**EAST YORK COLLEGIATE INSTITUTE**

**MCV4U Course Outline Winter 2015**

This Course Outline is based upon the Ministry of Education and Training Ontario Curriculum for Grade 12 Mathematics as per the revised document of 2007.

***Board:*** Toronto District School Board

***School:*** East York Collegiate Institute

***Curriculum Leader:*** R.Singh

***Developing Teachers:*** R.Singh, D. Rowsell

***Date of Revision:*** January 2015

***Course Title:*** Calculus and Vectors, Grade 12, University Preparation

***Grade:*** 12

***Code:*** MCV4U

***Credit Value:*** 1.0

***Prerequisite:*** Advanced Functions, Grade 12, University Preparation (MHF4U)

***Textbooks:*** Advanced Functions and Introductory Calculus, Harcourt (2002) Geometry and Discrete Mathematics, Harcourt (2002)

***Resources:*** Calculus and Vectors 12, McGraw-Hill Ryerson (2008) Calculus and Vectors 12, Nelson (2008)

Algebra and Geometry, Holt, Rinehart and Winston (1988) Teacher-made Worksheets

Graphing Calculators & Computers

**Course Description**

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 modeling of real-world relationships. Throughout the course, students will engage in the following processes: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing and Communicating. This course is intended for students who choose careers in fields such as science, engineering, economics, and some areas of business, including those who will be required to take a university- level calculus, linear algebra or physics course.

**Strands**

Rate of Change 29 periods Derivatives and Their Applications 25 periods Geometry and Algebra of Vectors 34 periods

**Program Planning Considerations**

***Exceptional Students****:* Additional time will be allowed for tests. Additional accommodations will be provided in consultation with the Guidance, Special Education and ESL departments.

***Technology:*** Graphing Calculators, and Computers will be utilized for technology-related applications.

***Career Education:*** Links to related fields will be established throughout the course. ***Co-operative Education****:* These will be provided in association with Guidance Department. ***Mathematics Anxiety****:* Attention will be addressed according to the following:

• Cultural perspectives

• Positive reinforcements

• Variety of assessment techniques

• Group structures

• Consideration for Learning Styles

**Learning Skills**

Assessment of the learning skills will be done on an ongoing basis throughout the academic year by observations of students at work, checklists and interviews. This will include:

Classwork/homework (Work habits, homework and organization) Completed work and seeking assistance (Organization and initiative)

Persistence and independence at tasks (Working independently and initiative) Extension of task (Organization and initiative**)** Achievement of group goals (Team work)

**Assessment Strategies**

A variety of teaching/assessment strategies to address students’ needs will be used during the school year. Formative assessments will be ongoing through out the academic year. These may include:

• Diagnostic assessment

• Formative assessment

• Performance assessment

• Portfolio assessment

• Rubrics

• Checklists

**Term Summative Evaluations (70% Term Work)**

• Tests, quizzes, tasks and other forms of term summative evaluations will occur throughout the academic year at the end of units of work as outlined in the accompanying course outline.

• Students will be provided with reasonable opportunities to master skills relating to the achievement of the curriculum

expectations before assessment and evaluation occurs.

• Major evaluations will be announced at least one week in advance.

• Accommodations will be made for school activities, statutory holidays, religious days, cultural days, sports events and other occurrences that may impact on any scheduled evaluation. It is the student’s responsibility to notify teachers of such absences in advance and to make up missed work.

• Absence on the day of an evaluation must be documented. If a student must miss an evaluation, s/he is expected to:

a) see the teacher before the absence to arrange for an alternative date to make up the evaluation; or

b) in case of illness or unexpected absence, present a note to the teacher, signed by a parent or guardian, immediately upon their return to explain the absence. An alternate evaluation will then be scheduled at a mutually convenient time.

• The East York Late Policy applies to all assignments and evaluations. See your Agenda book.

• Cheating will not be tolerated in any form and will be dealt with appropriately.

**Final Mark Calculation**

Calculation of the Term Mark will be based upon the ***Categories*** of the ***Achievement Chart***. This chart is meant to assist teachers in planning instruction and learning activities for the achievement of the curriculum expectations. It is also used in designing assessment and evaluation tools and in providing feedback to students. Each mathematical topic will contain each category in the chart due to the integrated nature of the discipline in mathematics. Final marks will be calculated as follows:

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| **Term Work:** |  | **70%** | ***Levels of Achievement:*** |
| Knowledge and Understanding: | 35% |  | Level 1: 50 - 59% |
| Application: | 35% |  | Level 2: 60 – 69% |
| Thinking and Inquiry: | 15% |  | Level 3: 70 – 79% |
| Communication: | 15% |  | Level 4: 80 - 100% |
| **Final Summative Evaluation**  **Reporting** |  | **30%** |  |

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| **Report #1** | **Report #2** | **June Report** |
| 100% Term Work | 100% Term Work  (Cumulative) | 70% Term Work + 30% Final Summative Evaluation  (Cumulative) |

**Communication**

***Access to extra help and mark records***. Students are encouraged to consult their teachers on a regular basis for extra help and guidance as it relates to improving their academic performance. Students are also expected to discuss strategies for improving their grades with their teachers. Students are expected to view their report cards as an indication of their current achievement and discuss with teachers for clarification.

