

PROGRAM INFORMATION

Academic Year	2024 - 2025
Credential	Advanced Diploma
Program Delivery	Full - Time
Duration	3 years
Length	6 Semesters
Program Code	W123 (PC) – Timmins Campus

DESCRIPTION

Solve today's problems while spearheading solutions for tomorrow.

Northern's advanced diploma in Mechanical Engineering Technology will give you an edge in the workplace — and set the stage for continuing studies at the university level. After two years of the Mechanical Engineering Technician program, by year three you'll specialize in machine design, manufacturing methods, process control, advanced fluid mechanics, thermodynamics, and heat transfer.

You'll get extensive hands-on training in a modern manufacturing lab complete with the latest scanners, printers, mills and lathes. You'll learn how to select, design, install, maintain, program and troubleshoot modern industrial mechanical components and systems. You'll graduate with the high-octane skills required to design, plan and coordinate full-scale mechanical engineering projects.

The first two years of the Mechanical Engineering Technology program is identical to the Mechanical Engineering Technician Program offered at Northern College. Students who are interested in designing, planning and coordinating mechanical engineering projects continue their studies for an additional year. They will acquire a greater depth of training and knowledge in strength of materials, manufacturing methods, advanced fluid mechanics, thermodynamics & heat transfer, process control, and machine design.

Students receive extensive hands-on instruction in a modern manufacturing lab with CNC mills, CNC lathes, CMM, 3D scanners, and a range of 3D printing technologies. They learn how to select, design, install, maintain, program, and troubleshoot modern industrial mechanical components and systems.

CAREER OPPORTUNITIES

Northern College graduates are currently employed by consulting engineering firms, manufacturing & processing companies, public institutions, and government departments in a wide range of industries including mining, oil & gas, forestry, automotive, and construction.

VOCATIONAL LEARNING OUTCOMES

1. Monitor compliance with current legislation, standards, regulations, and guidelines.
2. Plan, co-ordinate, implement and evaluate quality control and quality assurance procedures to meet organizational standards and requirements.
3. Monitor and encourage compliance with current health and safety legislation, as well as organizational practices and procedures.
4. Develop and apply sustainability best practices in workplaces.
5. Use current and emerging technologies to implement mechanical engineering projects.
6. Analyze and solve complex mechanical problems by applying mathematics and fundamentals of mechanical engineering.
7. Prepare, analyze, evaluate and modify mechanical engineering drawings and other related technical documents.
8. Design and analyze mechanical components, processes and systems by applying fundamentals of mechanical engineering.
9. Design, manufacture and maintain mechanical components according to required specifications.
10. Establish and verify the specifications of materials, processes and operations for the design and production of mechanical components.
11. Plan, implement and evaluate projects by applying project management principles.
12. Develop strategies for ongoing personal and professional development to enhance work performance.
13. Apply business principles to design and engineering practices.

PROGRAM COURSES

The following reflects the planned course sequence for full-time offerings of the program. Programs at Northern College are delivered using a variety of instruction modes. Courses may be offered in the classroom or lab, entirely online, or in a hybrid mode which combines classroom sessions with virtual learning activities.

Semester 1		Hours
CM1323	Professional Communications	42
GN1033	Health and Safety	42
IT1024	Introduction to Physics	56
MA1100	Mathematics I	56
ME1014	Geometric Dimensioning and Tolerancing	56
MM1002	Millwright Machining I	28
MM3003	Industrial Indoctrination	42
 Semester 2		
AR2014	Statics	56
CM2303	Communications for the Workplace	42
GN1443	Indigenous Culture and Awareness	42
IN1224	Computer Aided Drafting (CAD) I	56
MA2104	Mathematics II	56
ME3003	Electrical and Electronics Fundamentals	42
MM1275	Millwright Machining II	28
 Semester 3		
	General Education Elective	42
IN3263	Embedded Programming and Networks	42
MA3205	Mathematics III with Calculus	70
ME2014	Mechanical Design and Computer Aided Design II	56
ME3013	Fluid Mechanics	42
WE3044	Strength of Materials I	56
 Semester 4		
	General Education Elective	42
MA6023	Statistics	42
ME3004	Energy Systems I	56
ME3044	Manufacturing Processes I	56
ME3204	Dynamics	56
ME4013	HVAC	42
ME4044	Mechanical Design and Computer Aided Design III	42
 Semester 5		
MA5005	Calculus II	70
ME5002	Mechanical Lab I	28
ME5004	Engineering Operations and Management	56
ME5023	Advanced Fluid Mechanics	42

