enter at the beginning of the Session (October 1st), as many subjects begun in the First Term are continued through the Second, and Lectures cannot be repeated.

I. CIVIL ENGINEERING; II. MECHANICAL ENGINEERING; III. ARCHITECTURE.

(Reductions will be made to Special Students taking several courses.)

~~Text~~ Text-books for the First Year marked (a); for Second Year, (b); for Third Year, (c).

(I.) DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-books and Books of Reference. —Davidson's Projections.

Angel's Plane and Solid Geometry.

Binn's Orthographic Projection.

Church's Descriptive Geometry, (a),

(b), (c).

Warren's Stone Cutting (c).

McCord's Lessons in Mechanical
Drawing.

Worthen's Topographical Drawing (a),

(b), (c).

Fees for Special Students, \$14.

(II.) SURVEYING AND LEVELLING.

LAND SURVEYING—

Chain Surveys.
 Compass and Theodolite Surveys.
 Methods of keeping Field Notes.
 Determination of Heights and Distances.
 Plotting.

LEVELLING—

Longitudinal and Cross sections.
 Plotting.

SETTING OUT—

Setting out Straight Lines and Curves.
 Setting out Levels.

MENSURATION—

Lines, Surfaces and Solids.
 Timber, Masonry, Iron and Earthwork.
 Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text Books.—Murray's Manual of Land Surveying (a).
 Gillespie's Higher Surveying (b), (c).
 Henck's or Trautwine's Railway Curves (b).

Fees for Special Students, \$14.

(III.) PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE—

The work included in this course is sufficient to fulfil the requirements of the final examinations for Provincial and Dominion Land Surveyors.

In Astronomy the principle subjects are the determination of Time, Latitude and Azimuth, and the general principles of the methods of determining Longitudes. Practical instruction is given in the methods of taking observations.

In Geodesy all Surveys, Computations and Methods of Map Construction are based upon the supposition that the earth is a Sphere.

ADVANCED COURSE—

The work in this course is intended to fulfil the requirements of the final examination for Dominion Topographical Surveyors. It is distinguished from the work in the Ordinary Course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In Geodesy the earth is considered as a Spheroid.

Text Books.—Gillespie's Higher Surveying (b), (c).

Chauvenet's Spherical and Practical Astronomy (c).

Gore's Elements of Geodesy (c).

Nautical Almanac, 1891, (c).

Fee for Special Students, \$19.

(IV.) APPLIED MECHANICS.

STATICS—

The Calculation of the Stresses in Framed Structures, Solid and Rivetted Beams, Stone Arches, etc. Both Graphical and Analytical Methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS—

DESIGNING OF STRUCTURES in Timber, Iron and Masonry—Arches, Retaining Walls, Foundations, Roofs, Bridges, etc.

DYNAMICS—

Representation and Measurement of Forces and Motions.

Principles of *Work* and *Energy*.

Efficiency of Machines. Friction.

Transmission of Energy—Belts, Shafts, Crank and Connecting Rod, etc.

Fly-Wheels, Governors.

Balancing of Machinery.

Etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of Water through Orifices, Notches, etc. Flow in Pipes and Open Channels. Water Power. Water Wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text Books and Books of Reference.—Von Ott—Graphic Statics (a).

DuBois—Graphic Statics.

“ Strains in Framed Structures.

Cotterill—Applied Mechanics (a), (b)
(c).

Rankine—Applied Mechanics (b), (c).

“ Steam Engine and other
Prime Movers.

Unwin—Elements of Machine Design
(c).

Shann—Elementary Treatise on Heat
(c).

Kennedy—Mechanics of Machinery
(b), (c).

Merriman—Hydraulics.

Jackson—Hydraulic Manual.

Neville—Hydraulic Tables and Formule (c).

Fees for Special Students, \$19.

(V.) PRINCIPLES OF MECHANISM.

Principles of the Transmission of Motion without reference to Force :—

Pitch Surfaces, Spur Wheels, Bevel Wheels, Skew-bevel Wheels,
Trains of Wheelwork, Teeth of Wheels, Cams, Cranks,
Eccentrics, Links, Bands and Pulleys, Hydraulic Connections,
Frictional Gearing, Link Motion for Slide Valves,
etc., etc.

Text Books and Books of Reference.—Rankine—Machinery and Millwork.