***Communication with Parents/Guardians***. Comments pertaining to academic achievement and learning skills are placed on the report cards are primarily to provide feedback for parents/guardians as well as students. Parent/guardian nights can be used for one to one discussion. At times it may be necessary to contact parents/guardians by telephone to discuss a student’s performance. Parents/guardians are also encouraged to contact teachers as and when the need arises.

EAST YORK COLLEGIATE INSTITUTE

**MCV4U Daily Course Outline 2014 - 2015**

**Textbooks:** Calculus and Vectors (Nelson)

**Strand #1: RATE OF CHANGE (29 periods)**

Overall Expectations:

• To demonstrate an understanding of the 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 limits;

• To 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;

• To 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 functions.

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| **Per #** | **TOPIC** | **Section** | **ASSIGNMENT** | **Supplementary Resources** |
|  |  |  |  |  |
| **UNIT #1: INTRODUCTION TO CALCULUS (13 periods) AFIC** | | | | |
| 1 & 2 | Evaluating Limits Graphically | 3.3 | p 97-99, # 4–10, 12, 13 | Limits sheets |
| 3 | Piecewise-defined Functions | 3.3 | p. 99, #11 | Lesson sheet |
| 4, 5, 6 | Evaluating Limits Algebraically | 3.4 | p 105-107, # 1–19 | Practice sheet |
| 7 | Continuity | 3.5 | p 110-112, # 1–14 |  |
| 8 | TEST #1 |  |  |  |
| 9 & 10 | The Slope of a Tangent Line | 3.1 | p 83-86, # 6, 11, 18 – 20 |  |
| 11 | The Derivative Function using First Principles | 4.1 | p 130-132, # 1, 5, 6, 9, 10, 12 |  |
| 12 | Review |  | p. 115 #1-3, 7-12, 17, 18 | Review sheet |
| 13 | TEST #2 |  |  |  |
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| **UNIT #2: DERIVATIVES (9 periods)** | | | | |
| 1 & 2 | Derivatives of Polynomial Functions | 4.2 | p 138-140, # 1–26 |  |
| 3 & 4 | Derivative of a Product of Functions | 4.3 | p 145-146, #1–8,10–12 |  |
| 5 | Derivative of Rational Functions | 4.4 | p 149-150, # 1–12 | De-emphasize Quotient Rule |
| 6 & 7 | Derivative of Composite Functions | 4.6 | p 158-160, # 1–15 |  |
| 8 | Review |  | p. 163, #1-20 | Review sheet |
| 9 | TEST #3 |  |  |  |
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| **UNIT #3: DERIVATIVES OF EXPONENTIAL & SINUSOIDAL FUNCTIONS (7 periods)** | | | | |
| 1 | The Derivative of y = ex | 8.1 | p 302-304, # 1–14 |  |
| 2 | The Derivative of y = lnx | 8.2 | p 309-311, # 3-11 |  |
| 3 | Derivatives of General Exponential  & Logarithmic Functions | 8.3 | p 315-317, # 1–9 |  |
| 4 | Derivatives of y=sinx, y=cos x & y=tanx | Appendix  A2 | p. 400, #1, 2, 5 |  |
| 5 | More Derivatives of Trigonometric Functions |  |  | Practice sheets |
| 6 | Review |  | p. 330, #1-17 (select) | Review sheets |
| 7 | TEST #4 |  |  |  |

**Strand #2: DERIVATIVES AND THEIR APPLICATIONS (25 periods)**

Overall Expectations:

• To 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;

• To solve problems, including optimization problems, that require the use of concepts and procedures associated with the derivative,

including problems arising from real-world applications and the development of mathematical models.

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| **Per #** | **TOPIC** | **Section** | **ASSIGNMENT** | **Supplementary Resources** |
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| **UNIT #4: CURVE SKETCHING (10 periods) AFIC** | | | | |
| 1 | Increasing and Decreasing Functions | 9.1 | p 342-344, # 1–11 | **See Summary Sheet**  **& Assignment Sheets:**  Can introduce all topics at the beginning and make graphs more complicated over 6 periods. |
| 2 | Critical Points and Relative Maxima/Minima | 9.2 | p 349-351, # 1–13 |
| 3 | Asymptotes | 9.3 | p 361-362, # 1–14, |
| 4 | Concavity and Points of Inflection | 9.4 | p 369-371, # 1-13 |
| 5 & 6 | An Algorithm for Graph Sketching | 9.5 | p 375, # 1–8 |
| 7 & 8 | Exponential & Logarithmic Functions |  |  |
| 9 | Review |  | p. 378, #2-12 | Review Sheet |
| 10 | TEST #5 |  |  |  |