ME5033	Research Project I	42
ME5213	Advanced Dynamics	42

Semester 6

ME6003	Advanced Strength of Materials	42
ME6004	Advanced Dynamics of Machines	42
ME6013	Applied Thermodynamics and Heat Transfer	28
ME6014	Research Project II	56
ME6023	Mechanical Lab II	42
ME6033	Metrology and Quality Control	42
ME6043	Machine Design	42

PROGRAM PROGRESSION

The following reflects the planned progression for full-time offerings of the program.

Fall Intake

- Sem 1: Fall 2024
- Sem 2: Winter 2025
- Sem 3: Fall 2025
- Sem 4: Winter 2026
- Sem 5: Fall 2026
- Sem 6: Winter 2027

WORK INTEGRATED LEARNING OPPORTUNITIES

N/A

ARTICULATION/TRANSFER AGREEMENTS

A number of articulation agreements have been negotiated with universities and other institutions across Canada, North America and internationally. These agreements are assessed, revised and updated on a regular basis. Please contact the program coordinator for specific details if you are interested in pursuing such an option. Additional information can be found at [Articulation Agreements](#).

ADDITIONAL INFORMATION

N/A

PROGRAM SPECIFIC REQUIREMENTS

N/A

ADMISSION REQUIREMENTS

- Ontario Secondary School Diploma (OSSD)
- Grade 12 English (C, U)
- Grade 12 Math (C, U) (MCT4C preferred; MAP4C is accepted with a minimum GPA of 60%)
- Grade 12 Physics (C, U) recommended
- Or equivalent

Academic prerequisites for this program may be obtained free of charge through [Academic Upgrading](#). Applicants who do not have a high school diploma or equivalent and will have reached the age of 19 years on or before the start of the program must undergo academic testing and may be required to complete [Prior Learning Assessment & Recognition \(PLAR\)](#) process to demonstrate equivalency of admission requirements prior to admission into a program. For more details, please contact the Admissions Office at 705-235-7222 or admissions@northern.on.ca.

Additional Requirements for International Students

In addition to the general admission requirements, international students must have proof of English Proficiency and meet the requirements below.

1. Proof of Senior High School Diploma/Certificate
2. English Proficiency (we will require one of the following):
 - IELTS Academic International English Language Testing System: a minimum overall score of 6.0 must be achieved with no individual band score under 6.0; however, we will accept one band at 5.5.
 - TOEFL (Test of English as a Foreign Language) – Internet Based Test (iBT) overall minimum score of 79
 - PTE (Pearson Test of English) Academic – Graduate Diploma: 58+

If your country of citizenship has English as its official language, we may accept alternate proof of English Proficiency. All educational documents must be submitted in English and will be dependent on the country of citizenship. For more information, please contact admissions@northern.on.ca.

GRADUATION REQUIREMENTS

- 34 Program Courses
- 2 Communications Courses
- 4 General Education Courses

GRADUATION ELIGIBILITY

To graduate from this program, a student must attain a minimum of 60% or a letter grade of CR (Credit) in each course in each semester unless otherwise stated on the course outline. Students should consult departmental policies and manuals for additional detail and exceptions.

GRADUATION WINDOW

Students unable to adhere to the program duration of two years (as stated above) may take a maximum of four years to complete their credential. After this time, students must be re-admitted into the program, and follow the curriculum in place at the time of re-admission.

CONTACT INFORMATION

For questions about being admitted into the program, please contact Northern College Admissions at admissions@northern.on.ca or by phone at 705-235-3211 ext. 7222. For questions about the content of the program, contact the Program Coordinator.

