

# MECHANICAL ENGINEERING TECHNOLOGY - AUTOMOTIVE MANUFACTURING

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## Program Outline

<b>Major:</b>	META
<b>Length:</b>	3 Years
<b>Delivery:</b>	6 Semesters, plus 3 work terms
<b>Credential:</b>	Ontario College Advanced Diploma, Co-op
<b>Effective:</b>	2012-2013
<b>Location:</b>	Barrie
<b>Start:</b>	Fall (Barrie)

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### Description

This program is designed to meet both Provincial and National Standards (CTAB - Canadian Technician/Technologists Accreditation Board ) with six academic and three work terms. There is a core emphasis on automotive mechanical systems supported by learning about quality optimization, up-to-date automotive parts production, manufacturing and assembly methods. Technical management and supervisory procedures will further compliment the student's educational experience. The standards of the automotive industry are emphasized, recognizing the global nature of the industry and the internationalization of standards and practices in the North American manufacturers as well as the benchmark practices of international competitors.

### Career Opportunities

Graduates may find a range of occupations in automotive assembly and parts manufacturing companies. Graduates may participate in an engineer-technologist-technician team in mechanical consulting, manufacturing or design. Careers are possible in design, production, quality assurance, testing, management, technical sales and service. Automotive parts and assembly, metal fabricating and plastic moulding industries are among graduate employers.

## **Program Learning Outcomes**

The graduate has reliably demonstrated the ability to:

- apply the principles of mathematics, physics and the engineering sciences to solving technical problems and make decisions;
- utilize computer aided drafting media to plan and organize graphical layouts;
- develop designs for mechanical equipment and automotive manufacturing systems;
- incorporate design considerations for automation, robotics and flexible automotive manufacturing;
- apply automotive manufacturing and assembly methods;
- apply principles of process control and quality management in the automotive sector;
- apply efficient production and control methods used in automotive manufacturing;
- employ project development and management principles;
- apply management principles in Automotive Manufacturing;
- demonstrate effective communication and interpersonal skills;
- work effectively as an individual and team member in any setting with an awareness of leadership responsibilities;
- demonstrate computer and electronic systems literacy in a range of applications;
- demonstrate critical thinking and innovative problem solving abilities;
- apply generic and workplace skills for personal and professional growth;
- apply the benefits of general education to participate in society as an informed citizen and pursue an enriched personal and professional life;
- apply all skills and knowledge acquired in co-op work experience.

## **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 paid work experience related to their program 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 to proceed successfully to their first co-op work experience. 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.georgianc.on.ca/careers/for-students/](http://www.georgianc.on.ca/careers/for-students/)

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	Work Term 2	Sem 4
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Fall	Winter	Summer	Fall	Winter	Summer
2012	2013	2013	2013	2014	2014
Work Term 3	Sem 5	Sem 6			
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Fall	Winter	Summer			
2014	2015	2015			

### Admission Requirements:

Applicants must meet ONE of the following requirements to be eligible for admission to this program:

- OSS Curriculum: OSSD or equivalent with Grade 12 English (C) or (U) (ENG4C, ENG4U); plus any Grade 12 College Math (MCT4C or MAP4C), or Grade 12 University Math. Also recommended: Grade 12 College or Grade 11 or 12 University Physics (SPH4C, SPH4U, SPH3U) or Grade 12 College or Grade 11 or 12 University Chemistry (SCH4C, SCH4U, SCH3U); Grade 11 or 12 College or University Technological Design (TDJ3M, TDJ4M); Grade 11 or 12 College Manufacturing Engineering Technology (TMJ3C, TMJ4C).
- Academic and Career Entrance Certificate (ACE) program with: Communications; Business, Apprenticeship or Technical Mathematics
- Ontario High School Equivalency Certificate (GED)
- Mature applicant with standing in the required courses and/or mature student testing that meets the minimum standards for admission

Applicants who are 19 years of age or over by the first day of classes, and who lack the academic entrance qualifications, may be considered for entrance to an appropriate post-secondary diploma or certificate program as mature applicants. Each applicant will be considered on an individual basis and acceptance will be determined by counselling, Communication Placement Assessment (CPA), previous post-secondary education and evaluation of experience. Some programs also have specific prerequisite requirements that must be met prior to admission. Mature applicants must meet all program specific prerequisites. Those applying as mature students and having no documentation of Grade 12 education must supply, if required, proof of age, such as a copy of an official

birth certificate or driver's licence. Refer to Section 2.5 and 2.6 of the Academic Calendar for further details.