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| **Per #** | **TOPIC** | **Section** | **ASSIGNMENT** | **Supplementary Resources** |
| **UNIT #5: APPLICATIONS OF DERIVATIVES (15 periods)** | | | | |
| 1 & 2 | Higher-Order Derivatives;  Velocity & Acceleration,- Straight Line Motion | 5.2 | p 185-188, # 1–15, (#16–19) | Blob Demo with TI-83  Lesson & Exercise sheets |
| 3 & 4 | Rates of Change | 3.2 | p 92-94, # 1–19 | Problem Sheet |
| 5 & 6 | TEST #6  Maximum/Minimum on an Interval | 5.4 | p 200-202, # 1–12 |  |
| 7, 8 & 9 | Optimization Problems | 5.5 | p 206-208, # 1–18 | Assignment Sheets |
| 10 & 11 | Optimizing in Economics & Science | 5.6 | p 213-216, # 1–12 | Assignment Sheets |
| 12 | Optimization Problems – Exponential Functions | 8.4 | p 320-323, # 1–14 | Assignment Sheets |
| 13 & 14 | Review |  | p. 219-222, #10, 13-16, 24-31 p. 331, #11-15 | Review Sheets |
| 15 | TEST #7 |  |  |  |

**Strand #3: GEOMETRY AND ALGEBRA OF VECTORS (34 periods)**

Overall Expectations:

• To demonstrate an understanding of vectors in two-space and three-space by representing them algebraically and geometrically and by recognizing their applications;

• To 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;

• To 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.

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| **UNIT #6: VECTORS (6 periods) MGA** | | | | |
| 1 | Vector Concepts | 4.1 | p 127 #2, 6-12 |  |
| 2 | Vector Laws | 4.2 | p 133 #1, 3, 4, 6, 7, 11, 18, 20 |  |
| 3 | Force as a Vector | 4.3 | p 142 #6, 7, 12, 13, 18, 19, 22 |  |
| 4 | Velocity as a Vector | 4.4 | p 149 #2, 3, 4, 5, 8, 10, 11 |  |
| 5 | Review Exercise |  | p 153 #1-19 p 155 #1-8 | Review Sheet |
| 6 | TEST #8 |  |  |  |
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| **UNIT #7: ALGEBRAIC VECTORS & APPLICATIONS (10 periods)** | | | | |
| 1 | Algebraic Vectors in 2-Space | 5.1 | p 166 #1, 2, 3, 6, 7, 13, 19 |  |
| 2 | Algebraic Vectors in 3-Space | 5.1 | p. 166, #4, 5, 8-12, 14, 17, 22 |  |
| 3 | Operations With Algebraic Vectors | 5.2 | p 172 #2-4, 6-9, 12, 13, 17, 18 |  |
| 4 | The Dot Product of Two Vectors | 5.3 | p 178 #1-19 (select) |  |
| 5 | Applications of the Dot Product | 5.5 | p. 192 #1, 3, 5, 9-11, 13, 15, 17 |  |
| 6 | The Cross Product of Two Vectors | 5.4 | p 185 #197, 9, 10 |  |
| 7 | Applications of the Cross Product | 5.5 | p 192 #6-8, 18 |  |
| 8 & 9 | Review Exercise |  | p 194 #1-17 p 197 #1-7 | Review Sheet |
| 10 | TEST #9 |  |  |  |
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| **UNIT #8: LINES IN A PLANE (8 periods)** | | | | |
| 1 | Parametric and Vector Equations of a Line | 7.1 | p 245 #1-16 (select) |  |
| 2 | The Scalar Equation of a Line in a Plane | 7.2 | p 251 #1-9 |  |
| 3 | Equations of a Line in 3-Space | 7.3 | p 256 #1-12, 14 (select) |  |
| 4 | Distance Formulae in 2- & 3-Space | 7.2  7.3 | p. 252, #11, 12 p. 258, #15 |  |
| 5 & 6 | The Intersection of Two Lines | 7.4 | p 263 #1-11 |  |
| 7 | Review Exercise |  | p 266 #1-15 p 270 #1-7 |  |
| 8 | TEST #10 |  |  |  |
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| **UNIT #9: EQUATIONS OF PLANES (10 periods)** | | | | |
| 1 | The Vector Equation of a Plane in Space | 8.1 | p 279 #1-10 |  |
| 2 & 3 | The Scalar Equation of a Plane in Space | 8.2 | p 285 #1-13 |  |
| 4 | The Intersection of a Line and a Plane | 8.3 | p 292 #1-3, 7, 8 |  |
| 5 | Sketching Planes | 8.3 | p. 293, #4-6, 9-11 |  |
| 6 | The Intersection of Two Planes | 8.4 | p 300 #1-3 |  |
| 7 | Using Matrices | 8.4 | p. 301, #6, 8, 9 |  |
| 8 | The Intersection of Three Planes | 8.5 | p 308 #8 | Lesson & Assignment Sheet |
| 9 | Review Exercise |  | p 312 #1-22 p 315 #1-7 |  |
| 10 | TEST #11 |  |  |  |
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|  | **Cumulative Review (Units #1-9) FINAL SUMMATIVE EVALUATION (30%)** | | | |