MECHANICAL ENGINEERING TECHNOLOGY

Program Outline

Major: METY
Length: 3 Years
Delivery: 6 Semesters, plus 3 work terms
Credential: Ontario College Advanced Diploma, Co-op
Effective: 2016-2017
Location: Barrie
Start: Fall (Barrie)

Description
Mechanical technology is a cornerstone of sophisticated and advanced economies. Students in this program are learning the skills to apply scientific and engineering principles to solve mechanical engineering related problems. They are also undertaking the design and fabrication of mechanical apparatus and systems. These include automation and control systems, manufacturing processes and material handling.

Career Opportunities
Graduates may find a range of occupations in many industrial sectors including automotive, aerospace, advanced automation, natural resources and processing. They may participate in an engineer-technologist- technician team in mechanical consulting, manufacturing or mechanical design and maintenance. Careers are possible in machine and fixture building, manufacturing and production, quality assurance, testing, manufacturing management, technical sales and service. Specific industries may include automotive parts and assembly, metal fabricating and machining, and machine building.

Program Learning Outcomes
The graduate has reliably demonstrated the ability to:

- monitor compliance with current legislation, standards, regulations and guidelines;

- plan, co-ordinate, implement and evaluate quality control and quality assurance procedures to meet organizational standards and requirements;
- monitor and encourage compliance with current health and safety legislation, as well as organizational practices and procedures;
- develop and apply sustainability best practices in workplaces;
- use current and emerging technologies to implement mechanical engineering projects;
- analyze and solve complex mechanical problems by applying mathematics and fundamentals of mechanical engineering;
- prepare, analyze, evaluate and modify mechanical engineering drawings and other related technical documents;
- design and analyze mechanical components, processes and systems by applying fundamentals of mechanical engineering;
- design, manufacture and maintain mechanical components according to required specifications;
- establish and verify the specifications of materials, processes and operations for the design and production of mechanical components;
- plan, implement and evaluate projects by applying project management principles;
- develop strategies for ongoing personal and professional development to enhance work performance;
- apply business principles to design and engineering practices;
- apply basic entrepreneurial strategies to identify and respond to new opportunities.

Practical Experience:
Co-operative Education is a mandatory component of all Co-op programs at Georgian College; it has been designed as a process by which students integrate their academic education with work experience related to their programs of study. This integration affects much more than simply earning a salary, including the adjustment to the work environment and the development of professionalism. It also reinforces skills and theory learned during academic semesters, develops professional contacts, job knowledge and career path, improves human relations and communication skills, and promotes personal maturity and financial independence.

Students are requested to register, attend and participate in their scheduled co-operative education classes. These classes are scheduled for all first year students and are expected to be completed in order for students to proceed successfully to their first co-op work experiences. To ensure students are eligible to proceed onto any co-op work experience, students should refer to Promotional Status and Eligibility for Co-op as outlined in the College Calendar. Co-op policies and procedures can be located on our website: www.georgiancollege.ca/student-services/co-op-and-career-services/students-tab/

Georgian College follows the Co-operative Education guidelines set out by the Canadian Association for Co-operative Education (CAFCE) and Education at Work Ontario

(EWO) by supporting the learning outcomes designed for the program specific graduate profile and curriculum as set out by the Ministry of Training, Colleges and Universities.

The Program Progression:

Fall Intake - Barrie

Sem 1	Sem 2	Work Term 1	Sem 3	Sem 4	Sem 5	Work Term 2
Fall 2016	Winter 2017	Summer 2017	Fall 2017	Winter 2018	Summer 2018	Fall 2018

Work Term 3	Sem 6
Winter 2019	Summer 2019

Admission Requirements:

- OSSD or equivalent with
  - Grade 12 English (C or U)
  - any Grade 12 Mathematics (C or U)

Mature students, non-secondary school applicants (19 years or older), and home school applicants may also be considered for admission. Eligibility may be met by applicants who have taken equivalent courses, upgrading, completed their GED, and equivalency testing. For complete details refer to: www.georgiancollege.ca/admissions/policies-procedures/

Applicants who have taken courses from a recognized and accredited post-secondary institution and/or have relevant life/learning experience may also be considered for admission; refer to the Credit Transfer Centre website for details: www.georgiancollege.ca/admissions/credit-transfer/

Additional Information:

Students should hold, or obtain, a minimum Class G2 Ontario driver's license to ensure the greatest opportunity for co-op work terms.