Tina Thibault-Lambert, Program Coordinator
Tel: 705-235-3211 ext. 2298
Email: lambertt@northern.on.ca

COURSE DESCRIPTIONS

Semester 1

CM1323 Professional Communications

In this course, students will learn essential skills for success in college and the workplace. This course focuses on developing and strengthening oral and written communication skills, and critical thinking ability. During this course, students will engage in a variety of forms of communication with a focus on upholding the principles of academic integrity. Students will develop the skills necessary to create discipline-specific documents, practice business etiquette and professionalism, and apply critical thinking strategies to practical scenarios. Upon successful completion of this course, students will be able to plan and draft concise, coherent and well-organized writing assignments that are tailored to specific audiences and purposes.

GN1033 Health and Safety

This course introduces the student to health and safety in their home, in society and within an occupational setting. Students learn about the social and personal benefits of safe work practices and the methods to best prevent accidents or injuries. Students will review the role, right and responsibilities of an individual in today's health and safety conscious world. Students also learn how to read and interpret the Occupational Act and Regulations.

IT1024 Introduction to Physics

This course is an introductory course into the study of physics. It consists of 6 theory units and a corresponding laboratory component. The topics covered include: measurement, motion, forces, work and energy, fluids and heat. The lab component gives students the opportunity to connect with the acquired theory.

MA1100 Mathematics I

This course covers basic algebra properties, graphing the straight line, basic geometry and trigonometry, and solving a system of equations graphically and algebraically. It also covers vector addition by components and by the cosine and sine laws.

ME1014 Geometric Dimensioning and Tolerancing

This course will enable the student to create and modify professional-quality engineering drawings by familiarizing themselves with information typically found in manufacturing manuals, drawings, and specifications. The student will be able to identify drawing symbols, dimensions, and tolerances as well as draw and sketch using orthographic, isometric, and sectional views. The student will also learn the principles and practices of geometric dimensioning and tolerancing (GD&T) in accordance with ASME Y14.5 standard.

MM1002 Millwright Machining I

This course will develop the knowledge of ferrous and non-ferrous metals, alloys and non-metallic materials, thread systems for specific applications; select and install nuts, bolts, screws, dowels required to specifications, heat treat and stress relieve material if required.

MM3003 Industrial Indoctrination

This course will enable the student to protect self and others; comply with safety legislation under the Occupational Health and Safety Act, Workplace Hazardous Materials Information System (WHMIS); wear and maintain safety clothing and equipment; report all hazards; apply confined space safety procedures; apply

machinery and equipment lock-out procedures; use correct body mechanics when lifting loads; communicate with fellow workers; report all accidents and respond to emergency situations. In addition, the student will be able to plan lifts; perform calculations using load charts; estimate load weights; select and use correct rigging/hoisting equipment; inspect and maintain rigging/hoisting equipment; use hand signals; control, balance and direct loads; disassemble all equipment safely.

Semester 2

AR2014 Statics

This is an introduction to engineering statics/mechanics tailored to the needs of Mechanical and Civil students. The major topics include vectors, moments, couples, centroids and moment of inertia. Students will learn how to find the reaction forces at the supports and the internal force in members using the method of joints and the method of sections. Students will also learn how to calculate the centroid and the area moment of inertia for simple shapes and some commercial shapes. Applied statics/mechanics is the basis for all calculations in areas such as stress analysis, machine design, hydraulics and structural design.

CM2303 Communications for the Workplace

In this course, students will develop professional communication skills required for success in the workplace. Students will continue to develop and strengthen their oral and written communication skills and critical thinking abilities. During this course, students will use various modes of communication to complete assignments designed to meet program and professional expectations. Students will utilize a variety of technologies for the purpose of creating a professional presence in a digital environment. Students will develop the necessary skills to create polished workplace documents such as letters, resumes, cover letters and reports tailored to specific audiences. Students will learn to conduct themselves with professionalism in both workplace interviews and job searches. Upon successful completion of this course, students will be able to create clear, concise and coherent workplace and employment documents that are error-free and designed for specific audiences and purposes.

