MANITOBA
INSTITUTE OF TECHNOLOGY

TECHNOLOGY DIVISION

2055 NOTRE DAME AVENUE
WINNIPEG 23, MANITOBA
TELEPHONE 786-1481

DEPARTMENT OF YOUTH AND EDUCATION
PROVINCE OF MANITOBA

Hon. Donald W. Craik, B.Sc., M.Sc. (M.E.), P.Eng. .... Minister
W. C. Lorimer, M.A., Ed.D. .... Deputy Minister
E. G. Angood, B.Sc. (Eng. Sc.) .... Ass't Deputy Minister
Youth and Manpower Division

Administered by the
YOUTH AND MANPOWER DIVISION
Manitoba Department of Youth and Education
with financial assistance provided by
the Federal Government

J. E. McCannel, B.S.A. .... Senior Officer (Operations)
A. J. Buhr, B.A., M.Sc., (I.E.) .... Director
G. L. Talbot, B.Ed. .... Director

Approved by, and issued under, the authority of the
Minister of Youth and Education
The Honourable, Donald W. Craik, B.Sc., M.Sc., (M.E.), P.Eng.
Minister of Youth and Education
Historical Sketch

The dynamic spirit of "Growing to Beat '70" is spectacularly illustrated in the growth of provincially operated vocational education facilities since 1963.

Here are the highlights of that growth:

October 20, 1962 — The cornerstone of the Manitoba Institute of Technology, 2055 Notre Dame Avenue, Winnipeg 23, Manitoba, was laid by the Right Honourable John G. Diefenbaker, Prime Minister of Canada.

January, 1963 — The old M.T.I. trades training program, with an enrolment of about 800, was transferred to the Manitoba Institute of Technology Building to become the Industrial Division of the Manitoba Institute of Technology.

September, 1963 — The Technology Division of the Manitoba Institute of Technology began operation, with 304 students taught by 28 instructors.

September, 1964 — Increased enrolments in the Technology, Industrial, and Teacher Education Divisions necessitated a 40,000 square foot expansion of teaching area in the basement of the Manitoba Institute of Technology.

September, 1965 — Teacher Education, except for the Industrial Arts Workshops, moved into the former Day School for the Deaf, 1075 Wellington Avenue.

Fall, 1966 — The Manitoba Vocational Centre opened in Brandon, built to accommodate 850 full-time day students.

— The Northern Manitoba Vocational Centre opened in The Pas with a capacity for 500 students.

January, 1967 — In Winnipeg, classes began in the new fourth floor addition to the Technology Block of M.I.T., which provided 30,000 additional square feet of teaching and laboratory space.

September, 1968 — To the west of the Manitoba Institute of Technology, the new Applied Arts complex opened, adequately providing the needed space for the record 42% growth in student population over the previous year.

December, 1968 — During 1968, more than ten thousand persons received educational training at the Institute alone with Brandon and The Pas gaining in enrolments proportionately.

Now in 1969, we can look back with pride on seven years of achievement and growth unprecedented in our provincial history, and look forward to the refinement and development of vocational education with justifiable eagerness and anticipation.

Honourable Donald W. Craik, B.Sc., M.Sc., (M.E.), P. Eng.
Superintendent’s Message

To say that the Institute of Technology and Applied Arts has successfully provided programs reflecting the needs of business and industry would be similar to saying that Canada is a growing country — it would be true, but by no means adequate to describe the real spirit of success and growth behind that truth.

It has been said before that the courses offered here do provide, for some students, a very real alternative to a university education. We are now able to say that the success of our graduates has surpassed even our expectations, and that Manitoba’s employers are turning to us with more and more enthusiasm for career-minded people trained to meet the present and future needs of industry and commerce.

Everyone is aware that in this age of accelerated change, a man may have to seek new employment several times in his working life. That is why the first position held after graduating can be so important, why it is necessary to consider all the alternatives after high school, and why every student should seek guidance before embarking on any course of studies. With the above in mind we should all look to the future, and whatever your decision, we wish you success at your studies and in your chosen careers.

A. R. Low, Superintendent.
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Calendar of Events
1969-70

1969

Monday September 1st  
Labour Day. Institute Closed.

Tuesday September 2nd  
Registration—
8:30 a.m. for First Year Technology Students.
8:30 a.m. for Medical Radiological Technology Students.
1:30 p.m. for Second Year Technology Students.

Wednesday September 3rd  
8:30 a.m. Classes in all Technologies begin.

Monday September 8th  
8:30 a.m. Registration: Medical Laboratory Technology.

Wednesday September 10th  
Registration for the Fall Term Extension Courses.

Friday September 12th  
Final date for late Registration.

Monday September 22nd  
Fall Term Extension Courses commence.

Monday October 13th  
Thanksgiving Day — Institute Closed.

Tuesday November 11th  
Remembrance Day — Institute Closed.

Wednesday December 24th  
Last day of classes before Christmas Vacation.

Friday December 26th  
Boxing Day — Institute Closed.

Monday December 29th  
Office Re-opens.

1970

Friday January 2nd  
Office Re-opens.

Monday January 5th  
8:30 a.m. Institute re-opens.

Monday January 5th  
8:30 a.m. Registration for Medical Radiological Technology.

Wednesday January 7th  
Registration for the Winter Term Extension Courses.

Monday January 19th  
Winter Term of Extension Courses commence.

Wednesday January 21st  
First and Third Term Final Examinations begin.

Friday January 30th  
First and Third Term Final Examinations end.

Saturday January 31st  
Mid-term break begins.
Calendar of Events - cont.

**Monday**  **February 9th**  Registration—
8:30 a.m. for Second Term and Pre-Technology Students.
10:00 a.m. for Fourth Term Technology Students.
12:20 p.m. Classes in all Technologies begin.

**Friday**  **February 13th**  Final date for late registration — Pre-Technology only.

**Friday**  **March 27th**  Easter Friday — Institute Closed.
**Monday**  **March 30th**  Easter Monday — Office Re-opens.
**Tuesday**  **March 31st**  Institute re-opens after Easter recess.
**Wednesday**  **April 8th**  Registration begins for Spring Term for Extension Courses.

**Monday**  **April 13th**  Spring Term of Extension Courses commence.

**Thursday**  **April 16th**  Open House for High School Students.
**Friday**  **April 17th**  Open House for High School Students.
**Monday**  **May 18th**  Victoria Day — Institute Closed.
**Monday**  **June 15th**  Second and Fourth Term Final Examinations begin.
**Friday**  **June 26th**  Second and Fourth Term Final Examinations end.
**Saturday**  **June 27th**  Convocation (2:00 p.m.)
**Monday**  **July 6th**  Departmental Summer School opens.
Administrative Staff

BUSINESS ADMINISTRATOR . . . . . . . A. FRIESEN, B.A., C.G.A.
REGISTRAR . . . . . . . . . . . . . . . . . . . . W. H. GRANT
TRAINING CO-ORDINATOR . . . . . H. N. ANDREWS, P. Eng. (B.C.)
SUPERVISOR OF GUIDANCE AND TESTING . H. V. F. HUME, B.Sc., B.Ed.
DEPARTMENT HEAD - COMPUTER CENTRE . . . . . . T. T. ROBERTSON, B.Sc. (Hons.)
SUPERVISOR OF EXTENSION COURSES . . . . . . G. S. ROSS, B.Sc.
ACCOUNTANT . . . . . . . . . . . . . . . . . . . . . I. J. PUCHLIK
BOOKSTORE MANAGER . . . . . . . . . . . MRS. E. BAGOT
CHIEF STORE KEEPER . . . . . . . . . . . J. GRAHAM
SUPERVISER OF FOOD SERVICES . . . . . . J. G. CARTWRIGHT
MAINTENANCE SUPERINTENDENT . . . . . . S. URSEL
LIBRARIAN . . . . . . . . . . . . . . . . . . . . . . A. J. MIAH, B.A., L.L.B., M.Sc.

MANITOBA INSTITUTE OF TECHNOLOGY

Technology Division
PRINCIPAL . . . . . . . . . . . . . . . . . . . . . R. A. DUNHAM, B.Sc., B.Ed.
ASSISTANT PRINCIPAL . . . . . . . . . . . C. H. HOWARD, B.Sc. (C.E.), P.Eng.

Industrial Division
PRINCIPAL . . . . . . . . . . . . . . . . . . . . . S. P. DIDCOTE, B.Sc. (I.E.)
ASSISTANT PRINCIPAL . . . . . . . . . . . J. GREENAWAY, B.Sc., P.Eng.

MANITOBA INSTITUTE OF APPLIED ARTS

School of Business
PRINCIPAL . . . . . . . . . . . . . . . . . . . . . A. L. BERG, B.Com.
ASSISTANT PRINCIPAL . . . . . . . . . . . D. G. TRENHOLM, B.Com.

School of Commercial Studies
PRINCIPAL . . . . . . . . . . . . . . . . . . . . . R. A. SANBURN, B.Sc. (Bus. Adm.)
ASSISTANT PRINCIPAL . . . . . . . . . . . W. YANCHYSHYN, B.A.

Teacher Training Division
SUPERVISOR . . . . . . . . . . . . . . . . . . . . . . . . . . P. F. PENNER, B.A.
Instructional Staff

Technology Division

R. M. BARR, B.Sc. .................................. Mathematics
A. R. BEAL .................................. Chemical Lab. Demonstrator
R. S. BLICQ, M.I.E.E. .................................. English
L. BOILY, B.Sc. Cert. Ed. ................................. Mathematics
K. G. CAMPBELL, B.Sc. .................................. Mathematics
L. E. CARMICHAEL .................................. Electronic Technician
W. DYCHUK, B.Sc., A.C.I.C. ................................ Chemical Technology
W. P. DYCK, B.Sc., M.C.I.C. ................................ Chemical Technology
N. ELLIS, (Mrs.), B.Sc., A.R.T. ......................... Medical Laboratory Technology
K. S. W. FEGOL, B.S.A., M.Sc., M.C.I.C. .............. Chemical Technology
I. FERGUSON, (Mrs.), R.T ................................ Medical Lab. Demonstrator
R. J. GIESBRECHT, B.Sc., (E.E.), P.Eng. ............... Electronic Technology
G. M. GRAMEK, (Miss), R.T. ............................ Medical Lab. Demonstrator
W. M. GRAY, B.A. (Hons.) ................................ Chemical Technology
S. M. GUNNLAUGSON, R.T. .............................. Medical Lab. Demonstrator
A. HART, B.Sc., (M.E.), P.Eng. .................. Instrumentation Technology
D. J. HARRIS, C.E.T. ..................................... Civil Technology
G. W. HARRISON, B.Sc. (C.E.) ......................... Civil Technology
G. D. HERMANSON, B.Sc. (C.E.), O.L.S., P.Eng. ........... (Dept. Head) Civil Technology
F. B. HILL, C.E.T. ....................................... Electronic Technology
E. HIRST, (Miss), R.N., A.R.T. ......................... Medical Laboratory Technology
C. M. HOWLETT, (Miss), R.N., L.C.S.L.T. ............ (Dept. Head) Medical Laboratory Technology
J. H. KAMINSKY, (Miss), B.Sc., A.R.T. ................. Medical Laboratory Technology
J. KAPLAN, B.Sc., M.Ed. .................................. Physical Education
E. S. KOLASKI, B.Sc., (C.E.), P.Eng. .................. Civil Technology
L. LAZAR, C.E.T. ........................................ Design & Drafting Technology
A. N. LEITE, M.I.E.E., C.E.T. .......................... Electrical Technology
B. LUQUI, (Mrs.), L.C.S.L.T. . . . Medical Laboratory Technology
J. D. MARTIN, B.Sc. (C.E.), P.Eng. . . . . Civil Technology
L. MAUTHE (Miss), R.T. . . . . . Medical Lab. Demonstrator
W. MOFFAT, B.Sc., (Hons.) M.C.I.C. . . Chemical Technology
G. MORRISON, B.Sc., (C.E.) P.Eng. . . . Civil Technology
L. E. McLENNAN, (Mrs.), L.C.S.L.T. . . Medical Laboratory Technology
N. W. PEITSCH, B.Sc. (M.E.), P.Eng., C.I.M. . . . Mechanical Technology
A. M. PENNER, A.R.T. . . . . Medical Laboratory Technology
D. F. PLUMTON, B.Arch., M.R.A.I.C. Design & Drafting Technology
J. D. POUSTIE, B.Sc. (E.E.) . . . . Electrical Technology
L. ROSS, B.Sc. (Hons.), M.Sc., M.C.I.C. . . . . (Dept. Head) Chemical Technology
R. R. ROZIERE, B.Sc. (C.E.), M.Sc. (Structural), P.Eng. . . Civil Technology
J. SAGAN, (Miss), R.T. (C.S.R.T.) . . . Medical Radiological Technology
D. H. SHAND, C.E.T. . . . . . . . Electronic Technology
S. W. SHERE, B.Sc., M.A.M.S., M.E.M.S. . . . . Mathematics
E. S. SMENDZIUK, B.Sc., (C.E.), P.Eng. . . . Civil Technology
S. E. SOLMUNDSON, B.Sc. (C.E.), P.Eng. . . . Civil Technology
B. G. SZEBELEDY . . . . . . Chemical Lab. Demonstrator
G. S. THURSTON, B.A. . . . . . . . . . . . . . . English
J. TSUJIMOTO, (Miss), B.Sc., (L.A.) . . . Medical Laboratory Technology
K. WALKER, B.Sc. (M.E.), P.Eng. . . . . Mechanical Technology
H. D. WIEBE, B.A., B.Ed. . . . . . . . Mathematics
J. E. WIENS, B.Sc. (E.E.) . . . . . Electrical Technology
T. A. WILLIAMS, B.Sc. (C.E.), P.Eng. . . . Civil Technology
H. WILSON, B.Sc., (M.E.), P.Eng. . . . Mechanical Technology
General Information

The Manitoba Institute of Applied Arts and the Manitoba Institute of Technology are located in the north-west sector of Winnipeg, adjacent to the International Airport. The combined complex has over sixteen acres of floor space containing the most up-to-date facilities and equipment. It is actually six schools in one.

1. The Technology Division, offering technology courses for high school graduates interested in pursuing a technical career.

2. The School of Business Division, offering Business courses for high school graduates interested in pursuing a business career.

3. The School of Commercial Studies, offering business, office training and art based courses.

4. The Industrial Division, offering apprenticeship and pre-employment training in the trades and other areas.

5. The Teacher Education Division, offering three courses in teacher training: Business Education, Industrial Arts and Vocational Industrial.

6. The Extension Services Division, offering up-grading and trade development courses.

Calendars are available for each of the above Divisions.

Over 60 courses are offered in full-time day programs. Night school courses are offered for the purpose of up-grading those who are employed in business and industry in any area where the need arises.

The Vocational Centres at The Pas and Brandon, together with the Manitoba Institute of Technology and the Manitoba Institute of Applied Arts play an important role in meeting the ever increasing need for a qualified work force for our expanding economy.

The operation of these institutes is the responsibility of the Youth and Manpower Division, Manitoba Department of Youth and Education.
Admissions Committee:

This is a Committee established by the Principal. All applications must be approved by the Admissions Committee. Applicants may be asked to appear before the Committee for a personal interview or educational tests.

Admission to Technology Programs:

All applicants seeking admission are required to:

1. Apply in writing using the approved application form for the Technology Division. This application must be accompanied by the $15.00 registration fee which is refundable only if the application is rejected. If through unavoidable circumstances a student must delay his registration at the Institute then the $15.00 registration fee will be held for one year. No refund will be granted. A student wishing to gain admission after this one year period must register in the normal manner and pay full fees.

2. Hold at least the minimum academic pre-requisite listed under each course.

3. Submit an official transcript of their high school marks. (Grade XI and XII) which must accompany the application. (These official transcripts may be obtained from: The Registrar's Office, Department of Youth and Education, 408-1181 Portage Ave., Winnipeg 10, Manitoba. Action on the application cannot be finalized until this official transcript has been received by the Manitoba Institute of Technology.

4. Be 16 years of age or over.

5. Be physically qualified in reference to the type of course selected.

Applications must be received or postmarked not later than midnight, August 31st.

When the number of applicants exceeds the accommodation available, the Admissions Committee reserves the right to accept those applicants who are considered most likely to succeed.

Attendance:

1. Students must be punctual and should have an attendance of 90% or better in each subject. When a student remains away from school for a period of five consecutive school days without notifying the Institute as to the reason for his absence, the student shall be considered as discontinuing his course.

2. Any student who willfully absents himself from any classes for which he is enrolled automatically bars himself from further instruction pending the decision of the Principal.
Board and Room:
Dormitories are not operated in connection with the Institute. The Institute has a list of boarding houses for students who wish to obtain board and room in the city. Because this list changes from day to day, we recommend that you refer to it on or before the day of registration. The acceptability of all boarding places listed is left entirely to the discretion of the student.

Book Store:
Textbooks and supplies may be purchased from the Institute's bookstore on a cash basis only. Students will be provided with a list of the required items. The bookstore does not handle used books.

Certificates and Diplomas:
1. Certificates of Attainment are awarded to students who successfully complete the course as Operating Engineers.
2. National Diplomas are awarded to students who successfully complete Technology Courses of two years' duration. These will be designated as:

   Diploma in Technology (Dipl. T.) for graduates of the Engineering Technologies.

