



Canada World Education

TER4M Course Outline

Course: Computer Technology and Robotics			
Grade: 12	Type: U C M O E	Credit Value: 1 Credit hours: 110	Course code: TER4M Dept: Technology
Online: Y	Face to face:	Online and Face to Face: Y	
Teacher: J.F. Michaud		Development date: Aug. 2020	
Course Reviser: J.F. Michaud Date: Oct. 2020		Prerequisites: TER3M	
Resources Required: electronic device with internet access Text book: none required Supplementary resources: Internet Platform contains CWE developed resources for this course unless otherwise stated in lessons Recommended: Arduino board, bread board, misc. robotics components			
Ministry Curriculum Documents: <ul style="list-style-type: none">- The Ontario Curriculum Grades 11 and 12 Technological Education 2009 Growing Success – Assessment, Evaluation and Reporting in Ontario Schools-2010- Learning for All – A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12, 2001- Environmental Education: Scope and Sequence of Expectations, 2017- Course Descriptions and Prerequisites, Grades 9 to 12, 2018- Equity and Inclusive Education in Ontario Schools: Guidelines for Policy Development and Implementation- Financial Literacy: Scope and Sequence of Expectations, Grades 9-12, 2016- First Nations, Métis, and Inuit Connections – Scope and Sequence of Expectations, 2016- Health and Safety: Scope and Sequence of Expectations, Grades 9–12, 2017			
Course Description <p>This course examines computer systems and control of external devices. Students will assemble computers and small networks by installing and configuring appropriate hardware and software. Students will develop knowledge and skills in electronics, robotics, programming, and networks that use computer programs and interfaces to control and/or respond to external devices. Students will build systems using a broad range of tools and equipment including modern manufacturing techniques and processes as they develop critical decision-making, problem-solving, and project-management skills. Students will develop an awareness of related environmental and societal issues, and will learn about college and University</p>			



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programs leading to careers in computer, mechatronics, automation and robotics technology.

Overall Curriculum Expectations

A. COMPUTER TECHNOLOGY FUNDAMENTALS

By the end of this course, students will:

A1. describe the business operations associated with manufacturing and explain their role in product development;

A2. describe and use modular programming concepts and principles in the creation of computer programs;

A2. demonstrate an understanding of how a design process is used in the planning and development of a manufacturing project;

A3. design and write algorithms and subprograms to solve a variety of problems;

A3. (Tech Studies Comp eng.) describe the function of electronic components and the use of these components in control systems and other circuits, and calculate values for circuit components;

A4. apply relevant mathematical skills, scientific concepts, and technological literacy and communication skills in developing a manufacturing system or process.

B. COMPUTER TECHNOLOGY SKILLS

By the end of this course, students will:

B1. use technical design and production skills to interpret and prepare drawings and to develop process plans for a manufacturing project;

B2. apply standard project management techniques in the context of a student-managed team project.

B2. demonstrate an understanding of the appropriate selection of materials to manufacture products to meet specific needs;

B4. demonstrate a working knowledge of the purpose, characteristics, and safe use of various hand tools, machine tools, power tools, and equipment used in the manufacture of products.

C. TECHNOLOGY, THE ENVIRONMENT, AND SOCIETY

By the end of this course, students will:

C1. demonstrate an understanding of ways in which the manufacturing industry affects



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the environment;

C2. demonstrate an understanding of ways in which the manufacturing industry affects society.

D. PROFESSIONAL PRACTICE AND CAREER OPPORTUNITIES

By the end of this course, students will:

D1. demonstrate an understanding of and compliance with the health and safety legislation, standards, and practices that are essential to the safe operation of a manufacturing facility;

D2. demonstrate an understanding of postsecondary pathways that lead to career opportunities in the manufacturing industry.

D3. (Comp Studies) describe postsecondary education and career prospects related to computer studies, manufacturing or robotics.