Camus—Teeth of Wheels.

MacCord—Slide Valve and Eccentric.

Goodeve—Elements of Mechanism (b).

Kennedy—Mechanics of Machinery
(b).

Cotterill—Applied Mechanics (b).

Fee for Special Students, \$19.

The foregoing comprises the work to which the lectures and practical instruction will be principally confined. In addition, the student will be required to obtain, by reading and observation during his course, a certain amount of information regarding the processes and details of Engineering Works, as below :—

(VI.) ENGINEERING WORKS.

Roads and Bridges.
 Canals and Harbours.
 Water and Sewage Works.
 Workshop and Foundry Practice.
 Mining Machinery and Processes.

Since information on these subjects is given in a plain and intelligible manner in the various treatises relating thereto, which can always be consulted by the Engineer when engaged in the actual practice of his profession, it has not been deemed expedient that much time should be given to them in the School.

(VII.) MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the School.

(VIII.) VACATION WORK.

THESIS AND CONSTRUCTION NOTES.

A subject will be given at the end of each session on which the student will be required to write a Thesis (accompanied with drawings and specifications when necessary) during the subsequent vacation.

The student will also be required to make, during the vacation, full and clear notes of various constructions of engineering interest that may fall under his notice.

The value of both the Thesis and the construction notes will be taken into account in determining his standing at the next following examination.

CIVIL ENGINEERING.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.

“ “ *Third* “ Sanitary Drainage.

Books of Reference.—Gilmore—Roads, Streets and Pavements.

Waring—Sanitary Drainage of Houses and Towns.

Latham—Sanitary Engineering.

MECHANICAL ENGINEERING.

Subject of Thesis for Second Year.—Machine-shop Practice.

“ “ *Third* “ Foundry Practice.

Books of Reference.—

Any other works on the above subjects may be consulted, and results of original observation should be given.

IV. CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO—

Inorganic Chemistry.

Organic Chemistry.

Historical Development of Chemical Theory.

Physiological Chemistry.

Qualitative and Quantitative Analysis.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY IN THE SCHOOL OF PRACTICAL SCIENCE—

Elementary Chemistry.

Applied Chemistry.

The Chemistry of Combustion, Fuel, Furnaces, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air and Sewage, Metallurgy, Chemical Manufactures.

Laboratory Work, including Technical Analysis.

V. MINERALOGY AND GEOLOGY.

COURSES OF LECTURES.

1. Elementary Course.—Rudiments of Mineralogy.
Geology and Palæontology.
Physical Geography.

Text Books and Books of Reference.—Chapman's Mineralogy and Geology.
of Canada, 3rd edition.

Dana's Manual of Mineralogy.

Dana's Text Book of Geology.

Page's Physical Geography.

Johnston's Elementary Physical
Atlas.

2. Advanced Course.—Mineralogy and Crystallography.
Geology and Palæontology.
Mathematics and Crystallography.
Physical Geography.
Geology and Palæontology of Canada.

Text Books and Books of Reference.—Dana's System of Mineralogy.
Chapman's Geology of Canada.
Nicholson's Palæontology.
Chapman's Synopsis.

PRACTICAL COURSES.

1. Use of Blowpipe—Chapman's Blowpipe Practice.
2. Blowpipe Analysis, Determinative Mineralogy. Economic Minerals
of Canada.
Kerl's Leitfaden bei qual. u. quant. Lothrohr-Untersuchungen, etc.,
Auf. 2. Plattner's Blowpipe Treatise. Von Kobell's Tafeln. Chapman's
Mineral Tables.
3. Assaying.—Mitchell's Assaying, by Crooks.
Kerl's Probirkunst.
Chapman's Assay Notes, 2nd edition.

4. Mining Geology.—*Books of Reference*—Burat's *Géologie Appliquée* and *Cours d'Exploitation des Mines*. Niederist's *Bergbaukunde*. Von Cotta's *Erzlagerstätten*

PHYSICAL LABORATORY AND WORKSHOP.

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of Mechanics, Sound, Light, Heat and Electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an Elementary Laboratory, there are several special Laboratories, which offer unusual facilities for the conduct of experiments in the various branches of Physics.