Graduation Requirements:

34 Mandatory Courses
2 Communications Courses
1 Optional Course
3 General Education Courses
3 Co-op Work Terms

Graduation Eligibility:

To graduate from this program, the passing weighted average for promotion through each semester, from year to year, and to graduate is 60%. Additionally, a student must attain a minimum of 50% or a letter grade of P (Pass) or S (Satisfactory) in each course in each semester unless otherwise stated on the course outline.

Mandatory Courses

BUSI3008 Economics, Ethics and Entrepreneurship
COMP1025 CAD - Mechanical 2
COMP1084 CAD Mechanical 1
COMP1085 Computer Aided Manufacturing
COMP2043 Computers and Programmable Controllers
COMP2120 CAD Mechanical 3
COMP2121 New Simulation Technologies
ENVR1000 Environmental Science and Sustainability
MATH1018 Introduction to Technical Mathematics
MATH1019 Technical Mathematics
MATH2003 Statistical Analysis - SPC
MATH2008 Calculus and Engineering Mathematics
MCHN1001 Machine Shop
MCHN2001 Engineering Tooling
MENG1008 Engineering Materials
MENG1019 Manufacturing Processes
MENG2003 Statics
MENG2004 Workplace Design and Industrial Ergonomics
MENG2005 Fluid Mechanics
MENG2007 Strength of Materials
MENG2019 Thermodynamics
MENG3006 Instrumentation and Controls
MENG3007 Design of Energy Systems
MENG3010 Machine Design
MENG3011 Dynamics
MENG3020 Advanced Materials
MENG3021 Quality and Reliability
MENG3022 Facilities Design and Production Control
MENG3023 Vibrations

MENG3024 Mechatronics
MGMT2002 Project Management
PHYS1007 Engineering Physics
ROBT2000 Introduction to Robotics
TDIE2000 Hydraulics and Pneumatics

Communications Courses
To be selected at time of registration from the College list, as determined by testing.

Optional Course
To be selected from College list

General Education Courses
To be selected from College list

Co-op Work Terms
COOP1043 Mechanical Work Term 1
COOP2035 Mechanical Work Term 2
COOP3013 Mechanical Work Term 3

Course Descriptions:
BUSI3008 Economics, Ethics and Entrepreneurship 42.0 Hours
Technologists are increasingly required to understand the implications of their work from a broader perspective. Students will explore the ethical, economic, and environmental impact that technology and manufacturing systems may have on the company and community. Students will also develop essential skills to that can be used to engage in entrepreneurial endeavors both within a company and as an independent business venture.

COMP1025 CAD - Mechanical 2 42.0 Hours
Advancing technology requires product variation be closely controlled in both design and reproduction of manufactured parts. Students will be introduced to traditional methods of dimensioning and tolerancing. Subsequently, current approaches to drawing interpretation will be introduced. These will include overviews of Design for Manufacturability (DFM), Design for Assembly (DFA) and Geometric Dimensioning and Tolerancing. A CAD platform will be utilized to practice these skills.
P- COMP1084 CAD Mechanical 1

COMP1084 CAD Mechanical 1 56.0 Hours

The ability to read and correctly interpret an engineering drawing is a required skill in the industrial workplace. Students in this course will be introduced to reading, understanding and creating engineering drawings in the mechanical disciplines. Standards and conventions will be introduced and the application of these will be practiced using CAD methods.

COMP1085 Computer Aided Manufacturing 42.0 Hours
Machining using today's automation technology is a critical component of manufacturing. Students will be introduced to Computer Numerical Control (CNC) programming, Computer Aided Manufacturing (CAM) applications and CNC machine setup and operations. Students add to their existing machining skills to producing machined components using CNC manual programming and CAM software applications.
P- MCHN1001 Machine Shop

COMP2043 Computers and Programmable Controllers 42.0 Hours
Students in this course learn functional design, hardware configuration, programming and application of Programmable Logic Controllers (PLC). The design and programming of control circuits using examples from industrial applications are emphasized. The application of PLC's in process automation is examined. An overview of functional hardware design is also included. The equipment used includes small and medium sized PLC's using hand held programmers and RSLogix 500 for circuit applications.