The above regulations do not apply to the Medical Laboratory Technology or Medical Radiological Technology Courses.

Course Content:
The course content listed herein is intended to provide information for the guidance of applicants in the selection of appropriate courses. It is not intended to be so rigid and inflexible that it restricts the initiative of Instructors and students. In general, the courses will be conducted in accordance with the curriculum outlines but may, through consultation between the Institute authorities and the Advisory Committees, be subject to revision to meet special educational needs as they arise.

Dining Areas:
The modern dining areas at the Institute provide excellent, low cost meals during the mid-day break periods.

Discipline:
Students are expected to exhibit adult behaviour. All students are subject to the rules and regulations of the Institute and may be suspended or dismissed if their conduct, progress,
attendance, or attitude proves unsatisfactory. The Institute reserves the right to dismiss at any time, students who are unable or unwilling to profit from instruction. In such cases, no portion of the fee is refundable.

Disciplinary problems of an extreme or persistent nature will be dealt with by the Disciplinary Board of the Institute.

**Dress:**

Students are expected to dress in a neat and tidy manner appropriate to the classroom or laboratory in which they are working.

**Extra-Curricular Athletic Activities:**

**Opportunities for recreation and athletic competition:**

In addition to the physical education program required in the technology courses, there are many opportunities for the student to be physically active in wholesome recreation, both competitive and non-competitive.

An extensive intra-mural program offers competition in volleyball, basketball, badminton, table tennis, curling, bowling, and golf. Archery and ski clubs are active, and Red Cross swimming and water safety instruction is available. The gymnasium contains an excellent running track which is used extensively by students and staff members to maintain a high level of fitness.

**Inter-Collegiate Competition:**

The Institute is a member of the Manitoba Small College Conference. Other members include the University of Winnipeg, University of Brandon, and the Manitoba Vocational Centre. Games are also scheduled with other colleges and senior teams. Teams from the Institute compete in cross-country running, soccer, field hockey, volleyball, basketball, badminton and curling.

**Examinations:**

**Appeals:**

All subject failures are carefully scrutinized before the final mark is recorded. Appeals, therefore, cannot be considered unless they are substantiated by a Medical Certificate.

**Final Examinations:**

Final examinations are conducted at the end of each term. Term marks based on student assignments, progress tests, etc. are incorporated with the results of the final examinations to determine the final mark.
Supplemental Examinations:
1. A student must not have more than two subject failures in order to register for the next term.
2. If a student has subject failures but is permitted to continue into the next term, he (she) must write supplemental examinations within two weeks of the commencement of that term.
3. If failures occur in these supplemental examinations the student will be allowed to proceed with the term work but must clear these supplementals at a special examination sitting, to be given near the end of the term.
4. Any student who fails one or more supplementals after two successive sittings will be required to withdraw from the course.
5. If these subjects are later cleared in evening classes, it may be possible for the student to be readmitted to the day school program.
6. Students who are repeating a term or who have transferred to another course must take all the subjects prescribed for the course regardless of previous credits obtained.
7. A student wishing to enroll for a term previously failed must submit an application to the Institute through the normal channels. The acceptance of such applicants is at the discretion of the Admissions Committee.

Fees & Expenses:
Tuition fees are due and payable on the date of registration. The fee for a Technology Program is $100.00 for each term. Other expenses include books, incidentals, board and lodging.

Field Trips:
The work of the Institute is closely related to the work of industry. It is the policy of the Institute to encourage field trips to outstanding establishments whose business and industrial activities are closely related to the students' studies. Students are expected to bear their own expenses, if any, on these trips.

Financial Assistance:
Unfavorable financial circumstances need not deter deserving students from enrolling at the Institute. Assistance is available from the following sources:

1. Allowances:
Persons who are unemployed or underemployed may, under Federal Government regulations, be entitled to living allowances and other personal benefits.
Information regarding these benefits can be obtained from your nearest Canada Manpower Centre.

2. **Canada Student Loans Plan:**
   This plan is designed to make bank loans (up to $1000.00 per year) available to students who need financial help to enable them to engage in full-time studies above high school level. Application forms are available at the Institute or the Student Aid Office, Department of Youth and Education, Room 413, 1181 Portage Avenue, Winnipeg 10, Manitoba.

3. **Department of Education Bursaries:**
   Applicants for admission and students presently enrolled may apply for bursaries. Application forms are available at the Institute or the Student Aid Office. These awards are based upon financial need and scholarship.

4. **Children of War Dead (Education Assistance Act):**
   Tuition fees and monthly allowances are provided for children of veterans whose deaths were attributable to military service. Inquiries should be directed to the nearest district office of The Department of Veterans Affairs.

5. **Vocational Rehabilitation Training:**
   This program is sponsored jointly by the Government of Canada and the Province of Manitoba under the provisions of the Vocational Rehabilitation of Disabled Persons Agreement.
   All applicants must be over 16 years of age and not eligible for Occupational Training for Adults through Canada Manpower Centre. Interested persons may secure further information by corresponding with the Co-ordinator of Rehabilitation Services, Department of Health, 383 York Avenue, Winnipeg 1, Manitoba.

6. **Scholarships and Awards:**
   See Page 22 for a list of Scholarships and Awards.

**Graduation:**
Graduating Exercises, following final examinations, are held at the end of June each year.

**Guidance:**
Vocational and Educational guidance is available to applicants and students through the Guidance office maintained at the Institute.
Illness, Accidents and Injuries:

The Institute reserves the right to call a physician in case of illness or accident, the expense to be borne by the student.

The Institute has exerted and will continue to exert every effort to avoid accidents, but incorporates the following statement as part of the understanding between themselves and their students: “The Province of Manitoba, its officers, agents, or employees, assume no liability, expressed or implied for the result of sickness or accidents involving personal injury to any student, whether in connection with the Institute’s instruction program wherever conducted, or incidental to other activities on the Institute’s properties or elsewhere.”

Filing of an application form carries with it approval and consent with respect to the Institute policy governing accidents or illness as hereon set forth.

Students should consider obtaining adequate Medical, Hospital and accident insurance coverage for the period while they are attending the Institute.

All OTA and VRT students are covered by Workmen’s Compensation. This will include medical, hospital and other necessary costs which are directly attributable to a compensable accident. For students receiving allowances, it will cover income replacement.

This accident coverage under Workmen’s Compensation does not cover extra-curricular activities. It covers only activities related to the course which could be deemed necessary or compulsory.

A Safety Program is in continuous operation at all times in all Departments.

Library:

The Institute Library functions as a centre through which the students and instructors are able to carry on many of their research studies and recreational reading activities. The library collection, consisting of textbooks, reference materials, magazines, indexes, and newspapers provide both the breadth and the specialization of resources necessary for study in the diverse fields of Technical, Industrial and Business Education. It is open from 8:30 a.m. to 9:30 p.m., Monday through Thursday, and 8:30 a.m. to 5:00 p.m. on Friday. Students leaving the Institute are cautioned that all Library reference material must be returned to the Library.

Lockers:

Lockers are available without cost to full-time students. Students should provide themselves with their own locks as the Institute is not responsible for personal property. Combination padlocks may be purchased from the Book Store.
Office Hours:
The General Office is open from 8:00 a.m. until 5:00 p.m., Monday through Friday.

Placement and Career Planning Office:
Head - Mrs. Allison Armstrong - 786-5653
Manpower Counsellors — Mrs. L. Barron - 786-5654
Mr. B. Gunn - 786-5654
Mr. R. Pelletier - 786-5654

The Department of Manpower and Immigration through its Canada Manpower Centres, operates on-campus Student Placement services in various Institutes of Technology across Canada. The office at the Institute is located in Room RB-31. It co-ordinates all recruiting of graduates carried out by employers for their Canadian operations. Current information on career opportunities is readily available and those students seeking part-time summer employment are also given assistance.
Students are encouraged to take advantage of these services by contacting the office early in the academic year.
Hours are from 8:00 a.m. to 4:30 p.m., Monday through Friday.

Registration:
Registration will take place as indicated in the Calendar of Events.

Refunds:
1. Fees are collected on a term basis at the time of registration.
2. Where a satisfactory reason for withdrawal has been given to the Principal, he may recommend that a refund be granted to the student.
3. A Clearance Form must be completed and returned before a refund will be considered.
4. In those cases where refunds are granted, the following will apply:

First Term Students:
(a) Students withdrawing before the final date for late registration will be granted a refund of the full amount paid less the $15.00 registration fee.
(b) Students withdrawing after the final date for late registration but before the end of the first calendar month of instruction will be granted a refund of the full amount paid less $35.00 ($15.00 registration fee plus $20.00 per month tuition).
(c) Students withdrawing during the second calendar month of instruction will be granted a refund of the full amount paid less $55.00.
(d) No refunds will be granted after the second calendar month of instruction, but if a student transfers to an Industrial Division Course, credit up to the amount of the unused portion may be applied towards the payment of the fees of that course.
Second, Third and Fourth Term Students:

(a) Students withdrawing before the end of the first calendar month of instruction will be granted a refund of the full amount paid less $20.00.

(b) Students withdrawing during the second calendar month of instruction will be granted a refund of the full amount paid less $40.00.

(c) No refunds will be granted after the second calendar month of instruction, but if a student transfers to an Industrial Division Course, credit up to the amount of the unused portion may be applied towards the payment of fees of that course.

Scholarships and Awards:

A number of scholarships, bursaries and prizes are available to Technology Division students through the generosity of interested business firms, organizations and individuals.

The American Society for Metals (Manitoba Chapter) Scholarships ($25.00) to a student in First Year Mechanical Technology having the highest standing in “Manufacturing Processes”.

Association of Manitoba Land Surveyors Scholarship (two at $100.00 each) to students entering the Third Term of Surveying Technology.

Bird Construction Company Limited Scholarships ($200.00 and $100.00) for students entering Third Term of Building Technology.

Bristol Aerospace Ltd., Scholarships (two at $100.00 each) to students entering the Third Term of Electronic and Mechanical Technology.

Chemical Institute of Canada (Manitoba Chapter) — Book Award — to a student in First Year Chemical Technology for outstanding progress.

Chemical Institute of Canada — Silver Medal Award — to a student in Chemical Technology with the highest standing in the Fourth Term.

Chevron Standard Oil Scholarship ($250.00) to a student entering the Third Term of Civil Technology.

Co-Op Vegetables Oils Ltd., Scholarship ($50.00) to a student in the Operating Engineers Program who completes Term 1 successfully.

Crane Supply Limited — A $25.00 award for the best Utilidor Design in Plant Engineering in Heat and Power Technology.

Ejax of Canada Award ($25.00) to a student in Fourth Term Chemical Technology with the highest overall mark in the Chemical Project Lab.

The Hudson Bay Company Service Award (summer employment and Second Year Tuition) to a student in second term of the Design and Drafting Technology program.
I. Alex Grosney Memorial Bursary ($100.00) to a student in first year Electrical Technology.

Imperial Oil Higher Education Awards — Imperial Oil Limited offers annually free tuition and other compulsory fees to all children or wards of employees and annuitants who proceed to higher courses. The courses may be taken at any Canadian University or other approved Institution of higher learning.

Each award is tenable for a maximum of four years. To be eligible a student must attain an average mark of 70% or higher in the appropriate secondary school examinations in the subjects required for admittance to the approved institution. Further information and application forms may be obtained from The Secretary, Committee on Higher Education, Imperial Oil Limited, 111 St. Clair Avenue West, Toronto 7, Ontario.

The International Nickel Company of Canada Scholarships (five at $100.00 each) to students in Chemical, Civil, Electrical, Electronic and Mechanical Technologies.

James Robert Shore Memorial Award ($100.00) awarded to the graduate in Fourth Term with the highest standing in the Technology Program.

The Manitoba Electrical Association Scholarship ($100.00 plus an equal amount from the Provincial Government) for a student in the Third Term of Electrical Technology.

Manitoba Hydro Scholarship ($100.00) for a student entering Third Term of Electrical Technology.

The Manitoba Society of Certified Engineering Technicians and Technologists Award — A slide rule to the Engineering Technology student who shows the most improvement during Term 1.

The Manitoba Sugar Company Limited Annual Bursary ($200.00) to a student in Operating Engineers who completes Term I successfully.

Manitoba Telephone System Scholarship ($100.00) to a student entering the third term of Electronic Technology.

The O’Keefe Brewing Company Scholarships (one at $100.00 and another at $50.00) for students in Operating Engineers who complete Term I successfully.

Pritchard Engineering Co. Ltd. Scholarships (two at $300.00 each) to students in first and second year of Mechanical Technology.

Templeton Engineering Scholarships (two at $200.00 each) to students entering the Third Term of Civil and Structural Technology.

Canadian Laboratory Supplies Limited — an annual Book Award to a Chemical student with the highest achievement in the Instrumentation subject. (CHEM 305 & 405).
ROYAL CANADIAN ENGINEERS MEMORIAL SCHOLARSHIPS

Scholarships of up to $500 each are offered annually to students, both male and female, who are attending any educational course of study or practical training course beyond secondary school level. Scholarships are awarded on the basis of merit and need to the most suitable candidates from among those students who apply for the scholarship.

A candidate to be eligible for the Royal Canadian Engineer Memorial Scholarship must be the child or grandchild of a person who served in any rank in any of the following components of the Canadian Armed Forces:

a. A Royal Canadian Engineer component of the Canadian Army during World War I, World War 2, or under the United Nations in Korea; or

b. The Royal Canadian Engineers in the Canadian Army Regular or Permanent Force or Militia or Non-Permanent Active Militia, for not less than three continuous years; or

c. The Military Engineers Branch of the unified Canadian Armed Forces for not less than three continuous years after the First day of February, 1966.

MEDICAL LABORATORY TECHNOLOGY AWARDS:

Warner Chilcott Company — award for General Proficiency.


Canadian Laboratory Supplies — award for Theory in Microbiology.

Fisher Scientific Company — award for Theory in Microbiology.

School Hours:

Classes are in session from 8:30 a.m., until 4:05 p.m., five days per week, Monday through Friday. However, these hours may be altered in accordance with training requirements and school facilities.

Student Administrative Council:

There is an active Student Council at the Institute. Membership in this Student Organization gives a student many privileges. The Student Council levies a membership fee, at the time of registration, based on the duration of the course.

Tools and Equipment:

Relatively expensive tools and equipment are made available to the students by the Institute. Certain items which for sanitary or other reasons should be personal property, are purchased by the student.
Programs ...

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     Pre-Technology Program

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             Chemical Technology
     Civil
             Building Technology
             Civil Technology
             Design & Drafting Technology
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     Medical Laboratory Technology
     Medical Radiological Technology
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             Radiological Technology

* 

Technology Programs are offered by the Vocational
Centres at Brandon and The Pas. Separate calendars
are available from these Institutes.
Program for Adults
Pre-Technology Program

Entrance Requirements:
1. Mature Students — The candidate must be at least 21 years of age in the calendar year of registration and have a partial Manitoba Grade XI (300 or 301 subjects) or equivalent.
2. Students who have discontinued a Term 1 Technology program and who feel that future success at the Institute would be more assured by reviewing Grade XII topics.
3. Students successful in Vocational Preparation Level 1 and with a demonstrated proficiency in English, Mathematics and Physical Science.

Course Information:
The course will be of five months duration starting in February and ending in June of each year. The successful completion of this program will allow a candidate admission into any Engineering Technology program at the Manitoba Institute of Technology. The course material offered will prepare the student for the General Course Mathematics 301, English 301, and Physical Science 301 June examinations. Department of Education standing will be awarded to all students who are successful in their examinations.

Fees and Expenses:
The tuition fee for the Pre-Technology Program is $100.00 for the 5 month term. Other expenses include textbooks, incidentals, board and lodging.

Caution:
Students, to be successful in this program, must be prepared to spend considerably more time on their studies than the indicated 20 hours per week. They should also have a strong interest in Mathematics and the Physical Sciences.

COURSE OUTLINE

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-301</td>
<td>English</td>
<td>3 2</td>
</tr>
<tr>
<td>G-301</td>
<td>Mathematics</td>
<td>4 3</td>
</tr>
<tr>
<td>G-301</td>
<td>Physics</td>
<td>2 2</td>
</tr>
<tr>
<td>G-301</td>
<td>Chemistry</td>
<td>2 2</td>
</tr>
</tbody>
</table>

11 9
Certificate Program
Operating Engineers

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics, and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Vocational Preparation Training - Level 1 with demonstrated proficiency in English, Mathematics and Physical Science.
4. Successful completion of the Pre-Technology Program.

Course Information:
ONE SCHOOL YEAR of approximately 10 months duration with courses commencing in September of each year. Upon graduation, the Fourth Class Certificate is immediately obtainable following the successful completion of the Provincial Examinations.

*Fees and Expenses:*
The tuition for the Operating Engineers' course is $100.00 per term. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
Operating Engineers are responsible for the safe operation of mechanical equipment in Industry, Utilities, Commercial Buildings and Institutions. They are examined and licensed under the Boiler Plant and Pressure Vessels Act.

Industry in Manitoba is diversified. A few examples of industries relying on Operating Engineers' services are: Meat Packers; Cold Storage Plants; Laundry and Dry Cleaning Plants; Dairies, Food Processing Plants; Breweries; Hospitals; and large public buildings. In these plants, Operating Engineers are responsible for the operation of steam boilers, refrigeration compressors, air compressors, and air conditioning systems and the associated distribution systems for each.