GN1443 Indigenous Culture and Awareness

This general education course will provide students with an introduction to Canadian Indigenous Nations' history, sovereignty, land titles, cultural history and current critical issues. Topics addressed include the content of Indigenous rights, economic and social development, community and political processes, and business law and policies, justice & social services. Canadian Indigenous History and Relations is a general education course that has been incorporated into all programs at Northern College.

IN1224 Computer Aided Drafting (CAD) I

This is an introductory course designed to teach students the basics of using the AutoCAD drafting software to create 2 dimensional drawings. Lessons include using the draw, modify, layering and annotation commands.

MA2104 Mathematics II

MA2104 is the second course in the math stream for students in an Engineering Technician / Technology program. The emphasis of this course is on solving equations relating to quadratics, logarithms, exponentials, with sections on factoring, fractional equations, manipulating exponent and radical expressions, and complex numbers, and for some programs studying systems of linear equations and determinants. Applications of the basic concepts, to particular fields of study, will be covered. The second semester Mathematics course is designed to give the student the mathematical tools required to function in his/her special field of study.

Students are encouraged to seek help after class hours if problems are encountered in the course. Every effort will be made to identify problem areas to the student, but in the final analysis, it is the responsibility of the student to ask for help. Prerequisite: MA1100 – Mathematics I (with 60%)

ME3003 Electrical and Electronics Fundamentals

This is an introductory course intended to give students a basic understanding of electronic devices and fundamental electrical concepts including current, voltage, resistance, ohm's law, series/parallel circuits, combination circuits, Kirchoff's Law, inductance, and reactance. The student will also be introduced to the general principles of motor controls, electronics, and electrical safety considerations.

MM1275 Millwright Machining II

This course will develop the theories and practices taught during MM1002 while furthering their knowledge on conventional machine tools such as engine lathes, drilling machines, saws, pedestal grinders and various hand tools. They will learn the parts, various operations, cutting tools and the relationship of speeds and feeds applied to milling machines. They will manufacture parts to specified tolerances which reflect field operations.

Semester 3

General Education Elective

General Education Courses are selected online each semester by the student from a list provided and exposes students to a related area of study outside of their immediate academic discipline. Certain programs have predetermined electives.

IN3263 Embedded Programming and Networks

The first part of this course introduces the learner to the fundamentals of computers and how they are networked. Topics include a basic overview of computer/network equipment, networking fundamentals and standards, and network design. The second part of the course provides the learner with an introduction to computer programming using embedded systems. Topics covered include syntax, variables, equations, data types, loops, conditional statements, logical statements, and ADC interfacing.

MA3205 Mathematics III with Calculus

This course covers topics such as: graphs of trigonometric functions, trigonometric identities and equations, the study of analytic geometry including the properties of the circle, the parabola and the ellipse. Students will also be introduced to Calculus. The course expands with the study of the rate of change and the derivative of algebraic functions with applications to graphing, optimization and minimum and maximum problems. Students will also be introduced to integration of algebraic functions with applications to area and centroids.

Prerequisite: MA2014 - Mathematics II

ME2014 Mechanical Design and Computer Aided Design II

This course is designed to introduce the student to solid modelling, assembly construction and two-dimensional drawing construction using computer aided design (CAD) software. Standard drawing symbols, abbreviations, dimensioning, tolerancing, connections, and mechanical hardware will be covered. Both metric and US standard measurement systems will be used.

ME3013 Fluid Mechanics

This course introduces students to the behaviour of fluids at rest and in motion. The physical properties of fluids and their measurement are discussed. Energy and Bernoulli equations are applied to problems involving laminar and turbulent flow of fluids in pipes.

WE3044 Strength of Materials I

This course examines the behaviour of engineering materials under various loading conditions. The concepts of stress and strain are critically examined with emphasis on the application of those concepts to practical design and analysis problems. Topics include direct normal and shear stresses; axial deformation and thermal stress; torsional shear stress and torsional deformation; shearing forces and bending moments in beams; pressure vessel stresses; welded and bolted (riveted) connections.