Outline of course content :

Unit: 1 Programming	Hours: 20
Unit: 2 Mechanical Systems	Hours: 15
Unit: 3 Electronics, Robotics, and Computer Interfacing	Hours: 30
Unit: 4 Robotics Design/Build	Hours: 35
Unit: 5 Professional Practice and Career Opportunities	Hours: 5
Culminating activity	Hours: 5
	Total hours: 110

All components of the course are delivered online

Mark reporting

Student marks will be posted online so that parents and students can see student progress and current marks through a secure reporting software.

Mark breakdown

Evaluations Throughout the course: 70% of final grade

Final Evaluation: 30% of final grade

The term work and Exam will be broken down in the following skill Categories:

Knowledge and Understanding	25%
Thinking	25%
Communication	20%
Application	30%

The activities completed during the course will account for the following percentages:



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Assignments	35%
Quizzes	15%
Tests	20%
Summative	30%

Achievement levels

Level 1 50-59%	Level 2 60-69%	Level 3 70-79%	Level 80-100%
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Teaching and Learning Strategies

Teachers use a variety of teaching strategies to maximize student learning. The following teaching strategies will be used in this course:

Teacher will utilize instruction that both responds to the characteristics of a diverse group of students and is precisely tailored to the unique strengths and needs of each student can be achieved using the principles and guidelines associated with three instructional approaches:

- 1) Universal Design for Learning (UDL),
- 2) differentiated instruction, and
- 3) the tiered approach to prevention and intervention. (Learning for All, Kindergarten to Grade 12: For more info please see <http://www.edu.gov.on.ca/eng/general/elemsec/speced/LearningforAll2013.pdf>)

What are UDL-aligned strategies? <https://goalbookapp.com/toolkit/strategies>

- UDL-aligned strategies are instructional methods and tools used by teachers to ensure that ALL students have an equal opportunity to learn. All of our strategies are aligned with Universal Design for Learning (UDL) guidelines. These guidelines help you to select strategies that remove barriers in instruction so that all students can achieve their learning goals.

- Differentiated Instruction is based on the idea that because students differ significantly in their interests, learning styles, and readiness to learn, it is necessary to adapt instruction to suit these differing characteristics. Teachers can differentiate one or a number of the following elements in any classroom learning situation (Tomlinson, 2004): the content of learning (what students are going to learn, and when); the process of learning (the types of tasks and activities); the products of learning (the ways in which students demonstrate learning); the affect/environment of learning (the context and environment in which students learn and demonstrate learning). (<http://edugains.ca/newsite/di/index.html>)



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Teaching and learning strategies adopted should be appropriate to the course type and should reflect an appropriate balance of theoretical components, practical applications for the course and appropriate to the range of student learning.

Helping students become self-directed.

In order to address the unique learning styles of students in this course, a variety of activities and learning experiences should be offered, including, but not restricted to: questioning, demonstrations, role-plays, simulations, co-operative group learning, brainstorming, discussion, peer coaching, interviewing, reflective writing, reflective thinking exercises, concept mapping, reading, tutoring, direct instruction, one-on-one teaching, and experiential learning.

Teachers will find ways throughout the course for students to make authentic learning connections with their other courses, the school, local community and the world at large. **Examples of teaching strategies:**

<ul style="list-style-type: none">• Brainstorming• Be the teacher• Case Studies• Computer technology – reports, spreadsheets, flow charts , data bases, electronic presentation;• Conferences• Documentaries/Videos /Ted Talks/Video critique• Flexible Grouping• Focus Groups–Informal discussions based on focus questions• Formal Debates/Informal debates• Graphic Organizers• Group critique• Group Discussions• Independent Study• Informal Debates• Internet Based Research/Investigation• Interview• Investigative and inquiry questions	<ul style="list-style-type: none">• Media Presentation• Peer feedback• Planning and writing analytical pieces of work• Provide specialized vocabulary• Reading: read for meaning• Reading: to develop the ability to use specialized vocabulary• Research Project –individual• Research Project-group• Role-play• Seminar• Skype interviews• Socratic Teaching• Structured discussion• Think-Pair Share• UDL-Aligned Strategies (see https://goalbookapp.com/toolkit/strategies)• Write or give a personal perspective in discussions
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Assessment & Evaluation of Student Performance

Assessment & Evaluation

The primary purpose of assessment and evaluation is to improve student learning and to help students assume responsibility for their learning.