Opportunities for advancement are always open. Usually, after one year of experience, the Fourth Class Certificate holder can qualify to write the Third Class Examinations.
Success in this brings added responsibility and remuneration. The requirements increase for qualification to write the Second Class, and ultimately the First Class Examinations. The responsibility that an Operating Engineer is allowed to assume increases with each classification. Many hours of home study and conscientious working effort are required to obtain the higher Certificates, but the financial reward and the increased stature provide ample compensation.

**Note:**

See Page 18 for details re: Training Allowances.

### COURSE OUTLINE

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TERM 1</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>LECT.</strong></td>
<td><strong>LAB.</strong></td>
</tr>
<tr>
<td>OPER-101</td>
<td>Power Plant Theory &amp; Practice</td>
<td>7</td>
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<tr>
<td>OPER-102</td>
<td>Electricity</td>
<td>2</td>
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<tr>
<td>OPER-103</td>
<td>Instruments &amp; Controls</td>
<td>1</td>
</tr>
<tr>
<td>MATH-104</td>
<td>Mathematics</td>
<td>3</td>
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<tr>
<td>RESC-105</td>
<td>Physics</td>
<td>1</td>
</tr>
<tr>
<td>RESC-106</td>
<td>Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>ENGL-107</td>
<td>English</td>
<td>3</td>
</tr>
<tr>
<td>OPER-108</td>
<td>Drafting</td>
<td>2</td>
</tr>
<tr>
<td>OPER-109</td>
<td>Machine Shop — practical</td>
<td></td>
</tr>
<tr>
<td>OPER-201</td>
<td>Power Plant Theory &amp; Practice</td>
<td>7</td>
</tr>
<tr>
<td>OPER-202</td>
<td>Electricity</td>
<td>2</td>
</tr>
<tr>
<td>OPER-203</td>
<td>Instruments &amp; Controls</td>
<td>1</td>
</tr>
<tr>
<td>MATH-204</td>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>RESC-205</td>
<td>Physics</td>
<td>1</td>
</tr>
<tr>
<td>RESC-206</td>
<td>Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>ENGL-207</td>
<td>English</td>
<td>3</td>
</tr>
<tr>
<td>OPER-208</td>
<td>Drafting</td>
<td>2</td>
</tr>
<tr>
<td>OPER-210</td>
<td>Welding — practical</td>
<td></td>
</tr>
</tbody>
</table>
**OPER-101 Power Plant Theory and Practice**

(a) Section I — Steam Generation
Acts and codes; types of boiler; boiler and furnace construction; heat transfer; theory of combustion; draft, fuels and firing equipment, boiler fittings; pipes and pipe fittings, pumps and injectors.

(b) Section II — Steam Use
Heat of steam; use of steam tables. Simple steam engines and pumps. Turbine theory, types, and operation; condensers.

(c) Section III — Refrigeration
Theory of mechanical compression cycle of refrigeration; types and characteristics of refrigerants. Use of tables; details of evaporators, compressors, condensers; basic controls.

**OPER-102 Electricity**

Electron theory; Ohm's Law; magnetism and induction; D.C. circuits; parallel and series; Lenz's Law; D.C. measuring instruments; D.C. motors and generators; principles of A.C. current; impedance; power factor.

**OPER-103 Instruments and Controls**

Fundamentals of temperature, pressure and flow measurement. Control valves; semi-automatic and programming flame failure protection systems; flame rod and photo electrical cell types and applications; self-actuating controls for refrigeration systems.

**MATH-104 & MATH 204**

Mathematics
Number and numerical calculations; mensuration, powers and roots; algebra — fundamental operations, linear and quadratic equations; problems with one and two unknowns; use and transposition of formulae; analytic geometry — straight line, circle, parabola in Cartesian co-ordinates; use of graphs and graphic methods; trigonometric functions; vectors; logarithms, use of the slide rule.

**RESC-105 & RESC-205 Physics**

Units and measurements; motion, velocity and acceleration; vectors; moments of forces; resolution of forces; work, mechanical advantage, power and energy; energy transfer and equations; terms and laws of mechanics in reference to gases and liquids; Archimedes principle; temperature measurement; thermal expansion; heat quantities; heat transfer.

**RESC-106 Chemistry**

Matter — elements, compounds and mixtures; physical and chemical change; atoms and molecules; chemical nomenclature; valence; chemical equations.

Gases — gas laws; preparation and properties of industrial gases; safety.

**ENGL-107 & ENGL-2207 English**

A course designed to improve the student's ability to study and improve his critical thinking as well as reading and writing skills. It demonstrates how elementary logic, fundamental writing techniques, outlining, summarizing, paragraphing, vocabulary, grammar, spelling, capitalization, punctuation are applied to the writing of short informal library research reports, business correspondence and technical explanations.

**OPER-108 Drafting and Blueprint Reading**

The language of drafting; use and care of instruments; pictorial representation; views; dimensions and tolerances; sections.
OPER-309 Machine Shop Practice
Students will undertake a project involving use of hand tools and an introduction to the operation, capabilities and care of machine tools.

OPER-201 Power Plant Theory and Practice
(a) Section I — Steam Generation
Feedwater systems, feedwater treatment; lubrication, corrosion; mechanical power transmission; fans and air compressors; plant operation; safety; log keeping; cost and efficiency calculations.

(b) Section II — Steam Use
Heating systems, return systems; traps and air venting; heat exchangers; heating in air-conditioning systems. Engine management, operation and maintenance.

(c) Section III — Refrigeration
Installation and operation of direct and indirect systems. Refrigeration codes, maintenance and trouble shooting. Insulation; air-conditioning and humidity control, the absorption system.

OPER-202 Electricity
Single and polyphase circuits. A.C. transformers, motors and generators; A.C. measuring instruments; switches, circuit breakers, motor starters. Preventive and running maintenance of plant electrical equipment; code; elementary electronics.

OPER-203 Instruments and Controls
Theory of on-off, proportional, reset, rate and floating control. Typical pneumatic and electrical boiler combustion control system; automatic draft regulation; electrical controls for refrigeration and air-conditioning systems.

RESC-206 Chemistry
Acids, bases and salts; solutions; PH; neutralization; ionization; oxidation and reduction.
Thermo-chemistry; combustion; latent heat; heat and work; first and second laws of thermodynamics; reversible and irreversible processes; Carnot cycle; heat engines; corrosion; feedwater treatment.

OPER-208 Drafting
Shop sketching; orthographic, oblique and isometric sketching and drawing practice. Electrical and pipefitting symbols and layout drawings.

OPER-210 Welding
Students will be introduced to oxy-acetylene. The capabilities and the safe operation and proper care of welding equipment.
Diploma Programs
Chemical Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

Fees and Expenses:
The tuition fee for the course in Chemical Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The technologist performs a special and indispensable role as a member of the scientific team in chemical research, product development, application, or production. Since the Canadian Chemical Industry has experienced phenomenal growth in the last decade, there are many opportunities for students who possess the personal initiative and responsibility for the attainment of a diploma.

The Chemical Technologist may become employed as: Research Assistant, Chemical Analyst, Plant Control Chemist, Laboratory Experimentation Specialist, Salesman and Service-man for Chemical Products and Equipment, etc.

The Chemical graduate finds employment in a wide variety of fields, such as foods, glass, rubber, building products, dyes, oils, lubricants, heavy chemicals, fuels, fertilizers paper, paints, plastics, metals and government agencies.

This course is designed for women as well as men. There are many jobs for which the industry prefers women. Jobs that require a good colour sense, patience and precision. Working conditions in most of the employing firms are the kind that would be attractive to women. The laboratories are safe, quiet and clean. The work is interesting and challenging. This field provides a wonderful opportunity to the girl with better than average intelligence who does not plan or cannot afford higher education but is not satisfied with the usual job opportunities found in the clerical fields.
# COURSE OUTLINE

## First Year

### TERM 1

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL-101</td>
<td>Communications</td>
<td>3 Lec., 0 Lab.</td>
</tr>
<tr>
<td>MATH-102</td>
<td>Mathematics</td>
<td>3 Lec., 2 Lab.</td>
</tr>
<tr>
<td>RESC-107</td>
<td>Physics</td>
<td>2 Lec., 2 Lab.</td>
</tr>
<tr>
<td>ERON-104</td>
<td>Electricity &amp; Magnetism</td>
<td>2 Lec., 2 Lab.</td>
</tr>
<tr>
<td>CHEM-101</td>
<td>General Chemistry</td>
<td>4 Lec., 3 Lab.</td>
</tr>
<tr>
<td>CHEM-102</td>
<td>Descriptive Inorganic Chemistry</td>
<td>3 Lec., 0 Lab.</td>
</tr>
<tr>
<td>CHEM-103</td>
<td>Inorganic Qualitative Analysis</td>
<td>1 Lec., 3 Lab.</td>
</tr>
<tr>
<td>PHYS-101</td>
<td>Physical Education</td>
<td>0 Lec., 1 Lab.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Lec., 13 Lab.</td>
</tr>
</tbody>
</table>

### TERM 2

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL-201</td>
<td>Report Writing</td>
<td>3 Lec., 0 Lab.</td>
</tr>
<tr>
<td>MATH-202</td>
<td>Mathematics</td>
<td>3 Lec., 2 Lab.</td>
</tr>
<tr>
<td>RESC-207</td>
<td>Physics</td>
<td>2 Lec., 2 Lab.</td>
</tr>
<tr>
<td>ERON-204</td>
<td>Electronics</td>
<td>2 Lec., 2 Lab.</td>
</tr>
<tr>
<td>CHEM-203</td>
<td>Inorganic Quantitative Analysis</td>
<td>2 Lec., 6 Lab.</td>
</tr>
<tr>
<td>CHEM-204</td>
<td>Organic Chemistry</td>
<td>3 Lec., 4 Lab.</td>
</tr>
<tr>
<td>PHYS-201</td>
<td>Physical Education</td>
<td>0 Lec., 1 Lab.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Lec., 17 Lab.</td>
</tr>
</tbody>
</table>

## Second Year

### TERM 3

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
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</thead>
<tbody>
<tr>
<td>MATH-302</td>
<td>Calculus</td>
<td>3 Lec., 2 Lab.</td>
</tr>
<tr>
<td>CHEM-304</td>
<td>Organic Chemistry</td>
<td>3 Lec., 4 Lab.</td>
</tr>
<tr>
<td>CHEM-305</td>
<td>Instrumental Chemical Analysis</td>
<td>2 Lec., 8 Lab.</td>
</tr>
<tr>
<td>CHEM-306</td>
<td>Physical Chemistry</td>
<td>3 Lec., 3 Lab.</td>
</tr>
<tr>
<td>CHEM-307</td>
<td>Laboratory Techniques</td>
<td>1 Lec., 0 Lab.</td>
</tr>
<tr>
<td>CHEM-309</td>
<td>Industrial Chemistry</td>
<td>2 Lec., 0 Lab.</td>
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<tr>
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<td>14 Lec., 17 Lab.</td>
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### TERM 4

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<tr>
<th>Course No.</th>
<th>COURSE</th>
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<tbody>
<tr>
<td>CHEM-402</td>
<td>Statistics &amp; Computer Programming</td>
<td>3 Lec., 0 Lab.</td>
</tr>
<tr>
<td>CHEM-405</td>
<td>Instrumental Chemical Analysis</td>
<td>2 Lec., 8 Lab.</td>
</tr>
<tr>
<td>CHEM-406</td>
<td>Physical Chemistry</td>
<td>3 Lec., 3 Lab.</td>
</tr>
<tr>
<td>CHEM-407</td>
<td>Laboratory Techniques</td>
<td>0 Lec., 2 Lab.</td>
</tr>
<tr>
<td>CHEM-408</td>
<td>Economics &amp; Industrial Relations</td>
<td>3 Lec., 0 Lab.</td>
</tr>
<tr>
<td>CHEM-409</td>
<td>Industrial Chemistry</td>
<td>2 Lec., 0 Lab.</td>
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<tr>
<td>CHEM-410</td>
<td>Chemical Projects</td>
<td>0 Lec., 4 Lab.</td>
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<td>13 Lec., 17 Lab.</td>
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</table>
COURSE DESCRIPTIONS

ENGL-101 Communication
Essentially a practical course aimed at improving the communication abilities of students; basic grammar; sentence structure; basic sentence faults; effective paragraphs.

MATH-102 Mathematics
Elementary statistics, errors and uncertainties in computations with measured values; elementary algebra, slide rule, logarithms, trigonometric relations and identities, vectors; equation solution methods, determinants, quadratic equations; elementary analytical geometry, straight line circle, parabola, ellipse, log functions.

RESC-107 Physics
Statics; kinematics; dynamics; energy; rotary motion; hydrostatics; elasticity; temperature; thermal expansion; radiation, conduction and convection; thermodynamics.

ERON-104 Electricity & Magnetism
Comprises basic electricity; D.C. and A.C. circuit analysis; frequency spectrum; use of test instruments; basic magnetism; magnetic circuits.

CHEM-101 General Chemistry
Atomic structure; energy levels and the periodic table; chemical bond; stoicheometry; the gaseous state; properties of liquids; types of solids, changes of state; solutions, colloids; chemical equilbrium; electrochemistry.

CHEM-102 Descriptive Inorganic Chemistry
Atomic theory and periodic classification of the elements. Properties of the elements and their respective compounds. Processes involved in their manufacture, etc.

CHEM-103 Inorganic Qualitative Analysis
Chemical equilibria; ionization; solubility product; complex ions, and other topics pertinent to a study of qualitative analysis; laboratory practice in separation and identification of cations and anions.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-202 Mathematics
Conics, loci, polar coordinates; solid geometry. Differential calculus and its use, \((x^n \text{ and } \sin x)\). Maxima and minima; increments. Integral calculus; area rules; integral of \(x^n \text{ and } \sin x\), work, velocity. Use of tables of differentials and integrals. Substitution. Integration by parts.

RESC-207 Physics
Light - reflection, refraction, dispersion; interference and diffraction; lenses optical instruments; polarization; relativity; atomic physics; nuclear and nuclear energy; nuclear reactions.

ERON-204 Electronics
Amplification by vacuum tubes and transistors; amplifier circuits; oscillators; comparison measurement; operational amplifiers for measurement and control; electronic switching and counting circuits.

CHEM-203 Inorganic Quantitative Analysis
The theory behind classical quantitative analysis as used in industry. Practical work involves mainly gravimetric and volumetric quantitative analysis.
CHEM-204 Organic Chemistry

A study of aliphatic organic chemistry and related topics including discussion on the characterization of organic compounds and the nature of organic reactions. Laboratory: development of basic laboratory techniques and preparation of representative organic compounds related to the theoretical study, including industrially important substances.

MATH-302 Calculus

Definition and differentiation of inverse trigonometry, hyperbolic, and inverse hyperbolic functions; integration by parts and from C.R.C. tables; series, explanation and uses; partial differentials; multiple integration; Newton's method of finding a root; integration by partial fraction; introduction to differential equations.

CHEM-304 Organic Chemistry

Aromatic Organic Chemistry to include; structure and nomenclature, preparations and properties; functional group reactions; methods of identification and commercial uses of important members; aliphatic and aromatic hydrocarbons and their derivatives halogen, nitrogen, sulfur, mono and di-carboxylic acids; esters and fats; proteins; carbohydrates; amino compounds; polynuclear hydrocarbons; etc. The fundamentals of store-chemistry; geometrical and optical isomerism; tautomerism, resonance, simple reaction mechanism.

The laboratory will dwell on the techniques of Organic Chemistry and experiments related to the above topics, including chromatography, electrophoresis, vacuum distillation, carbon-hydrogen train, etc.

CHEM-305 & CHEM-405 Instrumental Chemical Analysis

Discussion of errors; theory and instrumentation of visible and photometric colorimetry; fluorimetry; turbidimetry and nephelometry; spectrophotometry (ultraviolet, visible and infrared); spectrographic analysis (emission and raman spectra); flame photometry; gas detection and gas chromatography; radiochemistry; potentiometric titration and pH measurements, aquation; electrodeposition and polarography; coulometry and amperometry; conductometry; chemical micrography; spectroscopic analysis by comparison; ion exchange mass spectrometry; atomic absorption; spectrophotometry; electronic instrumentation related to chemical instruments, etc.

CHEM-306 & CHEM-406 Physical Chemistry

Ideal and non-ideal gas behaviour; the solid state: the three laws of thermodynamics and their applications; general characteristics of liquids and solutions: colligative properties: thermochemistry (heat of reaction, heat of combustion, etc.); chemical equilibria; electrochemistry; electrical conductance; phase diagrams; chemical kinetics; surface chemistry and catalysis; colloids (sedimentation, osmotic pressure, emulsions, etc.). Laboratory experiments include x-ray diffraction, DTA, TGA, bomb calorimetry, surface tension measurement, molecular weight determination by a variety of methods, viscosity, etc.

CHEM-307 & CHEM-407 Laboratory Techniques

Theoretical and practical glass-blowing techniques; repair of chemical glassware and construction of simple apparatus. Design and fabrication of apparatus for chemical laboratory use; consideration of problem, choice of materials, design of fittings, vacuum techniques, Fractional distillation.