The electrical apparatus includes Electrometers, Galvanometers, Resistance Coils and Bridges, Testing Keys, Batteries, Electrical Machines (Holz and Carré), Ruhmkorff Coils, Crooke's Tubes, Telephones, etc., etc.

The workshop contains a gas engine, lathes and other tools.

MODERN LANGUAGES.

Students in the regular courses are admitted, without extra charge, to the French and German classes in University College (see regulation 10). No special examinations are held in these languages, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto, are open to regular students.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL
SCIENCE.

OFFICERS FOR 1889-90.

<i>President</i>	J. A. DUFF, B.A.
<i>Vice-President</i>	E. B. MERRILL.
<i>Secretary-Treasurer</i>	T. R. DEACON.
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<i>Representatives—Graduates</i>	C. J. MARANI.
Third Year	J. R. PEDDER.
Second Year	M. DUNBAR.
First Year	C. H. MITCHELL.
Special Students	J. B. HANLY.

The Society meets every second Tuesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually containing the best papers read before the Society.

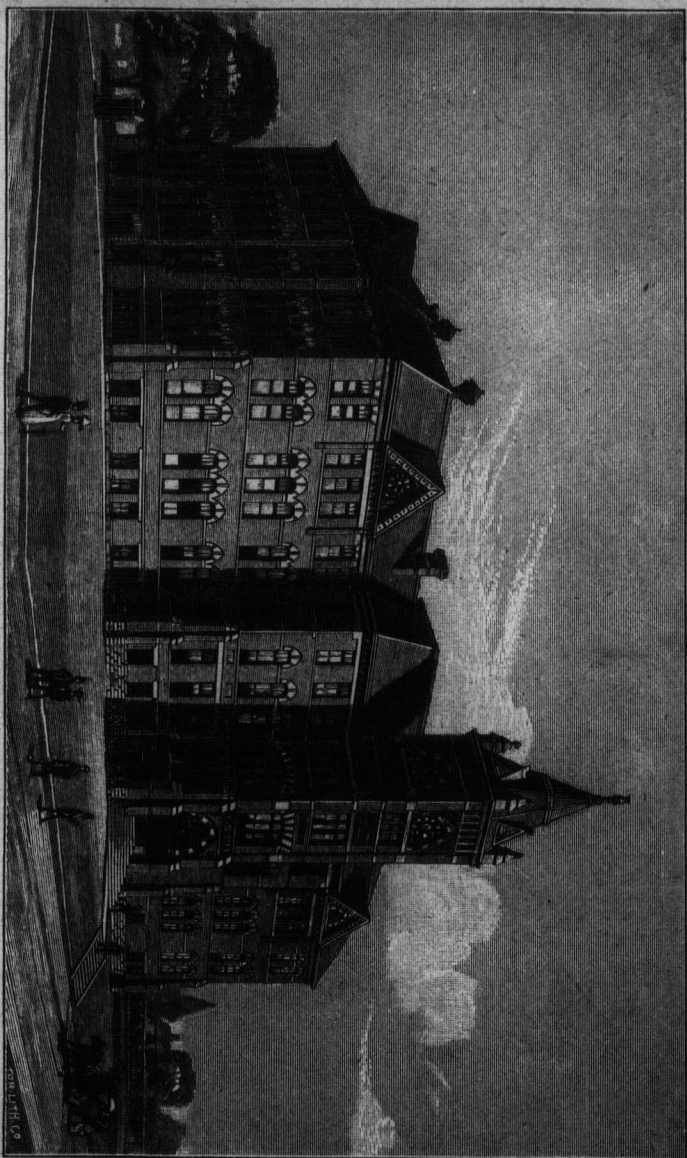
Membership fee, \$1 per annum.

ATHLETIC ASSOCIATION OF THE SCHOOL OF PRACTICAL
SCIENCE.

OFFICERS FOR 1890.

<i>Honorary President</i>	PROF. GALBRAITH.
<i>President</i>	H. D. SYMMES.
<i>Vice-President</i>	M. DUNBAR.
<i>Secretary-Treasurer</i>	A. F. MACALLUM.
<i>Curator</i>	(not yet appointed.)
<i>Committee, 3rd year</i>	C. W. DILL.
2nd year	C. E. LANGLEY.
1st year	—

This association has the supervision of the football, hockey and athletic sports in general.



Ontario School of Practical Science, Toronto.