Semester 4

General Education Elective

General Education Courses are selected online each semester by the student from a list provided and exposes students to a related area of study outside of their immediate academic discipline. Certain programs have predetermined electives.

MA6023 Statistics

This course will cover such topics as: Measures of Central and Dispersion Tendencies; Distributions (Frequency, Probability, Binomial and Normal); Quality Process Control; Correlation and Regression Models and Hypothesis Testing. This course will have applications to various fields in engineering while using Microsoft Excel. Pre-requisites: MA1100 Mathematics I

ME3004 Energy Systems I

The skyrocketing demand for clean, abundant energy has resulted in a need for comprehensive information that can be used by builders, technicians, energy industry professionals, and anyone else that wants to learn about alternative forms of energy and their everyday uses. This course explores solar, wind, and other sources and the technology available to harness them. Students will gain a better understanding on how these systems work as well as how they are put together.

ME3044 Manufacturing Processes I

This is an introductory course that deals with the correlation between manufacturing, mechanical properties, microstructure, and applications. The course addresses material structures at atomic, crystallographic, microstructural, and macrostructural levels. Also included are topics such as strengthening mechanisms, tensile and cyclic testing, failure mechanisms, solid state diffusion, solidification, and phase diagrams. The purpose of this course is also to provide students with hands-on experience in modern manufacturing processes. It introduces the learner to how each process works and its relative advantages and limitations. Major emphasis is on the fundamentals of production processes in order to produce quality products in a competitive manner.

ME3204 Dynamics

Dynamics is the study of motion and force systems on bodies in motion. The course will be an overview of the application of Newton's laws to rectilinear and curvilinear motion problems. Plane motion, work/energy, impulse/momentum and force analysis will also be studied.

ME4013 HVAC

Students learn to size, select, and analyze the economics of different types of heating and air conditioning systems. Topics include: human body comfort, heat loss, heat gain, humidity, load estimating, heat pumps, air duct sizing, etc. using computer software.

ME4044 Mechanical Design and Computer Aided Design III

This course builds upon the skills learned in ME2014 Mechanical Design / CAD II. The student will learn advanced solid modelling techniques including surface modelling, freeform modelling, meshing, and finite element simulations. The student will also be introduced to computer-aided manufacturing (CAM) and will learn how to set up and simulate a part for machining and additive manufacturing.

Semester 5

MA5005 Calculus II

This course is a continuation of Calculus I. The course expands the concepts of derivatives and integrals to trigonometric, logarithmic, inverse and exponential functions, and the use of the Table of Integrals. Other topics include Fourier series, Fourier Transforms and the integration of partial fractions. Students will also learn how to solve differential equations using methods of separable variables, Laplace Transforms and 2nd order differential equations equal to zero. Applications to differential equations include RLC circuits, PID controllers and transfer functions. Prerequisite: MA4204 - Calculus I

ME5002 Mechanical Lab I

The Mechanical Lab I course supplements and supports the Advanced Fluid Mechanics and Advanced Dynamics courses with practical learning. Lab topics in Advanced Fluid Mechanics include application of the Energy Principle, experimental determination of minor losses and losses in series/parallel pipeline systems, and pump selection. Lab topics in Dynamics include plane motion and inertial forces.

ME5004 Engineering Operations and Management

In this course, students learn concepts required to design competitive manufacturing systems. Topics include continuous improvement, cellular layouts, line balancing, equipment pay-back, cycle times, multi-product production and cost estimation. In this course, students learn concepts required to design and operate competitive manufacturing/industrial systems. Topics include product-production design interaction, facilities location and layout, material handling, work measurement, financial compensation, human factors, operations planning and control, quality control, linear programming, inventory control, and project management.

ME5023 Advanced Fluid Mechanics

In this course students learn about fundamentals and advanced topics of fluid mechanics. Topics include the nature of fluids and the study of fluid mechanics, viscosity of fluids, pressure measurement, forces due to static fluids, buoyancy, flow of fluids, general energy equation, Reynolds number and energy losses due to friction, minor losses, series pipeline systems, pump selection and application, flow measurement, forces due to fluids in motion, and drag and lift.