CHEM-309 Industrial Chemistry

Raw material requirements, production and chemical control methods in Canadian industry; industrial water supply and water control methods; energy sources; petroleum, rubber and plastics; paints; lacquers and protective coatings; agri-chemicals; pulp and paper; industrial electrochemistry; organic and inorganic chemicals; industrial hazards and practices; etc.
CHEM-402 Statistics and Computer Programming

Frequency distributions, measures of location, measures of variation; probability, probability distributions, sampling and sampling distributions; inferences from means, inferences from standard deviations, tests linear regression, correlation; introduction to computer systems, programming languages; FORTRAN IV, elements of language, control statements, input/output statements, specification statements, subprograms, sample programs in statistical analysis.

CHEM-408 Economics and Industrial Relations

The economic section will acquaint the student with modern economic theory and its practical applications to the Chemical Industry and the national economy. Topics will include business organization; theory of price; national income and income distribution; public finance; money and banking; international trade, etc.

The Industrial Relation portion will deal with human relations and its effects on morale and work production; selecting, inducting, training, and promoting employees; merit rating, labor relations; public relations of the chemical business as an industry in the community.

CHEM-409 Industrial Chemistry

Conventions in methods of analysis and measurement; the chemical equation and stoichiometry; material balances; material balances involving the elements; recycle calculations; ideal gas laws; real gas relationships; phase phenomenon; energy balances; enthalpy changes; reversible processes and mechanical energy balances; combined material and energy balances; unsteady state material and energy balances.

CHEM-410 Chemical Projects

A project is required to be satisfactorily completed by all graduating students. This project is to include:

(a) literature search and feasibility,
(b) practical laboratory work,
(c) written report.
Building Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.
The Building, Civil, Design and Drafting, Structural and Surveying Technology programs are common in Term 1. Students who originally register and successfully complete Term 1 of Building Technology may transfer, at the beginning of Term II, into Design and Drafting Technology. The Building, Civil, Structural and Surveying Technology programs are common in Term II. Students who successfully complete Term II of Building Technology may transfer, at the beginning of Term III, into Civil, Structural or Surveying Technology.

Fees and Expenses:
The tuition fee for the course in Building Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The Building Technology course is designed to produce technologists who will receive a comprehensive training in the field of construction engineering.
The Building Technologist can be employed in the fields of estimating, construction and maintenance supervision, building inspection, materials testing, building products sales and other related areas. The graduate can also expect to work with consulting engineering firms, contractors, builders, fabricators, and suppliers of construction materials. After gaining the required experience he may choose to become self-employed as a construction supervisor or as a contractor.
# COURSE OUTLINE

## First Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course</th>
<th>TERM 1</th>
<th>HOURS per WEEK</th>
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<tr>
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<td>MATH-209</td>
<td>Mathematics</td>
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## Second Year

## TERM 3

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<td>BLDG-306</td>
<td>Concrete Construction</td>
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<tr>
<td>BLDG-307</td>
<td>Building Services &amp; Finishings</td>
<td>3</td>
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<tr>
<td>BLDG-308</td>
<td>Construction Materials</td>
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<tr>
<td>BLDG-310</td>
<td>Site Investigation &amp; Soils Mechanics</td>
<td>3</td>
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<tr>
<td>BLDG-311</td>
<td>Code Interpretation &amp; Safety Regulations</td>
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<tr>
<td>BLDG-312</td>
<td>Estimating</td>
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## TERM 4

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<td>BLDG-401</td>
<td>C.P.M. &amp; Work Study</td>
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<tr>
<td>BLDG-402</td>
<td>Construction Procedures &amp; Equipment</td>
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<tr>
<td>BLDG-403</td>
<td>Construction Supervision</td>
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<td>BLDG-404</td>
<td>Project Administration</td>
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<td>BLDG-405</td>
<td>Structural Analysis</td>
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<td>Structural Design</td>
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<td>BLDG-410</td>
<td>Foundations</td>
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</table>
COURSE DESCRIPTIONS

ENGL-101 Communication
An essentially practical course designed to give technologists experience in preparing, writing and presenting technical documents of the type likely to be encountered in industry. The emphasis is on improving both written and oral "communication" abilities.

MATH-109 Mathematics

CIVL-102 Mechanics
The basic concepts of statics as applied in the analysis of structures. Forces, moments, free body diagrams, trusses, frames, friction, centres of gravity, centroids and moments of inertia.

CIVL-103 Surveying

CIVL-105 Strength of Material
Stress, strain, temperature stress, Poisson's ratio, bolted and welded joints, thin walled pressure vessels, torsion; shear force and bending moment.

CIVL-106 Drafting
Principles of engineering drawing based on Canadian Standards Association Series in the field of drawing practice; instruments and their use; applied geometry; lettering, orthographic drawing and sketching; auxiliaries; normal and edge views; sections and conventions; dimensions, notes, working drawings; assigned projects.

PHYS-101 & PHYS-201
Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual and team sports.

ENGL-206 Specifications & Reports
Writing of letters, interdepartmental memorandums and reports.
Interpretation of specifications as applied to Civil Technology and the preparing and writing of said specifications.
Standard forms; requisitions, work orders, change orders, purchase orders, etc.

MATH-209 Mathematics
Geometry: Circle and parabola; 3-d geometry, points, planes, volumes.
Computer: Desk Top calculator, memory, programs.
Fortran IV: Arithmetic, integers, real numbers, write statement, I E and F fields, formats, IF and GO TO, DO and CONTINUE, DIMENSION, READ and data.
Calculus: Variables and constants, limits, "delta process", slope, derivatives, velocity and rates, maxima and minima, differentiation. Integration, indefinite and definite, areas, trapezoidal rule, use of tables.

C-202 Mechanics
The basic concepts of dynamics including motion of projectiles, work, energy and power. The application of graphical statics in the solution of frames and trusses and an introduction to fluid statics.
CIVL-203 Surveying

Cross-sectioning and calculation of areas and volumes. Methods of calculating simple, spiral and vertical curves. Special problems on curve computations. Methods of stadia. Plane table surveys. Legal surveys with regard to township layouts.

CIVL-205 Strength of Material

Bending moments and shear force diagrams. Flexure formula, general shear equation, beam design, combined stresses, Mohr's circle, the three moment equation, deflections by the formula method, area moment method and the conjugate beam method.

CIVL-206 Drafting

Descriptive geometry. Drawing of structural steel frameworks and connections; reinforced concrete principles and drawing of structural concrete details; structural drafting including laminated construction, drawing of municipal structures using a sewer and water system.

BLDG-306 Concrete Construction


BLDG-307 Building Services and Finishings


BLDG-308 Construction Materials

Ferrous Metals - Properties of structural steel, type of structural steel, effects of elements on properties of steel.

Non-Ferrous Metals - Types of aluminum alloys, properties of aluminum. Use of aluminum in building construction and other non-ferrous metals.

Timber - Production, species and grading of lumber; protective treatments, laminated structural components, plywood. Bituminous Products - use of asphaltic mixes in various forms.

Sound and Thermal Insulation - Characteristics and uses of each type including "Sandwich Wall" and acoustic material.

Cement Products - Concrete tile, block, masonry products.

Clay Products - Traditional and modern forms and uses.

Characteristics of glass paints, plastic laminates as applied to the building industry.

BLDG-310 Site Investigation and Soil Mechanics

Site Investigation, soil log, site preparation, building layout, excavating, shoring, water control, soil structure and texture, field tests, soil density, soil water, permeability, capillarity and and seepage. Engineering soil classifications. Frost action and perma-frost. Stress distribution, consolidation and settlement. Bearing capacity.

BLDG-311 Code Interpretation and Safety Regulations

Zoning and building by-laws, regulations and laws relating to building premises, Department of Labour, Workmen's Compensation Code. Electrical, heating and ventilating, air-conditioning and plumbing.

BLDG-312 Estimating

Site investigation, basic blueprint analysis, quantity take-off, pricing, tendering bonds, rights and responsibilities, and cost accounting cycle. Contract management.
BLDG-401 C.P.M. and Work Study
Methods study, motion study, work sampling, material handling, predetermined time systems, learning curves. Critical path method of planning and scheduling; network theory, project scheduling, advanced network techniques, resource allocation. Analysis of Critical Path reports.

BLDG-402 Construction Procedures and Equipment
Winter Construction - problems including protective hoarding and heating.
Methods and Techniques of Building Construction - including tower cranes and effect on building design, pumping concrete, types of forms including form hardware.
Safety in Construction.
Pre-Fabrication, Pre-Assembly and Factory Made components.
Methods and types of plant used in excavation.
Setting up base and staging camps.
Closing down projects and restoration to pre-construction conditions of sites, ground and buildings.
Demolition and site clearance.
Fire Resistant Construction and fire prevention and protection.
Light weight roofing materials.

BLDG-403 Construction Supervision
Field office procedure, purchasing and receiving, timekeeping, records, budget control, contract coordination, foremanship, inspection and take over. Updating construction schedules.

BLDG-404 Project Administration

BLDG-405 Structural Analysis

BLDG-409 Structural Design
Steel - Design of tension and compression members; design of simple beams and columns; welded and bolted connections.
Timber - Design of beams and columns using sawn timber and glulam; connections using bolts and timber connectors; timber decking. Use of Plywood.
Study of structural combinations including steel joists, steel frames, precast concrete, reinforced concrete and timber construction.

BLDG-410 Foundations
Civil Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
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Fees and Expenses:
The tuition fee for the course in Civil Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The Civil Technologist is trained to assist the Civil Engineer in a variety of areas including building of streets, highways, railroads, airports, drainage and flood protection facilities, hydro electric development projects, plus the installation of adequate facilities for water supply and sewage disposal. The Civil Technologist could find employment in the planning, design, construction or inspection of such projects. After gaining the necessary experience, a Civil Technologist might become a sales representative for a building materials or engineering equipment manufacturer. He is trained to adopt engineering theory to construction techniques. His work is often described as developmental, covering the stages between engineering concepts and the physically completed project.
# COURSE OUTLINE

## First Year

<table>
<thead>
<tr>
<th>Course No.</th>
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<td>ENGL-101</td>
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## Second Year

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COURSE DESCRIPTIONS

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MATH-109 Mathematics


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The basic concepts of statics as applied in the analysis of structures. Forces, moments, free body diagrams, trusses, frames, friction, centres of gravity, centroids and moments of inertia.

CIVL-103 Surveying


CIVL-105 Strength of Material

Stress, strain, temperature stress, Poisson's ratio, bolted and welded joints, thin walled pressure vessels, torsion; shear force and bending moment.

CIVL-106 Drafting

Principles of engineering drawing based on Canadian Standards Association Series in the field of drawing practice; instruments and their use; applied geometry; lettering, orthographic drawing and sketching; auxiliaries; normal and edge views; sections and conventions; dimensions, notes, working drawings; assigned projects.

PHYS-101 & PHYS-201 Physical Education

The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual and team sports.

ENGL-206 Specifications & Reports

Writing of letters, interdepartmental memorandums and reports. Interpretation of specifications as applied to Civil Technology and the preparing and writing of said specifications.

Standard forms; requisitions, work orders, change orders, purchase orders, etc.

MATH-209 Mathematics

Geometry: Circle and parabola; 3-d geometry, points, planes, volumes.

Computer: Desk Top calculator, memory, programs.

Fortran IV: Arithmetic, integers, real numbers, write statement, I E and F fields, formats, IF and GO TO, DO and CONTINUE, DIMENSION, READ and data.

Calculus: Variables and constants, limits, "delta process", slope, derivatives, velocity and rates, maxima and minima, differentiation. Integration, indefinite and definite, areas, trapezoidal rule, use of tables.
CIVL-202 Mechanics

The basic concepts of dynamics including motion of projectiles, work, energy and power. The application of graphical statics in the solution of frames and trusses and an introduction to fluid statics.

CIVL-203 Surveying

Cross-sectioning and calculation of areas and volumes. Methods of calculating simple, spiral and vertical curves. Special problems on curve computations. Methods of stadia. Plane table surveys. Legal surveys with regard to township layouts.

CIVL-205 Strength of Material

Bending moments and shear force diagrams. Flexure formula, general shear equation, beam design, combined stresses, Mohr’s circle, the three moment equation, deflections by the formula method, area moment method and the conjugate beam method.

CIVL-206 Drafting

Descriptive geometry. Drawing of structural steel frameworks and connections; reinforced concrete principles and drawing of structural concrete details; structural drafting including laminated construction; drawing of municipal structures using a sewer and water system.

MATH-309 Mathematics

Calculus: Differentiation of trigonometry functions, inverse trigonometry functions, exponential and logarithmic functions, approximation of changes and meaning of partial differentiation. Integration of trigonometry and exponential functions, integration by parts and substitution, areas and volumes, liquid pressure.

Statistics: Tabulated values, histograms, distribution, probability, regrouping. Binomial, Poisson and Normal distributions, correlations, quality control.

CIVL-312 Hydraulics

Hydrostatics including intensity of pressure, manometers, pressure heads, and measuring of pressure. Closed Conduit Flow including Bernouilli’s Equation and Continuity Equation flow measurements with orifices, weirs, Pitot tubes and Venturi meters, pipe, pump and reservoir problems. Open channel flow including types, Manning Equation, Froude Numbers, specific head diagrams, and their use in solving problems in open channels, Hydraulic Jump pump, description, uses, and calculations of related elements.

CIVL-316 Photogrammetry


CIVL-317 Soil Mechanics


CIVL-320 Structural Design

Steel - Design of tension and compression members; beams; columns and bearing plates.

Concrete - Basic reinforced concrete design theory; design and review of simple beams and slabs; design of columns; reinforcing steel scheduling; principals of prestressed design.
CIVL-321 Street & Highway Design
Preliminary, location and construction survey requirements. Design factors for street and highway design - projected traffic volumes, speed, curvature, super-elevation, sight distances, grades, drainage, culvert design, right-of-way width. Design of rural and urban roadway sections including cross sections, quantities, mass diagram; profiles, plans, cost estimates and specifications required for tendering. Soil considerations including, subgrade, subbase, base course and load carrying capacity of various pavements. Construction methods.

CIVL-413 Job Control and Costing
Critical path method of planning and scheduling; network theory; project scheduling; advanced network techniques; resource allocation; visual presentation; project analysis; analysis of Critical Path reports; finance as related to the Critical Path. Applied industrial psychology.

CIVL-418 Pavement Mix Design

CIVL-419 Practical Geology
Mineral and rock identification, processes of rock weathering; foundation grouting including types, materials used, equipment, systems and methods employed. Permafrost as applied to northern road construction. Oral presentations by students on selected topics from instructor.

CIVL-423 Water Supply and Waste Disposal

CIVL-424 Hydrology
Hydrologic cycle; Hydrologic Equation; Conversion factors; Precipitation - types, measurement, presentation of data; frequency data as a basis of design; Stream gaging; discharge measurements; velocity measurements; rating curves; mass curves; Hydrographs; snow melt; the unit Hydrograph.

CIVL-425 Stabilization
Mechanical Stabilization — description, suitable soils, mixing, compacting.
Mechanical Stabilization with commercial stabilizing agents — Stabilization with lime; description and use, suitable soils, types of lime, lime content, strength requirements, construction procedures. Stabilization with Portland cement; types of cement treatment, cement content, construction procedures. Suitability of combination of lime and cement. Stabilization with bitumen; types, uses, suitable soils, types of bitumens, bitumen content, strength, moisture content, construction procedures. Various other chemical stabilizers.
Design & Drafting Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition, an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

The Building, Civil, Design and Drafting, Structural and Surveying Technology programs are common in Term I. Students who originally register and successfully complete Term I of Design and Drafting Technology may transfer, at the beginning of Term II, into Building, Civil, Structural or Surveying Technology.

Fees and Expenses:
The tuition fee for the course in Design and Drafting Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The rapid absorption of new scientific knowledge into the engineering sciences coupled with the advances in automation and computer control of production processes has increased the need for clear and concise presentation of technical information. The need for the preparation of engineering drawings to convey this information has not diminished and more drawings are required today than ever before. The future appears bright for the young person who chooses Design and Drafting Technology as his career.

A great variety of job opportunities await the graduate. Positions are available in architectural offices, consulting engineers, structural and fabricating offices, manufacturing, construction, service industry, tool design, civic, provincial and federal government departments.
## COURSE OUTLINE

### First Year

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<th>TERM 2</th>
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### Second Year

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COURSE DESCRIPTIONS

ENGL-101 Communication
An essentially practical course designed to give technologists experience in preparing, writing and presenting technical documents of the type likely to be encountered in industry. The emphasis is on improving both written and oral "communication" abilities.

MATH-109 Mathematics

CIVL-102 Mechanics
The basic concepts of statics as applied in the analysis of structures. Forces, moments, free body diagrams, trusses, frames, friction, centres of gravity, centroids and moments of inertia.

CIVL-103 Surveying

CIVL-105 Strength of Material
Stress, strain, temperature stress, Poisson's ratio, bolted and welded joints, thin walled pressure vessels, torsion; shear force and bending moment.

CIVL-106 Drafting
Principles of engineering drawing based on Canadian Standards Association Series in the field of drawing practice; instruments and their use; applied geometry; lettering, orthographic drawing and sketching; auxiliaries; normal and edge views; sections and conventions; dimensions, notes, working drawings; assigned projects.

PHYS-101 & PHYS-201 Physical Education
The physical education program provides students with the opportunities to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-209 Mathematics
Analytic geometry; common functions and curves. Differential and integral calculus for polynomial functions and simpler transcendental functions. Applications of calculus in technology. Computer programming.