**Graduation Requirements:**

- 35 Mandatory Courses
- 2 Communications Courses
- 5 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.

**Mandatory Courses**

- AUTO3006 Quality Concepts for the Automotive Industry
- BUSI3004 Production Control
- CHEM2001 Chemistry
- COMP1025 CAD - Mechanical
- COMP2043 Computers and Programmable Controllers
- COMP3020 Geometric Dimensioning and Tolerancing
- DRFT1008 Introduction to Engineering Drafting
- ENVR1000 Environmental Science and Sustainability
- MATH1018 Introduction to Technical Mathematics
- MATH1019 Technical Mathematics
- MATH2003 Statistical Analysis - SPC
- MATH2006 Engineering Math: Calculus
- MENG1006 Manufacturing Processes
- MENG1007 Measurement and Machine Shop
- MENG1008 Engineering Materials
- MENG2003 Statics
- MENG2004 Workplace Design and Industrial Ergonomics
- MENG2005 Fluid Mechanics
- MENG2006 Gauge Fixture And Tool Design
- MENG2007 Strength of Materials
- MENG2008 Thermodynamics
- MENG2012 CAM - Processing Engineering
- MENG3004 Polymer and Coatings Technology

MENG3005 Heat Transfer and Engine Performance  
MENG3006 Instrumentation and Controls  
MENG3007 Design of Energy Systems  
MENG3008 Facilities Design  
MENG3009 Metal Forming and Assembly  
MENG3010 Machine Design  
MENG3011 Dynamics  
MGMT2002 Project Management  
PHYS1001 Physical Sciences  
ROBT3000 Automation Robotics and Computer Integrated Manufacturing  
TECR3000 Project and Technical Reports  
TECR3004 Project Report Presentation

#### Communications Courses

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

#### General Education Courses

To be selected from College list

#### Co-op Work Terms

COOP1013 Technology Work Term 1  
COOP2009 Technology Work Term 2  
COOP3005 Technology Work Term 3

#### **Course Descriptions:**

AUTO3006 Quality Concepts for the Automotive Industry 42.0 Hours

This course familiarizes students with the current environment within which the automotive and automotive parts industries function, and provide them with up-to-date management techniques. The growth of this sector, combined with the increasing competitiveness of the world market will be related to North American auto and parts production. The application of automotive quality standards, with specific emphasis on the quality/business aspects of the standard; as well as strategies for business planning and financial analysis as required by, or alluded to, in the standard, is thoroughly explored.

BUSI3004 Production Control 42.0 Hours

This course introduces the concept of planning, organizing and controlling the activities required by the organization to produce its products and services. Topics such as: scheduling, inventory control, materials management and aggregate planning are studied to determine what, how much, when, and where the product should be

produced. Techniques such as Quantitative methods, Behavioral analysis and Modeling are applied to solve problems and contribute to the decision making process.

**CHEM2001 Chemistry 42.0 Hours**

This course will cover the fundamentals of chemistry specifically related to the automotive industry by examining topics such as element selection and use, electrochemistry, corrosion and organic chemistry.

**COMP1025 CAD - Mechanical 42.0 Hours**

This course will continue to develop CAD skills with emphasis on development of engineering drawings in the mechanical disciplines. Current software will be utilized in support of these outcomes.

P- DRFT1008 Introduction to Engineering Drafting

**COMP2043 Computers and Programmable Controllers 42.0 Hours**

This course develops the functional design, hardware configuration, programming and application of Programmable Logic Controllers (PLC). The design and programming of control circuits using examples from industrial applications will be emphasized. The application of PLC's in process automation will be examined. An overview of functional hardware design will be included. The equipment used will be small and medium sized PLC's using hand held programmers and RSLogix 500 for circuit applications.

**COMP3020 Geometric Dimensioning and Tolerancing 42.0 Hours**

This course builds upon the preceding engineering graphics courses by advancing the process of documentation. Drawings will convey the essential information of materials, dimensions, geometric characteristics and permissible variation of size and form.

Functional requirements of manufactured parts are emphasized.

P- COMP1025 CAD - Mechanical

**COOP1013 Technology Work Term 1 640.0 Hours**

Co-operative Education will provide students with the skills to conduct a college directed and self directed job search in their chosen field of study. Students will obtain a co-op work experience with an employer for a period of 14 weeks. All students are responsible to submit a work term report indicating achievement of specific learning outcomes during their 1st 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.

