



# Canada World Education

## Course Outline

<b>Course: MCV4U Calculus and Vectors</b>			
<b>Grade:</b> 12	<b>Type:</b> U C M O E	<b>Credit Value:</b> 1 <b>Credit hours:</b> 110	<b>Course code:</b> MCV4U <b>Dept:</b> Mathematics
<b>Teacher:</b> Dave Bocknek		<b>Development date:</b> June 2020	
<b>Course Reviser:</b> J.F. Michaud <b>Date:</b> June 2020		<b>Prerequisites:</b> Advanced Functions (MHF4U) must be taken prior to or concurrently with Calculus and Vectors (MCV4U). Functions MCR3U, Functions and Applications MCF3M	
<b>Resources Required:</b> electronic device with internet access <b>Text book:</b> none required Supplementary resources: Nelson Calculus and Vectors Gr. 12			
<b>Ministry Curriculum Documents:</b> <ul style="list-style-type: none"><li>- The Ontario Curriculum Grades 11 and 12 Mathematics revised, 2007 Growing Success – Assessment, Evaluation and Reporting in Ontario Schools-2010</li><li>- Learning for All – A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12, 2001</li><li>- Environmental Education: Scope and Sequence of Expectations, 2017</li><li>- Course Descriptions and Prerequisites, Grades 9 to 12, 2018</li><li>- Equity and Inclusive Education in Ontario Schools: Guidelines for Policy Development and Implementation</li><li>- Financial Literacy: Scope and Sequence of Expectations, Grades 9-12, 2016</li><li>- First Nations, Métis, and Inuit Connections – Scope and Sequence of Expectations, 2016</li><li>- Health and Safety: Scope and Sequence of Expectations, Grades 9–12, 2017</li></ul>			
<b>Course Description:</b> <p>This course builds on students' previous experience with functions and their developing understanding of rates of change. Students will solve problems involving geometric and algebraic representations of vectors and representations of lines and planes in three dimensional space; broaden their understanding of rates of change to include the derivatives of polynomial, sinusoidal, exponential, rational, and radical functions; and apply these concepts and skills to the modelling of real-world</p>			



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relationships. Students will also refine their use of the mathematical processes necessary for success in senior mathematics. This course is intended for students who choose to pursue careers in fields such as science, engineering, economics, and some areas of business, including those students who will be required to take a university-level calculus, linear algebra, or physics course.

## Overall Expectations

By the end of this course, students will:

- A. 1. demonstrate an understanding of rate of change by making connections between average rate of change over an interval and instantaneous rate of change at a point, using the slopes of secants and tangents and the concept of the limit;
- A. 2. graph the derivatives of polynomial, sinusoidal, and exponential functions, and make connections between the numeric, graphical, and algebraic representations of a function and its derivative;
- A. 3. verify graphically and algebraically the rules for determining derivatives; apply these rules to determine the derivatives of polynomial, sinusoidal, exponential, rational, and radical functions, and simple combinations of functions; and solve related problems
  - b.1. make connections, graphically and algebraically, between the key features of a function and its first and second derivatives, and use the connections in curve sketching;
- B.2. solve problems, including optimization problems, that require the use of the concepts and procedures associated with the derivative, including problems arising from real-world applications and involving the development of mathematical models.
- c.1. demonstrate an understanding of vectors in two-space and three-space by representing them algebraically and geometrically and by recognizing their applications;
- C.2. perform operations on vectors in two-space and three-space, and use the properties of these operations to solve problems, including those arising from real-world applications;
- C.3. distinguish between the geometric representations of a single linear equation or a system of two linear equations in two-space and three-space, and determine different geometric configurations of lines and planes in three-space;
- C.4. represent lines and planes using scalar, vector, and parametric equations, and solve problems involving distances and intersections.