RESC-204 Physics
Electricity: series - parallel circuits for DC and AC.
Heat: molecular theory, temperature, conduction, radiation, and expansion.
Light: basic photometry and illumination.
Sound: absorption, decibel intensity, acoustics.
DEDUR-205 Technical Drafting
Surface developments and intersections; maps and topographic drawing; structural steel detailing; commercial building project; municipal drawings, sewer and water system; highway project.

DEDUR-207 Descriptive Geometry
An analysis of space relationship, three-dimensional views, Orthographic projection, auxiliary views, lines as a point, plane as an edge, true lengths and angles, shortest distances. Revolution, curved lines and surfaces. Intersection problems.

DEDUR-208 Strength of Material
Shear force and bending moment diagrams. Flexure formula, general shear equation, stresses in beams, beam design, combined stresses, Mohr’s circle.

DEDUR-305 & DEDUR-405 Architectural Detailing & Design
Study of styles and techniques for advanced architectural working drawings; technical drawings that provide graphic description of basic building design, graphic presentation and practical application of building construction and strength of material principles; renovation and surveying of existing buildings.

DEDUR-308 Strength of Materials
Shear and bending moment diagrams for beams and frames, beam deflection by the conjugate beam method, beam deflection by the formula method, physical characteristics of timber, design of timber beams and columns, physical characteristics of steel, design of steel beams and columns, Portland cements, design of concrete mixes.

DEDUR-311 Building Construction
Basic methods of construction; qualitative aspects of structural design; code engineering; cost estimates; foundations, structural members and masonry construction; wood, steel and cast in place, concrete construction; wall sections; precast and prestressed concrete.

DEDUR-312 & DEDUR-412 Theory of Systems
Basic principles of architectural structures; loads on structures; structural requirements; heating and air conditioning; plumbing and sprinkler systems; electric power and lighting; vertical transportation.

DEDUR-321 & DEDUR-421 Mechanical Drafting & Design
Advanced work in projection drawing including material take-offs in developments, tolerancing, screw threads, fasteners, bearings, keys, springs, gearing and cams, mechanical drives, pumps, fans, plate-work and sheet metal detailing, fluid mechanics, pneumatics and hydraulic systems, piping symbols and drawings, pressure vessels, drawing reproduction, systems, industrial electrical drawings.

DEDUR-322 & DEDUR-422 Materials & Specifications
A detailed study of the physical and chemical properties of the commonly used engineering materials including steels, non-ferrous metals, concrete, timber, plastics, adhesives, building materials, etc. The following topics will be covered: engineering approach to material selection; material standards; specifications and codes; standardizing bodies and their jurisdiction; material testing and inspection; use of handbooks and catalogues; standard methods for specifying material; commercial sources of supply including stock sizes and grades; techniques of material estimating; quantity surveying; material specifications and contracts.

DEDUR-420 Industrial Practices
Architectural office procedure; sequence of production of working drawings; specification and tendering; job site supervision; sche-
A study of the basic manufacturing processes including the machines and methods used; moulding and casting, die casting, hot and cold forming, extruding, forging, stamping, coating and finishing.

Study of tool and die design as related to manufacturing methods. Subjects include: fundamentals of metal cutting tools, standard tooling components, and accessories, pressing and breaking dies, drill jigs, punches, gauges, gauge blocks, work measurement.

DEDR-423 Tool and Die Design

Study of tool and die design as related to manufacturing methods. Subjects include: fundamentals of metal cutting tools, standard tooling components, and accessories, pressing and breaking dies, drill jigs, punches, gauges, gauge blocks, work measurement.
Structural Technology

Entrance Requirements:

1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:

TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

The Building, Civil, Design and Drafting, Structural and Surveying Technology programs are common in Term I. Students who originally register and successfully complete Term I of Structural Technology may transfer, at the beginning of Term II, into Design and Drafting Technology. The Building, Civil, Structural, and Surveying Technology programs are common in Term II. Students who successfully complete Term II of Structural Technology may transfer at the beginning of Term III into Building, Civil or Surveying Technology.

Fees and Expenses:

The tuition fee for the course in Civil Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:

The Structural Technologist is trained to assist the Structural Engineer in the formulation and calculations of engineering design. Every commercial, industrial and large residential building, every highway and railroad bridge, every hydro-electric power plant and power transmission line, or any similar structure requires the services of Structural Engineers and Structural Technologists. The Structural Technology graduate can find job opportunities in structural design and analysis with consulting engineering firms, architectural firms, crown corporations or public works departments. After gaining the necessary experience the graduate could also find an interesting career in sales, or as a manager in the building materials or construction equipment fields.
COURSE OUTLINE

First Year

TERM 1

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<tr>
<th>Course No.</th>
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<tr>
<td>ENGL-101</td>
<td>Communications</td>
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<td>Mathematics</td>
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Second Year

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<td>STRL-308</td>
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<td>STRL-310</td>
<td>Testing Materials</td>
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<td>STRL-317</td>
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<td>STRL-407</td>
<td>Timber Design</td>
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<td>STRL-410</td>
<td>Design of Foundations</td>
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<td>STRL-414</td>
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<td>STRL-422</td>
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COURSE DESCRIPTIONS

ENGL-101 Communication
An essentially practical course designed to give technologists experience in preparing, writing and presenting technical documents of the type likely to be encountered in industry. The emphasis is on improving both written and oral “communication” abilities.

MATH-109 Mathematics

CIVL-102 Mechanics
The basic concepts of statics as applied in the analysis of structures. Forces, moments, free body diagrams, trusses, frames, friction centres of gravity, centroids and moments of inertia.

CIVL-103 Surveying

CIVL-105 Strength of Material
Stress, strain, temperature stress, Poisson’s ratio, bolted and welded joints, thin walled pressure vessels, torsion; shear force and bending moment.

CIVL-106 Drafting
Principles of engineering drawing based on Canadian Standards Association Series in the field of drawing practices; instruments and their use; applied geometry; lettering, orthographic drawing and sketching; auxiliaries; normal and edge views; sections and conventions; dimensions, notes, working drawings; assigned projects.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual and team sports.

ENGL-206 Specifications & Reports
Writing of letters, interdepartmental memorandums and reports.

PHYS-101 & PHYS-201 Physical Education
Interpretation of specifications as applied to Civil Technology and the preparing and writing of said specifications.

MATH-209 Mathematics
Geometry: Circle and parabola; 3-d geometry, points, planes, volumes.

Computer: Desk Top calculator, memory, programs.

FORTRAN IV: Arithmetic, integers, real numbers, write statement, IF and GO TO, DO and CONTINUE, DIMENSION, READ and data.

Calculus: Variables and constants, limits, “delta process”, slope, derivatives, velocity and rates, maxima and minima, differentiation. Integration, definite and indefinite, areas, trapezoidal rule, use of tables.
CIVL-202 Mechanics

The basic concepts of dynamics including motion of projectiles, work, energy and power. The application of graphical statics in the solution of frames and trusses and an introduction to fluid statics.

CIVL-203 Surveying

Cross-sectioning and calculation of areas and volumes. Methods of calculating simple, spiral and vertical curves. Special problems on curve computations. Methods of stadia. Plane table surveys. Legal surveys with regard to township layouts.

CIVL-205 Strength of Material

Bending moments and shear force diagrams. Flexure formula, general shear equation, beam design, combined stresses, Mohr's circle, the three moment equation, deflections by the formula method, area moment method and the conjugate beam method.

CIVL-206 Drafting

Descriptive geometry. Drawing of structural steel frameworks and connections; reinforced concrete principles and drawing of structural concrete details; structural drafting including laminated construction, drawing of municipal structures using a sewer and water system.

MATH-309 Mathematics

Calculus: Differentiation of trigonometry functions, inverse trigonometry functions, exponential and logarithmic functions, approximation of changes and meaning of partial differentiation. Integration of trigonometry and exponential functions, integration by parts and substitution, areas and volumes, liquid pressure.

Statistics: Tabulated values, histograms, distribution, probability, regrouping. Binomial, Poisson and Normal distributions, correlations, quality control.

STRL-306 Reinforced Concrete Design

General properties of cements and reinforced concrete; basic design theory; design and review of simple beams, T-beams and slabs; design of columns.

STRL-307 Structural Steel Design

Design of the individual components of buildings based on CSA Standard S16, 1965 using the C.I. S.C. handbooks; design of rolled tension members, built up tension members and sag rods; built up columns, three plate welded columns, lacing and tie plates, column base plates and columns subject to combined axial and bending stress; simple beams, continuous beams, plate girders, lintels and beams subject to biaxial loading; bolted and welded building connections.

STRL-308 Theory of Structures

Shear and bending moment diagrams for beams and frames, advanced truss analysis, influence lines for beams and trusses, moving loads for highway and railway bridges, approximate analysis of indeterminate structures moment distribution for continuous beams.

STRL-310 Testing Materials

Simple tests to be carried out on materials in order to illustrate their basic principles of mechanics and fundamental properties; description, application and handling of various strain gauges and strain recording devices; Destructive and Non-Destructive testing.

STRL-317 Soil Mechanics

CIVL-413 Job Control and Costing

Critical path method of planning and scheduling; network theory; project scheduling; advanced network techniques; resource allocation; visual presentation; project analysis; analysis of Critical Path reports; finance as related to the Critical Path; Applied industrial psychology.

STRL-406 Reinforced Concrete Design

Design and review of simple beams and T-beams reinforced for compression; design and review of continuous beams and slabs; design and review of simple, strap and cantilever footings, retaining walls. Ultimate design of rectangular beams, T-beams and columns; principles of prestressed concrete design.

STRL-407 Timber Design

Design of the individual components of buildings based on CSA Standard 086 using the C.I.T.C. handbooks. Design of sawn lumber beams, glulam beams, joist, rafters and decking; design of simple sawn columns, simple glu-

lam columns, spaced columns and columns subject to combined axial and bending stress; design of timber fastenings including nails, lag screws, bolts and timber connectors; plywood design including stressed skin panels, stiffened panels and plywood beams.

STRL-410 Design of Foundations

Site investigation; types of foundations, lateral pressures; sheet piling; cofferdam design.

STRL-414 Bridge Design

Bridge design consideration as based on A.A.S.H.O. specifications; hydrology, hydraulics and soil considerations; culvert design, selection and installation; design of a treated timber bridge, reinforced concrete bridge; bridge surveys and inspection correlated with the design, detailing and drawing of plans for a complete timber bridge.

STRL-422 Design of Structures

Moment distribution for frames and closed conduits, sidesway, non-prismatic frames, inlined frames, wind loads. Applied design of building frames.
Surveying Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and Physical Science (i.e. physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

The Building, Civil, Design and Drafting, Structural and Surveying Technology programs are common in Term I. Students who originally register and successfully complete Term I of Surveying Technology may transfer, at the beginning of Term II, into Design and Drafting Technology. The Building, Civil, Structural and Surveying Technology programs are common in Term II. Students who successfully complete Term II of Surveying Technology may transfer, at the beginning of Term III, into Building, Civil, or Structural Technology.

Fees and Expenses:
The Tuition fee for the course in Surveying Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The Surveying Technology course is designed to provide a broad scope of employment opportunities in the construction and resource industries, and in government. The various fields include land surveying, topographic surveying, construction surveying, town planning, mining surveying, hydrographic surveying and geodetic surveying.
A graduate also has the opportunity for further technical advancement by obtaining a commission as a Manitoba Land Surveyor. His diploma will reduce to not less than two years his Articles of Apprenticeship to a Manitoba Land Surveyor. This provision is covered by Section 35 (a), (b), and (c) of the Land Surveyors Act, Chapter 135 RSM 1954 with Amendment up to and including 1968. This would open up the specialized field of cadastral surveying which is concerned with the registration of the extent of ownership of land.
## COURSE OUTLINE

### First Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>TERM 1</th>
<th>HOURS per WEEK</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>Lab.</td>
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<tr>
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<td>MATH-109</td>
<td>Mathematics</td>
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<tr>
<td>CIVL-102</td>
<td>Mechanics</td>
<td>3</td>
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<tr>
<td>CIVL-103</td>
<td>Surveying</td>
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<tr>
<td>CIVL-105</td>
<td>Strength of Materials</td>
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<tr>
<td>CIVL-106</td>
<td>Drafting</td>
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### Second Year

<table>
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<th>HOURS per WEEK</th>
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<td>CIVL-316</td>
<td>Photogrammetry</td>
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<tr>
<td>SURV-301</td>
<td>Forestry &amp; Geology</td>
<td>2</td>
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<tr>
<td>SURV-303</td>
<td>Surveying</td>
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<tr>
<td>SURV-304</td>
<td>Theory and Use of Instruments</td>
<td>3</td>
<td>2</td>
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<td>SURV-306</td>
<td>Town Planning</td>
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### TERM 4

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<td>CIVL-413</td>
<td>Job Control and Costing</td>
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<tr>
<td>SURV-403</td>
<td>Advanced Surveying</td>
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<tr>
<td>SURV-406</td>
<td>Legal Surveying</td>
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<tr>
<td>SURV-410</td>
<td>Astronomy &amp; Spherical Trigonometry</td>
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<tr>
<td>SURV-416</td>
<td>Photogrammetry &amp; Cartography</td>
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<tr>
<td>SURV-424</td>
<td>Hydrology</td>
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</table>
COURSE DESCRIPTIONS

ENGL-101 Communication
An essentially practical course designed to give technologists experience in preparing, writing and presenting technical documents of the type likely to be encountered in industry. The emphasis is on improving both written and oral "communication" abilities.

MATH-109 Mathematics

CIVL-102 Mechanics
The basic concepts of statics as applied in the analysis of structures. Forces, moments, free body diagrams, trusses, frames, friction, centres of gravity, centroids and moments of inertia.

CIVL-103 Surveying

CIVL-105 Strength of Material
Stress, strain, temperature stress, Poisson's ratio, bolted and welded joints, thin walled pressure vessels, torsion; shear force and bending moment.

CIVL-106 Drafting
Principles of engineering drawing based on Canadian Standards Association Series in the field of drawing practice; instruments and their use; applied geometry; lettering, orthographic drawing and sketching; auxiliaries; normal and edge views; sections and conventions; dimensions, notes, working drawings; assigned projects.

PHYS-101 & PHYS 201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, duel and team sports.

ENGL-206 Specifications & Reports
Writing of letters, interdepartmental memorandums and reports. Interpretation of specifications as applied to Civil Technology and the preparing and writing of said specifications.

Standard forms; requisition, work orders, change orders, purchase orders, etc.

MATH-209 Mathematics
Geometry: Circle and parabola; 3-d geometry, points, planes, volumes,

Computer: Desk Top calculator, memory, programs.

Fortran IV: Arithmetic, integers, real numbers, write statement, I E and F fields, formats. IF and GO TO, DO and CONTINUE, DIMENSION, READ and data.

Calculus: Variables and constants, limits, "delta process", slope, derivatives, velocity and rates, maxima and minima, differentiation. Integration, indefinite and definite, areas, trapezoid rule, use of tables.

CIVL-202 Mechanics
The basic concepts of dynamics including motion of projectiles, work, energy and power. The application of graphical statics in the solution of frames and trusses and an introduction to fluid statics.
CIVL-203 Surveying
Cross-sectioning and calculation of areas and volumes. Methods of calculating simple, spiral and vertical curves. Special problems on curve computations. Methods of stadia. Plane table surveys. Legal surveys with regard to township layouts.

CIVL-205 Strength of Material
Bending moments and shear force diagrams. Flexure formula, general shear equation, beam design, combined stresses, Mohr’s circle, the three moment equation, deflections by the formula method, area moment method and the conjugate beam method.

CIVL-206 Drafting
Descriptive geometry. Drawing of structural steel frameworks and connections; reinforced concrete principles and drawing of structural concrete details; structural drafting including laminated construction, drawing of municipal structures using a sewer and water system.

MATH-310 Mathematics
Plane and solid geometry, proofs, definitions, deductions and application of propositions from Euclid’s elements. Application of geometry to plotting and surveying without angular instruments. Volumes of bodies bounded by plane, spherical, conical or cylindrical surfaces. Review of differential calculus, integral calculus, functions used in mathematical statements. Problems in arc length, areas, volumes, centroids, work, liquid pressure and moments of inertia.

CIVL-316 Photogrammetry

SURV-301 Forestry and Geology

SURV-303 Surveying
Hydrographic surveying, determination of shore line, methods of sounding, bottom sampling, plotting of soundings. Hydrographic maps. Obstruction surveying, field layout and level controls for bridges, buildings, water control structures and municipal utilities. Volume determination of earthwork quantities, cross-sectioning, borrow pits, stockpiles by the use of contours and grid systems. Underground surveying, mensuration. Emphasis on compiling and use of clear, neat, concise field notes.

SURV-304 Theory and Use of Instruments

SURV-306 Town Planning
CIVL-413 Job Control and Costing
Critical path method of planning and scheduling; network theory; project scheduling; advanced network techniques; resource allocation; visual presentation; project analysis; analysis of Critical Path reports; finance as related to the Critical Path; Applied industrial psychology.

SURV-403 Advanced Surveying

SURV-406 Legal Surveying

SURV-410 Astronomy and Spherical Trigonometry


Emphasis on compiling and use of clear, neat concise field notes.