**COOP2009 Technology Work Term 2 560.0 Hours**

Co-operative Education will allow students to gain new/enhanced technical work experience. As students begin to recognize their chosen academic strengths and career direction, they will be better prepared to choose their academic courses and professional options. All students are responsible for submitting a work term report and

employer evaluation form following this work term. It is expected that a student wishing to return to their Work Term 1 employer, be asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes be achieved.

P- COOP1013 Technology Work Term 1 or P- FLD4201 Co-Op Work Term 1 (4 Mths)

COOP3005 Technology Work Term 3 560.0 Hours

Co-operative Education will allow students to gain further technical work experience. As students realize their chosen academic strengths and career direction, they will be better able to choose their academic courses and professional options. All students are required to submit a work term report and employer evaluation form following this work term. It is expected that a student wishing to return to a Work Term 1 or Work Term 2 employer, be asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes will be achieved.

P- COOP2009 Technology Work Term 2 or P- FLD4202 Co-Op Work Term 2 (4 Mths)

DRFT1008 Introduction to Engineering Drafting 42.0 Hours

This course introduces students to reading, understanding, and creating engineering drawings. Emphasis is on creating accurate, clear sketches and CAD drawings based on current professional practices. Standards and conventions are presented and their applications are shown using CAD.

ENVR1000 Environmental Science and Sustainability 42.0 Hours

This course focuses on 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

This course provides 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

This course extends the mathematics ideas taught in Introduction to Technical Mathematics through advanced mathematics problems needed for mechanical engineering programs. Mathematical reasoning and problem solving will be reinforced through problems in an engineering context. Mathematics concepts reinforced and

extended are algebra, systems of linear equations, vectors and oblique triangles, graphs of trigonometric functions, and complex numbers.

P- MATH1018 Introduction to Technical Mathematics

MATH2003 Statistical Analysis - SPC 42.0 Hours

This course is designed to provide the student with 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.

MATH2006 Engineering Math: Calculus 56.0 Hours

This course in calculus is intended to develop practical skills in differential and integral calculus. As well, it is intended to illustrate various applications of calculus to technical problems. The rules of differentiation will be introduced, and methods of differentiating various algebraic and transcendental functions will be developed. Applications of differential calculus to finding roots of equations by Newton's methods, to finding maxima and minima, and to developing power series representation for functions will be studied. Methods of algebraic integration will be introduced, with both definite and indefinite integrals being determined for a variety of functions. The use of tables of integrals for finding solutions for difficult integrals will be introduced. Numerical integration using Simpson's rule will also be developed.

MENG1006 Manufacturing Processes 42.0 Hours

This course will familiarize students with the methods and capabilities of various manufacturing processes within the categories of moulding, cutting, forming, assembly, finishing and automation.

MENG1007 Measurement and Machine Shop 56.0 Hours

A project on the use of hand tools, precision measuring devices and the operation of basic machine tools is assigned. The student is required to set up the machine tool, select the cutter, establish the cutting rate and produce components to a specified tolerance.

MENG1008 Engineering Materials 42.0 Hours

This course will familiarize the student with the properties of metal, ceramic, polymer and composite engineering materials. Methods to protect materials and alter their properties will be investigated.

MENG2003 Statics 42.0 Hours

This course is an introduction to the equilibrium of externally applied forces and internally developed reaction forces as applied to engineering structures and machines.



**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**

This course will provide the student with a basic understanding of fluid properties, fluid statics and dynamics, and fluid flow. The flow of incompressible fluids in pressure systems constitutes the major portion of this course. Fluid measurement is covered both in the lecture and the laboratory portion of the course.

**MENG2006 Gauge Fixture And Tool Design 42.0 Hours**

The course is designed to familiarize the students with production tooling methods that are applied in manufacturing.

**MENG2007 Strength of Materials 42.0 Hours**

This course is designed to familiarize the student with some basic concepts of strength of materials, particularly direct stress and strain, bending and torsional stresses.

P- MENG2003 Statics or P- EML4113 Statics or P- MENG2011 Statics and Dynamics or P- EML4237 Statics And Dynamics

**MENG2008 Thermodynamics 56.0 Hours**

This introductory course in Thermodynamics provides students with experience in analyzing problems related to the First Law, Second Law, and Thermodynamic Processes. This course also provides students with further experience in analyzing problems related to refrigeration and air conditioning. Laboratory sessions employing refrigeration and air conditioning apparatus assist in providing practical experience.