COMP2120 CAD Mechanical 3 42.0 Hours
Advancing technology requires product variation be closely controlled in both design and reproduction of manufactured parts. Students in this course continue building skills related to part variability and dimensional control using a CAD platform. 3D models represent the perfect design concept of a product under development. Manufactured parts require defined variables that will influence the suitability of the finished product.
P- COMP1025 CAD - Mechanical 2

COMP2121 New Simulation Technologies 42.0 Hours
Mathematical modeling of processes allows simulation tools to be used to iterate design ideas without the costs of physical prototyping. Students are introduced to a variety of simulation tools including finite element analysis (FEA), computational fluid dynamics (CFD) and computer aided engineering (CAE).
P- COMP1025 CAD - Mechanical 2

COOP1043 Mechanical Work Term 1 560.0 Hours
Co-operative Education provides students with the skills to conduct a college supported self-directed job search in their chosen field of study. Students obtain a co-op work experience with an employer for a period of 14 weeks. All students are responsible to submit a work term record for approval prior to starting work, and a work term report indicating achievement of specific learning outcomes during their first co-op work term. Georgian College follows the Co-operative Education guidelines set out by the Canadian

Association for Co-operative Education (CAFCE) and Education at Work Ontario (EWO) by supporting the learning outcomes designed for each program.
P- CPHR0001 Co-op and Career Preparation

COOP2035 Mechanical Work Term 2 560.0 Hours
Building on previous Co-op experience, students continue to gain valuable experience and develop knowledge and skills related to their program. Students gain experience with a variety of mechanical functions in the workplace. Students returning to their previous employer are asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes be achieved.
P- CPHR0001 Co-op and Career Preparation

COOP3013 Mechanical Work Term 3 560.0 Hours
Building on previous Co-op experience, students continue to gain valuable experience and develop knowledge and skills related to their program. Students gain experience with a variety of mechanical functions in the workplace. Students returning to their previous employer are asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes be achieved.
P- CPHR0001 Co-op and Career Preparation

ENVR1000 Environmental Science and Sustainability 42.0 Hours
Students will be introduced to ecological principles, population dynamics and energy resources in order to assess their impact on the environment. The major types of pollution are examined and their effects on the various components of the ecosphere analyzed. Strategies for pollution control and the conservation of the Earth's resources are examined in the context of economic considerations and sustainable development.

MATH1018 Introduction to Technical Mathematics 42.0 Hours
Students are provided a foundation in mathematics in engineering technology and related programs. Students will develop skill in mathematical thinking and problem solving, and appropriately apply technology in the solution of engineering related problems using algebra, geometry, right angle trigonometry, trigonometric functions of any angle, systems of linear equations, and exponential and logarithmic functions. Additional time to strengthen and reinforce mathematical competencies will be made available to those students who require it.

MATH1019 Technical Mathematics 42.0 Hours
Students will continue to develop mathematical reasoning and problem solving which will be reinforced through problems in an engineering context. This course extends the mathematics ideas taught in Introduction to Technical Mathematics through advanced mathematics problems needed for mechanical engineering programs. Mathematics concepts reinforced and extended are algebra, systems of linear equations, vectors and oblique triangles, graphs of trigonometric functions, complex numbers, Sequences Series and the binomial theorem.

P- MATH1018 Introduction to Technical Mathematics

MATH2003 Statistical Analysis - SPC 42.0 Hours
Students will learn specific statistical tools. The introduction will emphasize the role and importance of statistical methods, including organization and presentation of data; the normal distribution; quality control charts for variables and attributes; special charts and process capability considerations; Cause and Effect diagrams and Pareto Analysis. Probability distributions and acceptance sampling will be introduced, along with limited inferential techniques.