SURV-416 Photogrammetry and Cartography

SURV-424 Hydrology
Hydraulics - Bernoulli's and continuity equation - flow measurements with weirs and flumes. Open channel flow including types, Manning equation, Froude numbers, specific head diagrams and their use in solving problems in open channels.

Hydrology-Collection and presentation of precipitation data; collection and presentation of runoff data; measuring discharge, stream gaging and graphical presentation of presenting runoff data. Peak discharge and flood runoff and forecasting with emphasis on unit hydrograph.

Field methods for taking sedimentation samples.
Computer Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.
The Computer, Electrical, Electronic and Instrumentation Technology programs are common in First Year. Students who originally register and successfully complete First Year of Computer Technology may transfer, at the beginning of Term III into Electrical or Instrumentation Technology. The Computer and Electronic Technology programs are common in Term III. Students who successfully complete Term III of Computer Technology may transfer, at the beginning of Term IV into Electronic Technology.

Fees and Expenses:
The tuition fee for the course in Computer Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The graduate in Computer Technology is a special kind of person. He must have an adequate and precise knowledge of electronic fundamentals, supplemented by an understanding of both the hardware and the software aspects of computer techniques. Such a person occupies a key and unique position. Trained to adapt engineering theory to industrial practice, he may find challenging job opportunities as a computer applications technologist with any of the industries using computers in process control, scientific application, data logging, numeric controlled machines or in areas of customer engineering.
# COURSE OUTLINE

## First Year

### TERM 1

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course</th>
<th>Lect.</th>
<th>Lab.</th>
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<tbody>
<tr>
<td>ENGL-101</td>
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<tr>
<td>MATH-102</td>
<td>Mathematics</td>
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<tr>
<td>RESC-103</td>
<td>Physics</td>
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<tr>
<td>ERIC-102</td>
<td>Electrical Fundamentals</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>ERIC-103</td>
<td>Basic Electrical Instruments</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ERIC-104</td>
<td>Engineering Drawing</td>
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<td>2</td>
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<tr>
<td>ERON-105</td>
<td>Electronic Techniques</td>
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<tr>
<td>PHYS-101</td>
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Total: 17 Lect., 14 Lab.

### TERM 2

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<th>Lab.</th>
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<tr>
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<tr>
<td>RESC-203</td>
<td>Chemical Physics</td>
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<td>ERIC-202</td>
<td>Electrical Fundamentals</td>
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<tr>
<td>ERIC-203</td>
<td>Basic Electrical Instruments</td>
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<tr>
<td>ERIC-204</td>
<td>Engineering Drawing</td>
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<tr>
<td>ERON-205</td>
<td>Electronic Techniques</td>
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<td>PHYS-201</td>
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Total: 17 Lect., 14 Lab.

## Second Year

### TERM 3

<table>
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<th>Course No.</th>
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<th>Lab.</th>
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<tbody>
<tr>
<td>MATH-304</td>
<td>Mathematics</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ERON-303</td>
<td>Electronic Circuits</td>
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<tr>
<td>ERON-304</td>
<td>Electronic Devices</td>
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<tr>
<td>ERON-306</td>
<td>Electronic Measurements</td>
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<tr>
<td>ERON-307</td>
<td>Control Systems</td>
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<tr>
<td>ERON-309</td>
<td>Pulse Circuits</td>
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<tr>
<td>ERON-312</td>
<td>Electromechanical Devices</td>
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Total: 13 Lect., 17 Lab.

### TERM 4

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<tr>
<td>MATH-404</td>
<td>Mathematics</td>
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<tr>
<td>ERON-403</td>
<td>Electronic Circuits and Fields</td>
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<td>ERON-404</td>
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<td>COMP-409</td>
<td>Computer Logic and Circuits</td>
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<tr>
<td>COMP-410</td>
<td>Computer Systems</td>
<td>3</td>
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</tbody>
</table>

Total: 14 Lect., 15 Lab.
COURSE DESCRIPTIONS

ENGL-101 Communication
Essentially a practical course aimed at improving the communication abilities of students; basic grammar; sentence structure; basic sentence faults; effective paragraphs.

MATH-102 Mathematics
Fundamental concepts, functions, graphs and trigonometry functions. Determinants, factors, quadratic. Logarithms and exponents, operator trigonometry graphs, identities and equations. Straight line and circle.

RESC-103 Physics
Statics, kinematics, dynamics energy, rotary motion, wave motion, electric fields and potential, magnetic fields, introduction to atomic structure.

ERIC-102 Electrical Fundamentals
Systems of units; charge, current, voltage, power and energy; electric and magnetic fields; Coulomb's Law; capacitive, inductive and resistive effects; Ohm's Law, Kirchoff's Laws, frequency, impedance; complex quantities; resonance.

ERIC-103 Basic Electrical Instruments
Principle and operation of the basic meter movement in DC and AC measurements; Comparison and null detection methods; Basic Wheatstone bridge and applications; AC bridge and impedance measurements; Magnetic fields, flux density, B-H curve and magnetic circuits.

ERIC-104 Engineering Drawing
Principles of engineering drawing based on Canadian standards, lettering; instruments and their uses; orthographic projection.

ERON-105 Electronic Techniques
Basic electronic communications systems: Concepts introduced through the study of the superheterodyne receiver, tube theory, components, circuit analysis, use of test equipment, alignment procedures, fault finding, etc.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual, and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-202 Mathematics
Differentiation of powers, products, sums trigonometry functions, logs and exponentials. Slope, velocity, maxima and minima. Integration, definite and indefinite, area under a curve.

RESC-203 Chemical Physics
Atomic structure, Bohr atom, light and atomic spectroscopy, solid state, bonding, crystals, electrochemistry, solid state topics, lasers, photoelectric, thermionic; Nuclear structure, radioactivity equations, detectors, accelerators.

ERIC-202 Electrical Fundamentals
Single phase and polyphase power systems; Measurement of three phase power; transformers: Vacuum tubes and single stage amplifier; Introduction to semi-conductor devices and transistors.
ERIC-203 Basic Electrical Instrument
Electronic measuring instruments including VTVM, TVM and CRO; electron ballistics and applications; AF and RF signal generators; Tube and transistor test.

ERIC-204 Engineering Drawing
Graphic symbols, size and proportions; block diagrams; signal flow; schematic elements; layout procedures; components and assemblies; complete schematic diagram interpretation with fully complicated schematic. Drawing a schematic diagram from an operational subassembly.

ERON-205 Electronic Techniques
Electronic system concept expanded through the study of the television receiver. Transmission and reception of picture information; Scanning and synchronization circuits; Video circuit analysis; Sweep alignment of R-F and I-F amplifiers; Introduction to color circuits.

MATH-304 Mathematics

ERON-303 Electronic Circuits
Kirchoff's Laws; loop and nodal analysis; circuit response in determinantal forms; circuits of electronic devices such as amplifiers and oscillators.

ERON-304 Electronic Devices
Semi-conductor amplifiers; cascaded R-C coupled amplifiers; pulse amplifiers; temperature compensation for transistor amplifiers; D.C. amplifiers; large signal amplifiers.

ERON-306 Electronic Measurements
Electronic measuring instruments; AF, RF, and UHF measuring techniques.

ERIC-207 Control Systems
Equations of physical systems; hydraulic pneumatic, mechanical and electrical, components of physical systems; transfer functions.

ERIC-309 Pulse Circuits
Linear waveshaping of RLC networks; switching characteristics of devices; clipping, clamping and comparator circuits; multivibrators; sampling gates; counting and timing.

ERON-312 Electromechanical Devices

MATH-404 Mathematics
Laplace transforms - waveforms; complex numbers, length, volumes, attraction, multiple integration. Boolean algebra and sets, convergence of series. Analytic, computer, binary arithmetic. FORTRAN IV programming.

ERON-403 Electronic Circuits and Fields
Transmission lines; parameters and equations; high frequency applications of transmission lines; guided electromagnetic waves; selected types in microwave antennas and propagation.

ERON-404 Electronic Devices
Oscillators; modulation and demodulation processes; microwave devices.

ERON-408 Electronic Projects
A project is required to be satisfactorily completed by all graduating students. This project is to include: (a) preliminary investigation, (b) practical work, (c) written report.
COMP-409 Computer Logic and Circuits

Number Systems; Coding; Integrated Logic Circuits; D-A and A-D Convertors; Counters; Arithmetic Units; Digital Readout Devices.

COMP-410 Computer Systems

Digital Computers; analog computers; hybrid computer systems; Selected Applications.
Electrical Technology

Entrance Requirements:

1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).

2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition, an entrance examination may be required before admission is considered.

3. Successful completion of the Pre-Technology Program.

Course Information:

TWO SCHOOL YEARS, each of ten months duration, lead to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

The Computer, Electrical, Electronic and Instrumentation Technology programs are common in First Year. Students who originally register and successfully complete First Year of Electrical Technology may transfer, at the beginning of Term III, into Computer, Electronic or Instrumentation Technology.

Fees and Expenses:

The tuition fee for the course in Electrical Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:

The graduate occupies a key and unique spot between the engineer and craftsman. Trained to adapt engineering theory to industrial practice, he is limited only by his personal horizon. Consulting engineers, manufacturers, power companies, government agencies, contractors and distributors are some of the groups offering employment in this dynamic and challenging field.
# COURSE OUTLINE

## First Year

**TERM 1**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>HOURS per WEEK</th>
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<td>ENGL-101</td>
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<td>ERIC-103</td>
<td>Basic Electrical Instruments</td>
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**TERM 2**

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## Second Year

**TERM 3**

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<th>COURSE</th>
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**TERM 4**

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<td>ERIC-418</td>
<td>Technical Research &amp; Report</td>
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Essentially a practical course aimed at improving the communication abilities of students; basic grammar; sentence structure, basic sentence faults; effective paragraphs.

MATH-102 Mathematics
Fundamental concepts, functions, graphs and trigonometry functions. Determinants, factors, quadratic. Logarithms and exponents, logarithmic and exponential functions, identities and equations. Straight line and circle.

RESC-103 Physics
Statics, kinematics, dynamics energy, rotary motion, wave motion, electric fields and potential, magnetic fields introduction to atomic structure.

ERIC-102 Electrical Fundamentals
Systems of units; charge, current, voltage, power and energy; electric and magnetic fields; Coulomb's Law; capacitive, inductive and resistive effects; Ohm's Law, Kirchhoff's Laws, frequency, impedance; complex quantities; resonance.

ERIC-103 Basic Electrical Instruments
Principle and operation of the basic meter movement in DC and AC measurements; Comparison and null detection methods; Basic Wheatstone bridge and applications; AC bridge and impedance measurements; Magnetic fields, flux density, B-H curve and magnetic circuits.

ERIC-104 Engineering Drawing
Principles of engineering drawing based on Canadian standards; lettering; instruments and their uses; orthographic projection.

ERN-105 Electronic Techniques
Basic electronic communications systems: Concepts introduced through the study of the super-hetodyne receiver, tube theory, components, circuit analysis, use of test equipment, alignment procedures, fault finding, etc.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual, and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-202 Mathematics
Differentiation of powers, products, sums, trigonometry functions, logs and exponentials. Slope, velocity, maxima and minima. Integration, definite and indefinite, area under a curve.

RESC-203 Chemical Physics
Atomic structure, Bohr atom, light and atomic spectroscopy, solid state, bonding, crystals, electrochemistry, solid state topics, lasers, photo-electric, thermionic; Nuclear structure, radioactivity equations, detectors, accelerators.

ERIC-202 Electrical Fundamentals
Single phase and polyphase power systems; Measurement of three phase power; transformers: Vacuum tubes and single stage amplifier; Introduction to semi-conductor devices and transistors.

ERIC-203 Basic Electrical Instruments
Electronic measuring instruments including VTVM, TVM and CRO; electronic ballistics and applications; AF and RF signal generators; Tube and transistor testers.
ERIC-204 Engineering Drawing

Graphic symbols, size and proportions; block diagrams; signal flow; schematic elements; layout procedures; components and assemblies; complete schematic diagram interpretation with fully complicated schematic. Drawing a schematic diagram from an operational subassembly.

ERVON-205 Electronic Techniques

Electronic system concept expanded through the study of the television receiver. Transmission and reception of picture information; Scanning and synchronization circuits; Video circuit analysis; Sweep alignment of R-F and I-F amplifiers: Introduction to color circuits.

MATH-304 Mathematics


ERIC-304 Electrical Circuits

Matrix methods of analysis; development of the circuit concept; equivalent sources; source transformations; transients in simple networks; application of the Laplace transform method to the solution of network problems; coupled circuits. Computer solutions.

ERIC-305 Electrical Machines

D.C. generators; D-C motors; 3-phase induction motors; synchronous machines.

ERIC-306 Digital & Computer Control Techniques

Measurement and control — primary sensing devices; modes of control; proportional, reset and rate; control combinations; digital logic and static control.

Binary numbering system; logical algebra; logic operations; AND, OR, NOT, NAND, NOR; truth tables; static control system examples.

Analog computers — analog simulation; summors; integrators; hardware mechanization; initial conditions; amplitude scaling; time; scaling.

Computers in Control Systems — concept of a digital computer; characteristics of a real-time system; input/output interfacing of control and recording devices; A-D and D-A conversion; process control by a real-time computer.

ERIC-308 Industrial Electronics

Vacuum and gas-filled tubes; amplifiers; power supplies — rectifiers, and filters; A-C. circuits for electronics; solid-state devices — diodes, tunnel diodes, zener diodes, SCR'S, SCS'S, etc.

ERIC-313 Electrical Measurements

Wave forms and AC meters — periodic wave-forms; form factor; rectifier instruments; thermocouple instruments; electrostatic voltmeter.

Power and Energy — Hall effect wattmeter; Thermal converter; polyphase power measurements; power factor meters; Fourier Analysis — Fourier Series; RMS value in terms of Fourier components.

Transformer concepts — equivalent circuits; polarity testing; exciting and inrush current; harmonics in three phase banks; parallel operation of transformers; auto transformers.

Instrument transformers — current transformers; potential transformers; standard burdens; accuracy classes; effect of C.T.'s and P.T.'s on metering.

ERIC-317 Electrical Practices and Design

Underwriters, CSA, and Canadian Electric Code; resistance and wire tables; basic circuits and devices; overcurrent devices; conductor selection; grounding; wiring methods and materials; motor conductor sizing and control.

Electrical design and layouts; wiring in hazardous locations; electrical heating; auxiliary systems; main distribution design.
MATH-404 Mathematics
Laplace transforms - waveforms; complex numbers, arc lengths, volumes, attraction, multiple integration. Boolean algebra and sets, convergence of series. Analogue computer, binary arithmetic FORTRAN IV programming.

ERIC-405 Electrical Machines
Single phase induction motors; fractional horsepower motors of various types; printed-circuit motors; electronic machine control.

ERIC-406 Control Systems
Linear systems; frequency response; feedback concepts; bode diagrams; stability, transfer functions; block diagram algebra; control system components; example systems.

ERIC-408 Industrial Electronics
Solid state devices continued from ERIC-308; photodiodes, photoresistors, photo transistors; Hall devices; transistors; AM and FM modulation; telemetry principles; transistor circuitry-amplifiers, oscillators, regulators, switching and logic circuits, etc.

ERIC-413 Electrical Measurements
Transmission line topics; analog telemetry systems; digital telemetry systems; power system grounding considerations; ground resistance measurements.

ERIC-414 Switchgear & Protection
Various types of switches; various types of relays; various types of circuit breakers; fault current calculations; protective devices.

ERIC-418 Technical Research and Report
A project is required to be satisfactorily completed by all graduating students. This project is to include: (a) preliminary investigation, (b) practical work, (c) written report.
Electronic Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

The Computer, Electrical, Electronic, and Instrumentation Technology programs are common in First Year. Students who originally register and successfully complete First Year of Electronics Technology may transfer, at the beginning of Term III into Electrical or Instrumentation Technology. The Computer and Electronic Technology programs are common in Term III. Students who successfully complete Term III of Electronic Technology may transfer, at the beginning of Term IV, into Computer Technology.

Fees and Expenses:
The tuition fee for the course in Electronic Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
The studious Electronic Technician is limited only by his personal horizon. There is a place in research and development with government agencies and industrial laboratories, in installation and maintenance with communications organizations, in design, in development and production with manufacturers, in technical sales and marketing with industrial distributing firms — there is, in fact, a place for the well qualified technician wherever electronics equipment is utilized.
## COURSE OUTLINE

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### Second Year

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RESC-103 Physics

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ERIC-104 Engineering Drawing

Principles of engineering drawing based on Canadian standards, lettering; instruments and their uses; orthographic projection.

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Atomic structure, Bohr atom, light and atomic spectroscopy, solid state, bonding, crystals, electrochemistry, solid state topics, lasers, photoelectric, thermionic; Nuclear structure, radioactivity equations, detectors, accelerators.

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Single phase and polyphase power systems; Measurement of three phase power; transformers: Vacuum tubes and single stage amplifier; Introduction to semiconductor devices and transistors.
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Electronic measuring instruments including VTVM, TVM and CRO; electron ballistics and applications; AF and RF signal generators; Tube and transistor testers.

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Graphic symbols, size and proportions; block diagrams; signal flow; schematic elements; layout procedures; components and assemblies; complete schematic diagram interpretation with fully complicated schematic. Drawing a schematic diagram from an operational sub-assembly.