## Outline of course content :

<b>Unit: 1</b> Rate of Change and Limits	Hours: 15
<b>Unit: 2</b> Derivatives and their Applications	Hours: 14
<b>Unit: 3</b> Trigonometry, Exponents and Logarithms	Hours: 16
<b>Unit: 4</b> Curve Sketching	Hours: 8
<b>Unit: 5</b> Optimization	Hours: 12
<b>Unit: 6</b> Geometric Vectors	Hours: 14
<b>Unit: 7</b> Algebraic Vectors	Hours: 14
<b>Unit: 8</b> Lines and planes	Hours: 15



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Exam

Hours: 2

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	30%
Thinking	20%
Communication	20%
Application	30%

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

Assignments	22%
Quizzes	15%
Tests	23%
Exam	30%

## Achievement levels

<b>Level 1 50-59%</b>	<b>Level 2 60-69%</b>	<b>Level 3 70-79%</b>	<b>Level 80-100%</b>
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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



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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> )

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

<b>Assessment as Learning</b>	<b>Assessment for Learning</b>
<b>Student Product</b> <ul style="list-style-type: none"> <li>• Entrance tickets</li> </ul>	<b>Student Product</b> <ul style="list-style-type: none"> <li>• 3-Minute Pause</li> </ul>



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<ul style="list-style-type: none"> <li>● Graphic organizers-KWL</li> <li>● Journal</li> <li>● Peer assessment</li> <li>● Peer editing checklist</li> <li>● Pre-tests/Diagnostic tests</li> <li>● Quizzes</li> <li>● Reflections</li> <li>● Rough drafts</li> <li>● Self assessment</li> <li>● Self-proofreading using a checklist</li> <li>● Practical task</li> </ul>	<ul style="list-style-type: none"> <li>● Assignments</li> <li>● Diagnostic Assessment</li> <li>● Exit tickets</li> <li>● Graphic organizers</li> <li>● Homework</li> <li>● Journals/Letters/Emails</li> <li>● Know, WonderLearn (KWL)</li> <li>● Learning Logs</li> <li>● Presentation (PPT/Prezi..)</li> <li>● Problem solving</li> <li>● Quiz/problem solving</li> <li>● Vocabulary notebook</li> <li>● Project</li> <li>● Practical task</li> </ul>
<p><b>Observation</b></p> <ul style="list-style-type: none"> <li>● Checklist/Feedback for group discussion</li> <li>● Peer rating on presentations</li> <li>● Teacher anecdotal feedback</li> <li>● Teacher feedback for a task</li> <li>● Teacher rating for a task</li> <li>● Whole class discussion</li> </ul>	<p><b>Observation</b></p> <ul style="list-style-type: none"> <li>● Class discussions</li> <li>● Demonstrations</li> <li>● Informal debate</li> <li>● Performance tasks</li> <li>● Presentations</li> <li>● Role Play</li> </ul>
<p><b>Conversation</b></p> <ul style="list-style-type: none"> <li>● Student teacher conversations</li> <li>● Questioning</li> <li>● Moderated group discussions</li> <li>● Peer-Oral feedback</li> </ul>	<p><b>Conversation</b></p> <ul style="list-style-type: none"> <li>● Brainstorming</li> <li>● Debate</li> <li>● Focused Conversations</li> <li>● Oral pre-tests</li> <li>● Oral quizzes</li> <li>● Interviews</li> <li>● Pair work</li> <li>● Group work</li> <li>● Portfolio conferencing</li> <li>● Student teacher conferences</li> </ul>
<p><b>Considerations for Program Planning</b></p> <ul style="list-style-type: none"> <li>● Individual Education Plan: Accommodations to meet the needs of exceptional students as set out in their Individual Education Plan will be implemented within the classroom program. Additional assistance is available through tutoring.</li> <li>● The Role of Technology in the Curriculum. Using information technology will assist students in the achievement of many of the expectations in the</li> </ul>	



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curriculum regarding research, written work, analysis of information, and visual presentations.

- English As a Second Language (ESL): Appropriate accommodations in teaching, learning, and evaluation strategies will be made to help ESL students gain proficiency in English.
- Programs will involve an open, collaborative, activity-based approach to teaching that accommodates students' interests, aspirations, and learning styles. Activities will be designed to include both individual and team approaches, with emphasis on equity and inclusive education, financial literacy, careers, and health and safety.

## **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.