MATH2008 Calculus and Engineering Mathematics 56.0 Hours
Calculus is required to develop formulas and solve engineering problems. Students develop practical skills in differential and integral calculus including algebraic and transcendental functions. Students will determine roots of equations by Newton's methods, maxima and minima, and develop power series representation for functions. Methods of algebraic integration cover both definite and indefinite integrals for a variety of functions. Tables of integrals are used for difficult integrals and Simpson's rule will be used to introduce numerical integration.
P- MATH1019 Technical Mathematics

MCHN1001 Machine Shop 70.0 Hours
Machining is a critical skill required by all mechanical program students. The student will set up the machine tools, select the appropriate tooling and methodology to produce components to a specified tolerance and quality. This course is project based encompassing machine shop safety, the use of hand tools, precision measuring devices and the operation of machine tools.

MCHN2001 Engineering Tooling 42.0 Hours
Engineering Technologists need a firm understanding of tooling and fixture requirements in developing manufacturing systems. Students study the fundamentals of measuring geometric and dimensional characteristics and the types of tools utilized for these purposes. Inspections are used to validate the suitability of an item to defined characteristics via measurements, testing or gauging. Results are compared to specifications or standards and determinations are made regarding conformance.
P- COMP1025 CAD - Mechanical 2

MENG1008 Engineering Materials 42.0 Hours
The ability to understand, select, and test materials based on their properties is crucial for successful product design and manufacturing. Students will develop skills in using standardized equipment and procedures to measure and test parts and materials though laboratory work. Methods used to protect materials and alter their properties will also be investigated. This course will familiarize students with the physical and mechanical properties of metal, ceramic, polymer and composite engineering materials.

MENG1019 Manufacturing Processes 42.0 Hours
Engineering Processes in today's manufacturing industries are a foundational requirement for students to explore and experience. Upon completion of this course, students will have an in-depth understanding of the principles of manufacturing engineering through a mix of lectures, labs and industry visits investigating such processes as: planning processes, materials, machining, forming and automation.

MENG2003 Statics 42.0 Hours
This course applies Newton's three laws to engineering structures in static equilibrium. It is an introduction to applied forces, and their externally and internally developed reaction forces, on such structures.

MENG2004 Workplace Design and Industrial Ergonomics 42.0 Hours
This course introduces and applies the concepts of methods engineering, work measurement and ergonomics with respect to workplace design.

MENG2005 Fluid Mechanics 42.0 Hours
Various fluids, and fluid systems, are used in engineering environments and processes. Therefore an understanding of fluid mechanics is a requirement for Technologists. Students will study static and dynamic properties of incompressible fluids. Finally, Bernoulli's equation, and the calculation of minor losses and pump head gain, in steady flow closed systems will be covered. Laboratory sessions assist in providing practical experience.

MENG2007 Strength of Materials 42.0 Hours
This course introduces students to the internal stresses and strains developed in engineering materials when externally loaded. Stresses, and resultant strains, studied include axial stress, shear stress, bending stress, and torsion. Bearing stress and stresses on oblique planes are also covered.
P- MENG2003 Statics

MENG2019 Thermodynamics 56.0 Hours
The principles of thermodynamics relate to almost every engineering process. Students acquire a basic understanding of heat transfer by conduction, convection, and radiation. Students gain experience in analyzing problems related to the First Law, Second Law, and Thermodynamic Processes, including refrigeration and air conditioning. Laboratory sessions assist in providing practical experience.

MENG3006 Instrumentation and Controls 42.0 Hours
Students study the application of industrial sensors and transducers used to measure temperature, pressure, flow and level. Topics include: operating theory of principal industrial process sensors; instrument calibration and installation practices with industrial applications as working examples in a modern automated control system.

MENG3007 Design of Energy Systems 42.0 Hours
Students apply the principles of fluid mechanics, heat transfer and thermodynamics to develop engineering solutions. In addition, compound piping systems and heat exchanger design and analysis is covered.
P- MENG2005 Fluid Mechanics

MENG3010 Machine Design 42.0 Hours
Student learn the conversion of one type of motion to another including type and direction of motion, and changes in rotational speed and torque. Students review, and further development, stress analysis methods. Subsequently, specific components of machines, such as shafts and bearings and belts, chains and gears are addressed.
P- MENG2007 Strength of Materials

MENG3011 Dynamics 42.0 Hours
Dynamics is the logical extension of statics, using the same assumptions based in the calculus and Newtonian principles. Students will study motion and force systems on bodies in motion, with paths of motion that can be linear and curvilinear. Plane motion, work/energy, impulse/momentum, and force analysis principles are applied to practical situations involving both particle and rigid body boundaries. Mechanical losses are also considered.
P- MENG2003 Statics