Mid-term and final marks are determined through evaluations or Assessments of Learning, which typically occur towards the end of a unit and end of the term. During



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the learning process, information about a student's learning is gathered and used by the teacher and student to inform decisions that affect goal setting and teaching in the classroom. The data gathered as Assessment as Learning and Assessment *for* Learning do not carry a mark weight, but do play a crucial role in student success as they help inform the teacher about each student's progress. All types of assessments allow teachers to provide descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement.

Learning Skills and Work Habits (responsibility, organization, independent work, collaboration, initiative, self-regulation) will be reported by a letter (E = Excellent, G = Good, S = Satisfactory, N = Needs Improvement). These skills and habits support a high level of success in meeting the course expectations in addition to contributing to the development of positive life and work skills for the future.

Assessment FOR Learning

Observation	Conversation	Product
<ul style="list-style-type: none"> ● Class discussions ● Demonstrations ● Informal debate ● Performance tasks ● Presentations ● Role Play 	<ul style="list-style-type: none"> ● Brainstorming ● Debate ● Focused Conversations ● Oral pre-tests ● Oral quizzes ● Interviews ● Pair work ● Group work ● Portfolio conferencing ● Student teacher conferences 	<ul style="list-style-type: none"> ● 3-Minute Pause ● Assignments ● Diagnostic Assessment ● Exit tickets ● Graphic organizers ● Homework ● Journals/Letters/Emails ● Know, WonderLearn (KWL) ● Learning Logs ● Presentation (PPT/Prezi..) ● Problem solving ● Quiz/problem solving ● Vocabulary notebook ● Project ● Practical task

Assessment AS learning

Observation	Conversation	Student Product
<ul style="list-style-type: none"> ● Checklist/Feedback for group discussion ● Peer rating on presentations 	<ul style="list-style-type: none"> ● Student teacher conversations ● Questioning ● Moderated group discussions 	<ul style="list-style-type: none"> ● Entrance tickets ● Graphic organizers-KWL ● Journal ● Peer assessment



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<ul style="list-style-type: none"> • Teacher anecdotal feedback • Teacher feedback for a task • Teacher rating for a task • Whole class discussion 	<ul style="list-style-type: none"> • Peer-Oral feedback 	<ul style="list-style-type: none"> • Peer editing checklist • Pre-tests/Diagnostic tests • Quizzes • Reflections • Rough drafts • Self assessment • Self-proofreading using a checklist • Practical task
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Assessment of Learning

<p>Observation</p> <ul style="list-style-type: none"> • Class discussions • Demonstrations • Informal debate • Performance tasks • Presentations • Role Play 	<p>Conversation</p> <ul style="list-style-type: none"> • Brainstorming • Debate • Focused Conversations • Oral pre-tests • Oral quizzes • Interviews • Pair work • Group work • Portfolio conferencing • Student teacher conferences 	<p>Product</p> <p>3-Minute Pause</p> <ul style="list-style-type: none"> • Assignments • Diagnostic Assessment • Exit tickets • Graphic organizers • Homework • Journals/Letters/Emails • Know, WonderLearn (KWL) • Learning Logs • Presentation (PPT/Prezi..) • Problem solving • Quiz/problem solving • Vocabulary notebook • Project • Practical task
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Considerations for Program Planning

Instructional Approaches

Technological education involves knowing and doing and teaching and learning approaches should address both areas. Technological education involves knowing and doing and teaching and learning approaches should address both areas.

Programs in technological education should involve an open, collaborative, activity-based approach to teaching that accommodates students' interests, aspirations, and learning styles.