ERON-205 Electronic Techniques
Electronic system concept expanded through the study of the television receiver. Transmission and reception of picture information. Scanning and synchronization circuits; Video circuit analysis; Sweep alignment of R-F and I-F amplifiers; Introduction to color circuits.

MATH-304 Mathematics

ERON-207 Control Systems
Equations of physical systems; hydraulic, pneumatic, mechanical and electrical, components of physical systems; transfer functions.

ERON-309 Pulse Circuits
Linear waveshaping of RLC networks; switching characteristics of devices; clipping, clamping and comparator circuits; multivibrators; sampling gates; counting and timing.

ERON-312 Electromechanical Devices

MATH-404 Mathematics
Laplace transforms-waveforms; complex numbers, arc lengths, volumes, attraction, multiple integration. Boolean algebra and sets convergence of series. Analogue computer, binary arithmetic. FORTRAN IV programming.

ERON-403 Electronic Circuits and Fields
Transmission lines; parameters and equations; high frequency applications of transmission lines; guided electromagnetic waves; selected types in microwave antenna and propagation.

ERON-404 Electronic Devices
Oscillators; modulation and demodulation processes; microwave devices.

ERON-407 Control Systems
Performance evaluation of proportional error, derivative and integral control systems; figures of merit, use of recorders, etc.
ERON-408 Electronic Projects

A project is required to be satisfactorily completed by all graduating students. This project is to include: (a) preliminary investigation, (b) practical work, (c) written report.

ERON-411 Communication Theory

Analysis of receivers and transmitters; single sideband; telemetry, radar and microwave communication systems.
Instrumentation Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
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The Computer, Electrical, Electronic and Instrumentation Technology programs are common in First Year. Students who originally register and successfully complete the first year of Instrumentation Technology may transfer, at the beginning of Term III into Computer, Electrical or Electronic Technology.

Fees and Expenses:
The tuition fee for the course in Instrumentation Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Employment Possibilities:
There are two main fields of employment. One is with firms who design, manufacture and sell engineering, laboratory, scientific and optical instruments; the other is in industries such as the chemical, petroleum refining, papermaking, electrical utility, atomic research and the air transport fields. Smaller numbers of technicians are in meteorology, geophysics and similar scientific fields.

Occupations in instrumentation are still emerging and there is considerable overlap between instrumentation, mechanical, chemical and electrical technologists. Consequently, duties will vary from industry to industry, and from company to company within the same industry. In general, technologists are involved in the design and modification of process control systems.
## COURSE OUTLINE

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<th>Course</th>
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<th>HOURS per WEEK</th>
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<td>INST-404</td>
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</table>
COURSE DESCRIPTIONS

ENGL-101 Communication
Essentially a practical course aimed at improving the communication abilities of students; basic grammar; sentence structure; basic sentence faults; effective paragraphs.

MATH-102 Mathematics
Fundamental concepts, functions, graphs and trigonometry functions. Determinants, factors, quadratic. Logarithms and exponents, j operator trigonometry graphs, identities and equations. Straight line and circle.

RESC-103 Physics
Statics, kinematics, dynamics energy, rotary motion, wave motion, electric fields and potential, magnetic fields, introduction to atomic structure.

ERIC-102 Electrical Fundamentals
Systems of units, charge; current; voltage; power; energy; electric and magnetic fields; Coulomb's Law; capacitive, inductive and resistive effects; Ohm's Law; Kirchhoff's Laws; frequency; impedance; complex quantities; resonance.

ERIC-103 Basic Electrical Instruments
Principle and operation of the basic meter movement in DC and AC measurements; Comparison and null detection methods; Basic Wheatstone bridge and applications; AC bridge and impedance measurements; Magnetic fields, flux density, B-H curve and magnetic circuits.

ERIC-104 Engineering Drawing
Principles of engineering drawing based on Canadian standards; lettering; instruments and their uses; orthographic projection.

ERON-105 Electronic Techniques
Basic electronic communications systems: Concepts introduced through the study of the superheterodyne receiver, tube theory, components, circuit analysis, use of test equipment, alignment procedures, fault finding, etc.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual, and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-202 Mathematics
Differentiation of powers, products, sums trigonometry functions, logs and exponentials. Slope, velocity, maxima and minima. Integration definite and indefinite, area under a curve.

RESC-203 Chemical Physics
Atomic structure, Bohr atom, light and atomic spectroscopy, solid state, bonding, crystals, electrochemistry, solid state topics, lasers, photoelectric, thermionic; Nuclear structure, radioactivity equations, detectors, accelerators.

ERIC-202 Electrical Fundamentals
Single phase and polyphase power systems; Measurement of three phase power; transformers: Vacuum tubes and single stage amplifier; Introduction to semi-conductor devices and transistors.
ERIC-203 Basic Electrical Instruments
Electronic measuring instruments including VTVM, TVM and CRO; electron ballistics and applications; AF and RF signal generators; Tube and transistor testers.

ERIC-204 Engineering Drawing
Graphic symbols, size and proportions; block diagrams; signal flow; schematic elements; layout procedures; components and assemblies; complete schematic diagram interpretation with fully complicated schematic. Drawing a schematic diagram from an operational subassembly.

ERIC-205 Electronic Techniques
Electronic system concept expanded through the study of the television receiver. Transmission and reception of picture information; Scanning and synchronization circuits; Video circuit analysis; Sweep alignment of R-F and I-F amplifiers: Introduction to color circuits.

MATH-305 Mathematics
Volumes; centroids; moments of inertia; Laplace transforms. Fortran programming; machine language programming; applications in design of orifice bore diameters, etc; programming for calibration of flow measuring devices; direct digital control.

ERIC-306 Digital & Computer Control Techniques
Binary numbering system; logical algebra; logic operations; AND, OR, NOT, NAND, NOR: truth tables; static control system examples.
Analog computers — analog simulation; summers; integrators; hardware mechanization; initial conditions; amplitude scaling; time.
Computers in Control Systems — concept of digital computer; characteristics of a real-time system; input/output interfacing of control and recording devices. A-D and D-A conversion, process control by a real-time computer.

ERIC-308 Industrial Electronics
Vacuum and gas-filled tubes; amplifiers; power supplies; rectifiers and filters; A.C. circuits for electronics; solid state devices - diodes, tunnel diodes, zener diodes, SCR's, SCS's, etc.

ERIC-317 Electrical Practices and Design
Underwriters, CSA, and Canadian Electrical Codes; resistance and wire tables; basic circuits and devices; overcurrent devices; conductor selection; grounding; wiring methods; motor conductor sizing; motor control.

INST-301 Fluid Mechanics
Concepts of pressure; manometers; laminar flow; turbulent flow; Bernoulli's Equation; flow losses in piping systems; orifice; flow nozzle; venturi; variable area flow meters; turbine flow meter; magnetic flow meter; target flow meter; mass flow measurement; control valves.

INST-302 Process Measurements
Temperature measurement — mechanical methods, thermocouples, resistance bulbs, pyrometers, transmitters, recorders, controllers.
Transducers - potentiometric, strain gage, LVDT, signal conditioners, data acquisition systems.

INST-304 Chemical Instrumentation
Introduction to optical methods of analysis; absorption of radiation; emission spectroscopy; analytical aspects of X-rays and electron beams; polarimetry; refractivity; dispersion; potentiometry; voltammetry and polarography.

ERIC-406 Control Systems
Open loop amplifiers; close loop amplifier; effects of feedback; stability; block diagram representation; block diagram algebra; Bode diagram building blocks; transmitting and error detecting components; synchro systems; phase sensitive demodulator; DC generator voltage regulating sys-
tem; the amplidyne; speed control; positional servo system digital positional system; suturable reactor furnace control system.

ERIC-408 Industrial Electronics
Solid state devices continued from ERON-308; photodiodes; photoresistors; Hall devices; AM and FM modulation; telemetry principles; transistor circuitry - amplifiers; oscillators; regulators; switching and logic circuits.

INST-401 Industrial Hydraulics
Hydraulic symbols; fluid power pumps and motors; hydraulic cylinders and rams; accumulators; reservoirs; filtration of hydraulic fluids; pressure control valves; flow control valves; directional control-valves; electrical devices for hydraulic circuits; servo systems; industrial hydraulic circuits; fluidics.

INST-402 Process Measurements
Measurement of pressure, level, humidity, specific gravity, viscosity.

Pneumatic and electrical indicators and recorders.

INST-403 Industrial Control Applications
Pneumatic and electrical control systems for pressure, level, flow, temperature, etc.; cascade control; telemetry; machinery controls; selection of instruments; applications in research, oil refineries, pulp and paper industry, cement plants, steelmaking, food processing.

INST-404 Chemical Instrumentation
Electrodeposition and coulometry; conductimetry; radioactivity; mass spectrometry; magnetic resonance spectroscopy; extraction analysis; chromatography; general considerations in analysis.

INST-405 Process Analysis
Open and closed loops; theory and application of basic modes of control - on-off, proportional reset, rate; response of control loop blocks; lag; dead time; controller adjustments; evaluation of system performance.
Heat and Power Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

Fees and Expenses:
The tuition fee for the course in Heat and Power Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Scope of Heat and Power Technology:
The Heat and Power Technology program at the Institute was developed to cover approximately one-half of the broad field of mechanical technology. It is a composite program, involving the sciences of heat transfer and mechanical power, and its aim is to make the students aware of the most efficient use of equipment in the building, construction, industrial, and mining fields. The graduates of this course will act as a liaison between the mechanical engineer and the craftsman.

Employment Possibilities:
Graduates have found employment in consulting engineering offices, plant engineering offices, rocket research facilities, atomic energy research facilities, in the sale and field installation of gasoline, diesel, and gas turbine equipment, and in technical sales generally. The graduates technical knowledge and design background is particularly adaptable to the heating, air conditioning, and refrigeration areas. Further work possibilities may be found in instrumentation, food processing, plastics, and in the gas and oil industry.
# COURSE OUTLINE

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<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>TERM 1</th>
<th>TERM 2</th>
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<td>HEPR-413</td>
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<td>HEPR-414</td>
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<td>HEPR-415</td>
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<td>HEPR-426</td>
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<td>HEPR-432</td>
<td>Plant Engineering</td>
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Fundamental concepts, functions, graphs and trigonometry functions. Determinants, factors, quadratic. Logarithms and exponents, j operator trigonometry graphs, identities and equations. Straight line and circle.

RESC-103 Physics
Statics, kinematics, dynamics energy, rotary motion, wave motion, electric fields and potential, magnetic fields, introduction to atomic structures.

MECH-102 Electrical Fundamentals
An introductory course dealing with the fundamentals of electricity, basic electrical units, batteries, principles of Direct Current, circuits, magnetism.

MECH-103 Manufacturing Processes
Shaping and planning, milling, broaching, boring, sawing, filing, grinding, measurement and inspection, machine shop practice, forming and time standards.

MECH-104 Mechanical Drafting
Principles of engineering drawing based on Canadian standards; lettering; instruments and their use; blueprint reading; geometrical drawing; pictorial representation; orthographic projections; sectional views, auxiliary views; isometric and other forms of pictorial drawings; dimensioning; special projects.

MECH-106 Management Methods
A general study of the procedures of industrial management; contracts and contract law; introduction to work study; specification and analysis of bids; the bid depository system for subtrades; introduction to accounting; corporation income tax; import duties; sales tax.

MECH-107 Industrial Materials
A general and detailed study of the properties of the materials of industry, including water and steam, industrial gases, ceramic and organic materials, steels, non-ferrous metals.

PHYS-101 & PHYS-201 Physical Education
The Physical Education program provides students with the opportunity to maintain a high level of physical fitness and to gain knowledge and experience in a wide variety of individual, dual, and team sports.

ENGL-201 Report Writing
This course familiarizes the student with technical writing and the types of reports, business letters and memorandums he is likely to encounter in industry.

MATH-202 Mathematics
Algebra, algebraic and trigonometric equations; curve plotting; conic sections; differentiation and integration.

RESC-203 Chemical Physics
Atomic structure, Bohr atom, light and atomic spectroscopy, solid state, bonding, crystals, electrochemistry, solid state topics, lasers, photoelectric, thermionic; Nuclear structure, radioactivity equations, detectors, accelerators.
MECH-204 Applied Mechanics

Statics; force and vectors, resolution of forces, free body diagram, equilibrium, simple frames, laws of dry friction, first and second moments of area.

Dynamics; rectilinear and circular motion, force, motion and mass moment of inertia, work, energy and momentum.

MECH-206 Industrial Electronics

Fundamentals of electronics including such topics as: vacuum tubes, power supplies, amplifiers, oscillators, relays, timers, electronic measurement, fundamentals of electronic control.

MECH-207 Production Welding

A study of the basic physics of the welding processes and influence of material properties on quality. The course emphasizes MIG, TIG, submerged arc, and resistance welding methods, welding power supplies, the effects of heat in the fusion zone, heat treating, together with destructive and non-destructive testing methods, and metallurgical examination.

MECH-208 Stress Analysis

Poisson’s ratio, stress strain relationship, temperature stresses, pressure cylinders, torsion, welded joints, torque, shear and bending; simply supported beams, design of beams, columns, selection of suitable sections for beams and columns; tensile, fatigue, hardness, impact and experimental stress analysis.

MATH-304 Mathematics

Differential and integral calculus; rates of change, maxima and minima; curve tracing; arc lengths, areas, volumes, centroids, moments of inertia.

MECH-309 Work Study

Methods study, motion study, work sampling, work measurement, case studies, report writing, cost analysis, productivity, work-
MECH-405 Automation
A course of study in the design of complete automation systems using electrical, pneumatic, and oil hydraulic components. Simple types of “Detroit” automation are studied, together with aspects of numerical control and electronic data processing.

MECH-407 Technical Research and Report
A technical research involving library investigation, practical work and field investigation.

HEPR-413 Heating and Ventilation
A continuation of Course HEPR-313 with air duct design; equipment selection; air conditioning systems; control systems; air distribution; hand tools in sheet metal; metal allowances; types of seams; dampers; grilles; fans.

HEPR-414 Refrigeration
Simple refrigeration cycles; refrigerants and their properties; compressors; condensers; expansion valves; evaporators; auxiliary equipment.

HEPR-415 Internal Combustion Engines
A course covering the operation of spark ignition and compression ignition engines including; engine components; air cycle approximation; fuel-air cycle approximation (using charts); actual engine cycle; engine friction; detonation; air capacity; carburetors.

HEPR-421 Machine Design
A continuation of course MECH-321 for bearings; screw fastenings; springs; spur gears; helical gears.

HEPR-426 Thermodynamics
A continuation of course HEPR-326 including analysis of vapor and gas power cycles; performances of steam turbines; IC. engines and steam generators; refrigeration; nozzle theory; introduction of heat transfer.

HEPR-432 Plant Engineering
A general study of the mechanical and electrical services of buildings. Electric motors, pumps, fans, lighting, electrical, plumbing, sprinkler systems, feed water treatment.
Production Technology

Entrance Requirements:
1. Grade XII standing with demonstrated proficiency in English, Mathematics and the Physical Sciences (i.e. chemistry and physics).
2. Mature Students - The candidate must be at least 21 years of age in the calendar year of registration and have a complete Manitoba Grade XI (300 or 301 subjects) or equivalent. In addition an entrance examination may be required before admission is considered.
3. Successful completion of the Pre-Technology Program.

Course Information:
TWO SCHOOL YEARS, each of ten months duration, leads to a Diploma in Technology (Dipl. T.). Each of the ten month periods is divided into two equal terms with final examinations written at the end of each term.

Fees and Expenses:
The tuition fee for the course in Production Technology is $100.00 for each of the four terms. Other expenses include textbooks, incidentals, board and lodging.

Scope of Production Technology:
Production technology is the science of planning and controlling the manufacture of consumer, industrial, military, and scientific products to required specifications at minimum cost. The relative efficiency of the production industry determines the standard of living of any nation, and the development of a better manufacturing industry is being stressed by economists and government planners in Canada, and especially in Manitoba.

Employment Possibilities:
The practitioner in the production field requires a comprehensive knowledge of business administration, report writing, industrial materials, design, automation, machinery, and manufacturing processes. Previous graduates have become established in nuclear power, X-ray radiography, product design, plant management, work study, production control, welding technology, industrial marketing, customer liaison, materials technology, in the aerospace industry and a wide spectrum of other responsibilities.
# COURSE OUTLINE

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<td>PROD-302</td>
<td>Metallurgy</td>
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<td>PROD-312</td>
<td>Non-Destructive Testing</td>
<td>1 2</td>
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Differential and integral calculus; rates of change, maxima and minima; curve tracing; arc lengths, areas, volumes, centroids, moments of inertia.

MECH-309 Work Study & C.P.M.
Methods study, motion study, work sampling, work measurement, case studies, report writing, cost analysis, productivity, working conditions, network theory, project scheduling, job overlap, critical path, float, manpower allocation, schedule compression, advanced network techniques and project analysis.

MECH-315 Industrial Fluid Mechanics
Fluid statics, Bernoulli's equation, flow devices, hydrodynamics. Reynolds number, viscosity, flow losses, compressible flow pumps and fans.

MECH-321 Machine Design
Application of strength of materials to mechanical design; simple stress analysis; materials and their properties; variable loads and stress concentrations; couplings; brakes.