MENG3020 Advanced Materials 42.0 Hours
Building upon previous coursework, students examine the latest technologies impacting industry as per advances in traditional and non-metallic engineering materials. Initiatives considered include advances in fabrication methods including joining, material removal, light weighting, and control of mechanical and electrical properties. Advanced materials are considered from an overall product and process design perspective, invoking cradle-to-cradle and lifecycle approaches to direct manufacturing and indirect societal costs.
P- MENG2007 Strength of Materials

MENG3021 Quality and Reliability 42.0 Hours
Defects and deficiencies in products and services to customers precisely define quality with respect to achievement of functional business objectives. Students study how underlying descriptive and inferential statistics are applied to control variation. Similarly, reliability is quantified as the ability of a product/process to perform a required function under stated conditions for a certain time. Different probability distributions are applied, using warranty data to understand mechanical applications like fatigue and predictive maintenance.
P- MATH2003 Statistical Analysis - SPC

MENG3022 Facilities Design and Production Control 42.0 Hours

The manufacturing environment is in constant flux as new technology, processes, and management techniques are incorporated into the production system and facilities. Students will be introduced to current and emerging tools and techniques used to develop modern industrial facilities. Students will also develop a solid understanding of the latest production systems and practice skills in using appropriate tools to plan, schedule, and produce products in and efficient and sustainable way.

MENG3023 Vibrations 42.0 Hours
Complex machines tend to generate vibrations with normal operation. Students will be introduced to the physical phenomena of mechanical vibrations, and the relationship between vibrations and equipment mechanical condition. Deleterious effects of these vibrations include excessive stress levels, reduced life of equipment, and undesirable noise. Mechanical system vibration measurements will address practical means of detection per frequency, amplitude, and phase. Practical means to mitigate and dampen vibrations in industrial situations are emphasized.
P- MATH2008 Calculus and Engineering Mathematics

MENG3024 Mechatronics 42.0 Hours
The use of mechatronics tends to produce elegant solutions to design problems that cannot easily be solved by remaining within the bounds of traditional design disciplines. Students will develop an understanding of effective system integration by building on the principles of sensor technology, control systems and technology, and actuator technology. Through hands-on projects, students will practice skills in solving design problems that require a multifaceted, yet integrated approach using electrical and mechanical systems.

MGMT2002 Project Management 42.0 Hours
Throughout their career, technologists will be involved in many projects. Students will be introduced to the fundamental principles necessary for the successful management of any project. Through simulation and real project planning, students will develop skills in creating proposals, budgets, risk assessments, Gantt charts, critical path reports, progress reports, and other industry standard planning and reporting techniques.

PHYS1007 Engineering Physics 42.0 Hours
Engineering is applying scientific principles to solve real world problems. Physics is the study of the material world. Students will be introduced to basic concepts of mechanics, simple harmonic motion, natural frequencies, sound, electromagnetic waves, electricity and magnetism. These concepts are developed by considering practical examples. Laboratory experiments will be used to illustrate and investigate the principals involved.

ROBT2000 Introduction to Robotics 42.0 Hours
This is an introductory course in industrial robots. There are two main classes of industrial robots - continuous path robots and pick- and-place robots. Students in this course will learn to operate, program, and service modern continuous path industrial

robots. They will also learn to design, construct, and program pneumatic pick-and-place robots using current industrial standards and materials. Proper robot safety procedures will be emphasized throughout the course.

TDIE2000 Hydraulics and Pneumatics 42.0 Hours
Students will study Industrial Hydraulic and Pneumatic applications. Topics covered include Fluid Power Principles, their components and their functions. Presentation of introductory concepts will be accompanied by students performing practical lab work on Industrial Fluid Power components and systems.

Course Description Legend
P = Prerequisite; C = Concurrent prerequisite; CO= Corequisite

Information contained in College documents respecting programs is correct at the time of publication. Academic content of programs and courses is revised on an ongoing basis to ensure relevance to changing educational objectives and employment market needs. The college reserves the right to add or delete programs, options, courses, timetables or campus locations subject to sufficient enrolment, and the availability of courses.