**MENG2012 CAM - Processing Engineering 42.0 Hours**

This course provides students with a basic introduction to Computer Aided Manufacturing (CAM). This fundamental course introduces the concepts of 2D geometry creation, development of tool paths, basic programming, and operation of a CNC milling machine.

P- MENG1007 Measurement and Machine Shop

**MENG3004 Polymer and Coatings Technology 42.0 Hours**

This is an introductory course on polymers with an emphasis on their usage in the automotive sector. It will address the major polymer processes of extrusion, injection molding, reaction injection molding and blow molding, followed by the dies and molds used in these processes. Finishing, assembly, polymer properties and coatings will be examined. The final topic will be designing with plastics considering the constraints imposed by the process, the mold and the polymer systems used.

**MENG3005 Heat Transfer and Engine Performance 42.0 Hours**

This introductory course will have a heat transfer component including one dimensional steady state heat conduction, natural and forced convection using empirical equations and radiation heat transfer for common configurations. Heat engine performance characteristics will also be evaluated both analytically and experimentally. This course is supported by a laboratory component including a computer operated dynamometer and various heat transfer equipment.

P- MENG2008 Thermodynamics

#### MENG3006 Instrumentation and Controls 42.0 Hours

This course is designed to provide a knowledge base in the area of industrial sensors and transducers used to measure temperature, pressure, flow & level. Topics will 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

The principles of fluid mechanics, heat transfer and thermodynamics are used to develop methodologies for the analysis and design of a wide range of energy system components, including piping networks, finned surface, shell-and-tube, and cross flow heat exchangers.

P- MENG2005 Fluid Mechanics

#### MENG3008 Facilities Design 42.0 Hours

The course is designed to familiarize the student with plant layout techniques, material handling concepts and equipment selection methods. The services which are required to allow the operation of the equipment in such layouts will be part of the design considerations. A number of projects will be investigated as examples of what can be done.

#### MENG3009 Metal Forming and Assembly 42.0 Hours

This is an introductory course on sheet metal forming processes and assembly utilized in automotive manufacturing. The main focus is on sheet metal stamping, which involves the presses, the dies and the sheet steel material used to fabricate a stamped part. Basic part design will then be addressed. Assembly processes require a knowledge of welding (resistance (spot) and continuous) and fastening as well as a knowledge of joint design.

#### MENG3010 Machine Design 42.0 Hours

Machine design studies the conversion of one type of motion to another. Along with the change in the type and direction of motion, the rotational speed and torque may also change. This course begins with a review and further development of stress analysis (statics). At that point, specific components of machines, such as shafts and bearings and belts, chains and gears will be addressed.

#### MENG3011 Dynamics 42.0 Hours

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, force analysis, and mechanical vibration will be studied as well as motivation to understand and analyze linkages.

**MGMT2002 Project Management 42.0 Hours**

This course introduces the fundamental principles necessary for successful management of projects. Project planning, management and control techniques will be discussed and the application of computers in project management will be studied.

**PHYS1001 Physical Sciences 42.0 Hours**

This is a course designed to introduce students to the basic concepts of Physics. It deals with topics which include basic mechanics, simple harmonic motion natural frequencies and sound; heat, thermal expansion, temperature and heat transfer; electromagnetic waves, light optics electricity and magnetism. These concepts are developed by considering practical related examples. Laboratory experiments may be used to illustrate and investigate the principles involved.

**ROBT3000 Automation Robotics and Computer Integrated Manufacturing 42.0 Hours**

The course will introduce modern industrial assembly techniques using robotics and other computer-controlled automated systems. The student will study the safety requirements and devices required for robotic systems, the conveyor and feeder systems used to support automated assembly, the motion control devices and systems used in robotics and other positioning systems, and the various types of robots used for assembly operations.

**TECR3000 Project and Technical Reports 14.0 Hours**

The student will demonstrate communication skills by completing and presenting, both written and orally, a major technical report of at least 3000 words in the narrative portion of the report. The course is largely self directed. The content of the report will be developed around a technical topic that is relevant to the student's program area in Engineering Technology. The content of the report may be based on original research and/or based on a current review of the literature on a specific technical field and/or based on data obtained or processes worked on during the student's co-op experiences.

**TECR3004 Project Report Presentation 28.0 Hours**

Students will demonstrate technical and communication skills by presenting, both written and orally, a capstone technical project. The topic is chosen by the student in Project Report 1 and is largely self-directed. This course will focus on the communication of technical information.

P- TECR3000 Project and Technical Reports

**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.*