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The study of current events related to technologies in various industries, including emerging technologies, should inform the technological education curriculum, enhancing both the relevance and the immediacy of the program.

Health and safety in Technological education

. Before using any piece of equipment or any tool, students must be taught and be able to demonstrate knowledge of how the equipment or tool works and of the procedures they must follow to ensure its safe use. Personal protective gear must be worn as required.

The role of Information and Communications Technology in Technological Education

ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings.

All students must be made aware of issues of Internet privacy, safety, and responsible use, as well as of the potential for abuse of this technology, particularly when it is used to bully or promote hatred.

Planning Technological Education Programs for Students with Special Needs

In any given classroom, students may demonstrate a wide range of strengths and needs. Teachers plan programs that recognize this diversity and give students performance tasks that respect their abilities so that all students can derive the greatest possible benefit from the teaching and learning process.

In planning technological education courses for students with special education needs, teachers should begin by examining the current achievement level of the individual student, the strengths and learning needs of the student, and the knowledge and skills that all students are expected to demonstrate at the end of the course, in order to determine which of the following options is appropriate for the student:

- no accommodations or modified expectations; or
- accommodations only; or
- modified expectations, with the possibility of accommodations; or
- alternative expectations, which are not derived from the curriculum expectations for a course and which constitute alternative programs and/or courses.

Program Considerations for English Language Learners

In planning programs for students with linguistic backgrounds other than English, teachers need to recognize the importance of the orientation process, understanding



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that every learner needs to adjust to the new social environment and language in a unique way and at an individual pace.

During their first few years in Ontario schools, English language learners may receive support through one of two distinct programs from teachers who specialize in meeting their language-learning needs:

English as a Second Language (ESL)

English Literacy Development (ELD)

Antidiscrimination Education in Technological Education

Consideration should be given to a variety of strategies for communicating and working with parents and community members from diverse groups, in order to ensure their participation in such school activities as technology fairs, plays, and teacher interviews.

Offering choices from a range of instructional activities or allowing students to select their own projects can help motivate all the students in a classroom by acknowledging the differences in their experiences, attitudes, and interests.

Environmental Education in Technological Education

In each of the technological education courses, the expectations in the Technology/Industry Practices, the Environment, and Society strand allow students to develop critical thinking skills and an understanding of responsible practice with respect to the environmental implications of the technology they are studying. Students analyze the impact of technology on the environment and learn about the safe handling and disposal of materials and substances used in the development of products and the provision of services.

Students will be expected to actively engage in developing and implementing strategies to reduce, reuse, and recycle materials and products, and will learn about government agencies and community partners that have developed relevant opportunities to support such practices.

Literacy, Mathematical Literacy, and Inquiry/Research Skills

In all technological education courses, students are required to use appropriate and correct terminology, and are encouraged to use language with care and precision in order to communicate effectively.

The technological education program also builds on, reinforces, and enhances mathematical literacy. For example, clear, concise communication often involves the use of diagrams, tables, and graphs, and many components of the technological education curriculum emphasize students' ability to interpret and use symbols and charts. Students are also required to take accurate measurements, produce plans to specified dimensions, and use metric and imperial systems of measurement, as required in their particular area of study.



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The ability to locate, question, and evaluate information allows a student to become an independent, lifelong learner.

Program Planning Characteristics

- knowledge and skilled based
- developmentally appropriate to the learner
- inquiry based
- holistic, taking the whole student attributes such as cognitive, emotional, social and physical.
- transformational, helping students grow and reach their potential
- inclusive, engaging all students
- differentiated to meet students learning and motivational needs
- well documented, information shared on an ongoing basis with students and parents

Technological Devices:

Any device with windows 8 or newer will work on the software used for all courses.

For Online courses Electronic devices are necessary to access the course content and lessons. However, it is strongly recommended that students use other means such as paper and pencil when comprehension skills are required.

CWEC supports the use of technology to enhance learning, but the use of such electronic technology in the classroom is at the discretion of the teacher. Working together we can ensure the appropriate use of technology by all members of our school community.