ME5033 Research Project I

Research Project I and II concentrate on the completion of an independent research project. This course mirrors working conditions that are frequently encountered in industry; that is, it is a self-directed, comprehensive study of a specific topic in the student's field, not one covered in other course. In Research

Project I, students prepare a detailed project proposal. Students begin work on the project in this course in preparation for project completion in Research Project II.

ME5213 Advanced Dynamics

In this course, students learn about kinematics of particles: rectilinear motion, planar curvilinear motion using various coordinate frames (such as rectangle, normal-tangential and radial-transverse), and analysis using Newton's Second Law. Students also study the kinematics of rigid bodies: translation, rotation, general planar motion, forces and accelerations, mass moment of inertia, and static forces in machines.

Semester 6

ME6003 Advanced Strength of Materials

This course builds on concepts students have learned in earlier courses. In this course, beams will be analyzed using first principles in terms of shear, bending and deflection with applications to statically determinant and indeterminate problems. Columns will also be analyzed for crushing (short columns) buckling (long slender columns). Euler's equation will be used to analyze columns with various end conditions.

ME6004 Advanced Dynamics of Machines

In this course students build upon knowledge and concepts from the previous dynamics course. The relationships between work and force, work and energy, energy and power will be learned. Conservation of forces, conservation of energy (potential, kinetic, electrical), and efficiency will be discussed. Linear and angular momentum and impulse principles will be analyzed with respect to systems of particles and impact examples. Conservation of momentum and conservation of energy will be used to analyze problems. Three-dimensional kinematics of rigid bodies will be analyzed with respect to velocities and accelerations. Students will also create mechanism displacement diagrams (for straight and curved links) of machine members using the relative velocity method, instantaneous centres, velocity polygon, relative acceleration polygon, coriolis acceleration, machine dynamics which includes inertia force method and analysis of translation, rotation, and plane motion, balancing rotating and reciprocating masses, and whirling of shafts.

ME6013 Applied Thermodynamics and Heat Transfer

In this course students build upon fundamentals from previous study in the application of thermodynamics and heat transfer. Concepts will include: phase-change processes, property diagrams (p-T, p-v, and T-v diagrams), thermodynamic tables, work, heat and energy transfer, heat transfer mechanisms (conduction, convection, radiation), thermal resistance analogy, application of the 1st-Law of thermodynamics to (a) a process, (b) a cycle of closed system, energy analysis of closed systems, applications of the 1st-law for steady-state-steady-flow processes and devices, and heat exchangers.

ME6014 Research Project II

Research Project I and II concentrate on the completion of an independent research project. This course mirrors working conditions that are frequently encountered in industry; that is, it is a self-directed, comprehensive study of a specific topic in the student's field, not one covered in other course. In Research Project I, students prepare a detailed project proposal. Students begin work on the project in this course in preparation for project completion in Research Project II.

ME6023 Mechanical Lab II

The Mechanical Lab II course supplements and supports the Advanced Strength of Materials, Advanced Dynamics, Machine Design, and Applied Thermodynamics and Heat Transfer courses with practical learning. Lab topics in Advanced Strength of Materials include stresses in beams, deflection in beams, and columns. Lab topics in the Advanced Dynamics include forces in machines and balancing rotating/reciprocating masses. Lab topics in Machine Design include connections, material strength, and power transmission. Lab topics in Applied Thermodynamics and Heat Transfer include heat transfer and psychrometry.

ME6033 Metrology and Quality Control

This course is dedicated to quality systems and learning the theory behind basic metrology. Students gain a theoretical understanding of calibration techniques and learn calibration standards, statistical process control, and methods of measurement using different measuring devices.

ME6043 Machine Design

In this course students learn how to design, select and integrate common machine elements found in mechanical devices and systems including shafts, bearings, springs, gears, cams, belts, and chains. Students will also analyze the performance of fasteners and welded joints in various loading conditions and be introduced to failure mechanisms.