PROD-302 Metallurgy
Mechanical and non-destructive tests, macro examination of metals, micro examinations, solidification of metals, phase diagrams and their interpretation, iron and carbon steel, heat treatment of steel, alloy steels, cast iron, light alloys, miscellaneous non-ferrous alloys, corrosion phenomena, high temperature alloys, metallurgical aspects of metal joining.

PROD-312 Non-Destructive Testing
Licensing of NDT technicians, flaws and their detection, zero defect programs, photography and its principles, ultrasonic flaw detection by longitudinal, shear, and surface waves, calibration of ultrasonic transducer shoes, dye penetrants and leak testing, magnafux, eddy current testing, theory and practice of radiography with tube and gamma camera.

PROD-331 Tool Design
Elastic and plastic bending, design for deformation in tooling, residual and fatigue stress, electric resistance strain gauge techniques, die sets, punches, dies, strippers and accessories for piercing, blanking, and bending, stock material layouts for presswork, presses, tolerances, principal stresses and strain gauge rosettes.
MATH-427 Statistics and Quality Control

Introduction to statistics as related to quality control; history, definition, statistical quality control training programs; frequency distributions, graphs of frequency distributions, the calculations of range, arithmetic mean, median, mode, variance, and standard deviation; probability distributions: the binomial distribution, the Poisson distribution, and the normal distribution; curve fitting; the method of least squares, inferences based on the least-squares estimators. Probability: introduction, definitions of probability, the addition and multiplication theorems. Permutations and combinations.

MECH-405 Automation

A course of study in the design of complete automation systems using electrical, pneumatic, and oil hydraulic components. Simple types of “Detroit” automation are studied, together with aspects of numerical control and electronic data processing.

MECH-407 Technical Research and Report

A technical research involving library investigation, practical work and field investigation.

PROD-403 Advanced Manufacturing Processes

Induction heating methods and design of induction heating coils, automatic welding setups and welding positioners for the welding of mild steel, stainless, and aluminum, machineability and the free-cutting metals, tooling and production in single and multiple spindle automatic lathes, precision grinding, distortion and distortion control in heat-treating, metal cleaning, finishing, and plating, programming for numerically-controlled machine tools using word address and tab sequential methods, optical comparator methods, and surface roughness recording and analysis.

PROD-411 Production Planning & Layout

The shop and office organization of job and production work in manufacturing, including the principals and procedures of paper systems, material handling, equipment, inventory management and procurement, process planning, estimating, scheduling, plant loading, dispatching, controlling, design of unit loads, shipping and receiving, transportation, work station design, general plant layout, material flow, packaging, analysis, special handling problems, cost analysis, learning curves. Organization charts, linear programming, and economic lot sizes.

PROD-429 Accounting

Double entry bookkeeping, adjustment of trial balances, preparation of financial and manufacturing statements. Cost accounting records; material control, labour and overhead distribution; job order, process and standard costs. Mathematics applied to business problems. Basic principles of economics including economic aims, the theory of prices and production output by business firms under various degrees of competition.

PROD-430 Management Studies

A study of industrial marketing and human relations in industry, including communication, motivation and labour relations.
Medical Programs
Medical Laboratory Technology

A program of training for Medical Laboratory Technologists has been developed by many of the larger hospitals and the Provincial Laboratories of Manitoba in conjunction with the Manitoba Institute of Technology.

Entrance Requirements:

The recommended entrance requirements for students entering the Medical Laboratory program are:

A Grade XII standing with English 300 or 301, Mathematics 300 or 301, Chemistry 300 or Physical Science 301, and one of Biology 300, Biology 301, or Physics 300, plus any other 300 or 301 electives to give a complete Manitoba Grade XII standing.

Note: Applications and enquiries with respect to admission requirements from prospective students (male and female) should be made to any of the hospitals approved by the Canadian Society of Laboratory Technologists for student training, or to the Department of Health. These training areas exercise the responsibility as to students acceptance into this program; therefore, DO NOT APPLY TO THE MANITOBA INSTITUTE OF TECHNOLOGY.

TRAINING HOSPITALS:

Brandon General Hospital, Brandon, Manitoba.

Deer Lodge Hospital (D.V.A.) Portage & Woodlawn, Winnipeg 12, Manitoba.

Department of Health School, 304 Norquay Building, Winnipeg 1, Manitoba.

Grace Hospital, 300 Booth Drive, Winnipeg 12, Man.

Misericordia General Hospital, 99 Cornish Avenue, Winnipeg 1, Manitoba.

St. Boniface General Hospital, 409 Tache Avenue, St. Boniface 6, Manitoba.

Winnipeg General Hospital, 700 William Avenue, Winnipeg 3, Manitoba.
Length of Course:
The training program is divided into two parts:
1. Nine months training is given at the Manitoba Institute of Technology.
2. A minimum of at least 1 year apprenticeship training is given at one of the approved Hospital Training Schools.
   Total length of Course — approximately 21 months.

*Tuition Fee:
$180.00 for nine months at the Manitoba Institute of Technology.

Note: *
See Page 18 for details re: Training Allowances.

Employment Possibilities:
Satisfactory completion of training qualifies the student to write registration examinations with the Canadian Society of Laboratory Technologists. Successful Candidates will be awarded a certificate (R.T.) which is recognized anywhere in Canada.

Further training and experience can lead to advanced certification with the C.S.L.T. There is a great demand for registered Medical Laboratory Technologists in hospital laboratories, medical clinics, research projects and some commercial companies.

COURSE OUTLINE

<table>
<thead>
<tr>
<th>Course No.</th>
<th>COURSE</th>
<th>TERM 1</th>
<th>HOURS per WEEK</th>
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<tr>
<td></td>
<td></td>
<td>Lect.</td>
<td>Lab.</td>
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<td>MEDL-101</td>
<td>Anatomy and Physiology</td>
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<td>MEDL-103</td>
<td>Clinical Chemistry</td>
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<td>MEDL-104</td>
<td>Haematology</td>
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<tr>
<td>MEDL-106</td>
<td>Blood Bank Serology</td>
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</tr>
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11 20
**COURSE DESCRIPTIONS**

**MEDL-101 & MEDL-201 Anatomy & Physiology**

Cell structure and physiology; anatomy of benign and malignant tumors; urinary, gastro-intestinal, respiratory, circulatory, and reproductive systems, nervous, and endocrine systems.

**MEDL-102 & MEDL-202 Clinical Microbiology & Immunology**

Principles and practice of aseptic techniques; the isolation and identification of common bacteria, parasites and fungi. Preparation of stains, media and the operation of equipment used. Basic principles of immunology and serology.

**MEDL-103 & MEDL-203 Clinical Chemistry**

Biochemical analyses of blood and other biological fluids related to diseases, e.g. Kidney function and liver function tests, enzyme studies, body fluid electrolyte balance studies. Basic instrumentation — photoelectric colorimeters, spectrophotometers, autoanalyzer, flame photometer, pH meters, microgasometer, and analytical balances.

**MEDL-104 & MEDL-204 Haematology**

The science of the blood, its nature, functions and diseases.

**MEDL-105 & MEDL-205 Histology**

Preparation of solutions and stains; basic principles of fixation, dehydration, clearing and embedding of tissue. Procedures for cutting and staining paraffin sections. Special staining procedures for — connective tissue, elastic fibres, fat, micro-organisms and haemosidern.

**MEDL-106 & MEDL-206 Blood Bank Serology**

**Medical Radiological Technology**

(X-Ray, Nuclear Medicine & Therapy Technicians)

**Entrance Requirements:**

Complete Manitoba grade XII standing with demonstrated proficiency in English, Mathematics, Physics, or Physical Science. This to be effective July 1st, 1969. Further, Biology 300 will be accepted in lieu of physics for students completing grade XII up to and including September 1st, 1969.

The applicant must be 18 years of age, in robust health, ambitious, of pleasing personality, and be interested in, and sympathetic with, persons who are ill or disabled.

**Entrance Dates:**

Two classes will be accepted at the Institute each year, the first in September and the second in January.

**Applications For Admission:**

Apply directly to the "Radiological Technician Training Program" at any of the Hospitals or Institutions operating training programs. These training hospitals or institutions exercise the responsibility as to student acceptance into this program, therefore, DO NOT APPLY TO THE MANITOBA INSTITUTE OF TECHNOLOGY.
Length and Type of Course:
Two years — leads to a diploma as a registered Technician (R.T.) in the Canadian Society of Radiological Technicians.

After commencing training, the student may be transferred to the Manitoba Institute of Technology where intensive lectures and demonstrations are given. This is followed by examinations which, if satisfactory, allow the student to return to his or her hospital to spend the balance of the two-year training period gaining practical experience under close supervision of the x-ray or radiotherapy department.

The probation period may extend from 3 to 6 months, depending upon the training hospital. The hospitals have the authority to recommend that the students write the qualifying examinations of the Canadian Society of Radiological Technicians. At the end of a two year period, the student writes the examination leading to a Diploma as Registered Radiological Technician (R.T.R.), Registered Radiotherapy Technician (R.T.T.) or Registered Nuclear Medicine Technician (R.T.N.M.)

Tuition Fee:
The tuition fee is $80.00 for the term at the Manitoba Institute of Technology. Other expenses include books, incidentals, board and lodging.

Expenses:
No living quarters are provided at M.I.T.

A student allowance is paid by the hospital for the time spent in the hospital. No pay is given during the time spent away from the Hospital at the Institute.

Students demonstrating a need for financial assistance during the time at M.I.T. will be able to negotiate a formal loan from their hospital upon agreement to repay from subsequent allowances or otherwise.

Employment Possibilities:
The employment possibilities are in Radiographic, therapeutic and radioisotope departments in large general hospitals in most cities in Canada, U.S.A., Great Britain and Australia.

Some technicians are employed as technical advisors and representatives for X-Ray equipment and supply manufacturers. Others are engaged in aspects of teaching or research.

The R.T. Diploma is recognized across Canada and in the U.S.A., Great Britain and Australia.
DIAGNOSTIC TECHNIQUES:

Brandon General Hospital,
Brandon, Manitoba.

Children's Hospital of Winnipeg,
685 Bannatyne Avenue,
Winnipeg 3, Manitoba.

Department of Health School,
304 Norquay Building,
Winnipeg 1, Manitoba.

Grace Hospital,
300 Booth Drive,
Winnipeg 12, Manitoba.

Misericordia General Hospital,
99 Cornish Avenue,
Winnipeg 1, Manitoba.

St. Boniface General Hospital,
409 Tache Avenue,
St. Boniface 6, Manitoba.

Victoria General Hospital,
424 River Avenue,
Winnipeg 13, Manitoba.

Winnipeg General Hospital,
700 William Avenue,
Winnipeg 3, Manitoba.

NUCLEAR MEDICINE AND THERAPEUTIC TECHNIQUES:

Manitoba Cancer Treatment & Research Foundation,
700 Bannatyne Avenue,
Winnipeg 3, Manitoba.

Radiotherapy Department,
St. Boniface General Hospital,
409 Tache Avenue,
St. Boniface 6, Manitoba.
COURSE OUTLINE

The following syllabus is approved by the Canadian Society of Radiological Technicians in co-operation with the Canadian Association of Radiologists.

The class hours designated for each of the following subjects are:

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<tr>
<th>Course No.</th>
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<tr>
<td>MEDR-109</td>
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<td>Physics of Electricity &amp; Magnetism</td>
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<td>30</td>
</tr>
<tr>
<td>MEDR-111</td>
<td>Radiation Physics &amp; Protection</td>
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</tr>
<tr>
<td>MEDR-112</td>
<td>Apparatus &amp; Accessory Equipment</td>
<td>60</td>
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<tr>
<td>MEDR-113</td>
<td>Image Recording in Radiography</td>
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<td>22</td>
</tr>
<tr>
<td>MEDR-114</td>
<td>Radiographic Positioning</td>
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</tbody>
</table>

COURSE DESCRIPTIONS

MEDR-108 Introductory

History of radiology development; history of registered radiological technician; departmental administration.

MEDR-109 Anatomy, Physiology and Pathology

Classification of bones. Bone description of: upper extremity — shoulder, arm, forearm, wrist, and hand; lower extremity — thigh, leg, foot, pelvic girdle; vertebrae, cervical, thoracic lumbar, sacral, coccygeal; ribs and sternum; skull and facial bones. Description of digestive system and accessory organs; respiratory system; circulatory system; urogenital system; lymphatic system; nervous system; endocrine system. Short discussion of pathology most often occurring in each area.

MEDR-110 Physics of Electricity and Magnetism

Elementary theory of magnets, magnetic fields, inverse square law, electrification by friction, properties of conductors and insulators, electromagnetics. Elementary discussion of atomic theory of matter. Electric currents and circuits, Ohm’s Law, electromagnets, ammeters, voltmeters, fuses and circuit breakers, measurement of electric power, principles of transformers. Discussion of electromagnetic spectrum x-rays, scattered radiation, detection of x-radiation, units of quantity, quality of x-ray beam.

MEDR-111 Radiation Physics and Protection

MEDR-112 Apparatus & Accessory Equipment

Distribution of electric power, transformers, types of rectification, x-ray tube, history and development, focal spot size and cooling charts. Instruments for control of time, K.V.P. and M.A., grids, diaphragms, cones and collimators, viewing devices, filters, spot film devices, stereoscopy image amplification, photo fluorography, body section radiography.

MEDR-113 Image Recording in Radiography


The four basic factors in photographic effect. Technical terms used to describe the quality of radiographs and how they may be varied. Conditions influencing variations in exposure technique, identification systems.

MEDR-114 Radiographic Positioning

Positioning techniques for the various anatomical divisions (see under Anatomy and Physiology).
Courses in...

Medical Laboratory and Radiological Technologies

The Provincial Department of Health and Social Services has programs for providing full training for students in either Medical Laboratory or Radiological Technology leading to the R. T. in either the Canadian Society of Laboratory Technologists or the Canadian Society of Radiological Technicians. (See accounts of separate courses elsewhere in this calendar). In addition, students taking full training in one technology are required to take an Assistant’s course in the other Technology.

Entrance Requirements:

Entrance requirements are those of the technology in which full training is taken, and these are listed elsewhere in this calendar.

See page 113 for entrance requirements for Medical Laboratory Technology.

See page 117 for entrance requirements for Radiological Technology.

Length of Course:

Radiology RT and Laboratory Assistant Course

Twenty-four months as a student, made up of a six-month Laboratory Assistant Course and 18 months studentship in Radiology (2 months orientation; 4 months at the Manitoba Institute of Technology; 1 month at the Portage X-Ray School; 9 months in Lab & X-Ray Units and 2 months in Winnipeg X-Ray Clinics). At the end of this student training, he is taken on staff and serves a further 6 months training on-the-job. After this training, the student is eligible to write the R. T. examination of the Canadian Society of Radiological Technicians.
Laboratory R. T. and Radiology Assistant Course

Twenty-four months as a student, made up of six months Radiology Assistants training followed by 18 months Laboratory training (9 months at the Manitoba Institute of Technology and 9 months in a Hospital Laboratory).

After this training the student is eligible to write the R. T. examination of the Canadian Society of Laboratory Technologists.

Financial Assistance:

A bursary of $100.00 a month is provided during the first year of training and $120.00 a month during the second year. Graduates are required to accept employment with the Manitoba Government or in Rural Manitoba for a period equal to the length of training. Tuition fees are paid, and an allowance for textbooks and uniforms is made.

Accommodation:

Students are responsible for their own room and board throughout the training period. The Manitoba Institute of Technology keeps a registry of known accommodations suitable to students. Similarly the Department of Health and Social Services knows of accommodation usually available in this field.

Employment:

There are unlimited opportunities in this rapidly expanding field in provincial laboratory and x-ray units, and in hospitals and medical clinics throughout Manitoba. Canadian Certification in these two fields is widely recognized in all the provinces and other countries including most U.S.A. States, and the British Commonwealth.

Salary:

The present salary range for certified technologists in provincial institutions is $375.00 - $725.00 per month.
For Additional Information Contact:

Training and Bursary Registrar, Manitoba Department of Health and Social Services, 304 Norquay Building, Winnipeg 1, Manitoba.

Cadham Public Health Laboratory, Medical College Building, Emily and Bannatyne, Winnipeg 3, Manitoba.

Laboratory, Hospital for Mental Diseases, Brandon, Manitoba.

Laboratory and X-Ray Services, P.O. Box 24, Portage la Prairie, Manitoba.

Laboratory and X-Ray Unit Headquarters at:

Birtle - Shoal Lake Laboratory and X-Ray Unit,
Birtle District Hospital,
Birtle, Manitoba.

Dauphin Laboratory and X-Ray Unit,
Dauphin General Hospital,
Dauphin, Manitoba.

Neepawa Laboratory and X-Ray Unit,
Neepawa District Hospital,
Neepawa, Manitoba.

Portage Laboratory and X-Ray Unit,
Portage la Prairie General Hospital,
Portage la Prairie, Manitoba.

Selkirk Laboratory and X-Ray Unit,
Selkirk General Hospital,
Selkirk, Manitoba.

Southwest Laboratory and X-Ray Unit,
Killarney and District Hospital,
Killarney, Manitoba.

Swan Valley Laboratory and X-Ray Unit,
Swan Valley District Hospital,
Swan River, Manitoba.

Virden Laboratory and X-Ray Unit,
Virden District Hospital,
Virden, Manitoba.