Ontario eSecondary School
Course Outline
2023-2024

Ministry of Education Course Title: Mathematics for College Technology	
Ministry Course Code: MCT4C	
Course Type: College Preparation	
Grade: 12	
Credit Value: 1.0	
Prerequisite(s): Functions and Applications, Grade 11, University/College Preparation, or Functions, Grade 11, University Preparation	
Department: Mathematics	
Course developed by: **Kiran Sandhar**	**Created: March 1, 2020**
Length: **One Semester**	**Hours:** **110**

This course has been developed based on the following Ministry documents:

1. *The Ontario Curriculum, Grades 11 and 12 Mathematics, Revised 2007*
2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)*
3. *Learning for All (2013)*

COURSE DESCRIPTION/RATIONALE

This course enables students to extend their knowledge of functions. Students will investigate and apply properties of polynomial, exponential, and trigonometric functions; continue to represent functions numerically, graphically, and algebraically; develop facility in simplifying expressions and solving equations; and solve problems that address applications of algebra, trigonometry, vectors, and geometry. Students will reason mathematically and communicate their thinking as they solve multi-step problems. This course prepares students for a variety of college technology programs.

OVERALL CURRICULUM EXPECTATIONS

Unit 1 & 2:
By the end of this course, students will:

- solve problems involving exponential equations graphically, including problems arising from real-world applications;
- solve problems involving exponential equations algebraically using common bases and logarithms, including problems arising from real-world applications.

Unit 3:
By the end of this course, students will:

- recognize and evaluate polynomial functions, describe key features of their graphs, and solve problems using graphs of polynomial functions;
- make connections between the numeric, graphical, and algebraic representations of polynomial functions;
- solve polynomial equations by factoring, make connections between functions and formulas, and solve problems involving polynomial expressions arising from a variety of applications.

Unit 4:
By the end of this course, students will:

- determine the values of the trigonometric ratios for angles less than 360º, and solve problems using the primary trigonometric ratios, the sine law, and the cosine law;
- make connections between the numeric, graphical, and algebraic representations of sinusoidal functions;
- demonstrate an understanding that sinusoidal functions can be used to model some periodic phenomena, and solve related problems, including those arising from real-world applications

Unit 5:
By the end of this course, students will:

- represent vectors, add and subtract vectors, and solve problems using vector models, including those arising from real-world applications;
- solve problems involving two-dimensional shapes and three-dimensional figures and arising from real-world applications;
- determine circle properties and solve related problems, including those arising from real-world applications.

COURSE CONTENT

Unit	*Length*
1: Exponential Functions	19 hours
2: Logarithmic Functions	18 hours
3: Polynomial Functions	18 hours
4: Trigonometric Functions	25 hours
5: Vectors and Applications of Geometry	20 hours
Culminating Project	8 hours
Final Exam	2 hours
TOTAL	110 hours

UNIT DESCRIPTIONS

Unit 1 & 2- Exponential and Logarithmic Functions
Through models, students are introduced to the definition of an exponential function and the notations associated with it. Students use graphing technology and paper-and-pencil tasks to investigate the properties of exponential functions. Students explore the domain and range of functions. Students investigate properties of exponential functions and logarithmic functions. The relationship between exponential function and logarithmic function is explored both algebraically and graphically. Students use laws of logarithms to simplify and evaluate logarithmic expressions, and to solve problems. A variety of models are examined.

Unit 3 - Polynomial functions
Students are introduced to the main concepts of graphing polynomial functions in order to explore them. Later in the course. Students examine the type and numbers of intercepts, the effect of changing coefficients, symmetry and the degree in relation to the shape of the functions. Using skills from previous years, students explore curve sketching from a factored form. Students will explore polynomial equations. Real and complex roots of both factorable and non-factorable polynomials are determined through graphical investigation and algebraic manipulation. Finally, students will solve problems that involve functions arising from real-world applications.

Unit 4- Trigonometric Functions
Students investigate the periodic nature and graphical properties of the primary trigonometric functions. Students use the primary trigonometric ratios, the sine law, and the cosine law to model and solve triangles. Students investigate the relationship between degree and radian measure, and explore the use of the unit circle and special triangles to determine selected values of the primary trigonometric ratios. Students consolidate and extend concepts first introduced. Using technology, students explore the effects of simple transformations on their graphs and equations. Students apply these concepts to model authentic and real-world problems. Students develop the skills to manipulate and solve trigonometric equations.

Unit 5 - Vectors and Applications of Geometry
Students will investigate, and then solve real-world problems. They will demonstrate an understanding of vectors, two-dimensional, three-dimensional in a variety of ways, including circle and related problems

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection is an opportunity for students to look back at concepts and theories with new eyes, to relate theory to practice, and to align learning with their own values and beliefs.

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Discussion forums are an opportunity for students to summarize and share their ideas and perspectives with their peers, which deepens understanding through expression. It also provides an opportunity for peer-to-peer feedback.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts. Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, relate variables, and examine relationships.

Diagrams are visual representations of mathematical ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphs and charts are visual representations of math concepts and analysis. This helps us to see the relationships within and between sets of data.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

ASSESSMENT, EVALUATION, AND REPORTING

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

Evaluation: Assessment of Learning focuses on Evaluation which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

Reporting: Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress. Assessment of student acquisition of learning skills also occurs regularly through unobtrusive teacher observation and conferencing.

Teachers are encouraged to share goals with students early in the course and to connect unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks. The teacher is encouraged to involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool..

ASSESSMENT ACTIVITIES

- ❑ Homework assignments
- ❑ Individual conference meetings
- ❑ Diagnostic tests and writing tasks
- ❑ Completed Templates & Graphic Organizers
- ❑ Reflections
- ❑ Oral presentations & Active Listening
- ❑ Tests & Exam
- ❑ Evaluations

EVALUATION

The final grade will be determined as follows:

- ❑ 70% of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
- ❑ 30% of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

  (*Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Ontario Ministry of Education Publication, 2010 p.41)

	Weight
Course Work	**70**
Knowledge/Understanding (K)	20
Thinking/Inquiry (T)	15
Communication (C)	15
Application (A)	20
Final	**30**
Exam (9.9K, 4T, 1.3C, 4.8A)	20
Culminating Project (2.5K, 2.5T, 2.5C, 2.5A)	10

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category	Weight Factor (1-10)
Reflective research projects	Research-based projects for each unit based on applications of learned functions to real life problems	K,T,C,A	7
Problem sets Learning Logs	Problem sets supplement lessons and are used to assess whether or not students are meeting criteria for success	K,T,C	5
Simulations/Live interview evaluations	Live interviews are used to evaluate students through observation and conversation. Some of these are a part of other research projects.	K,T,C,A	5
Unit Test(s)	Unit tests are based on curriculum expectations and cover the entirety of each unit	K,T,C,A	10

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category
Final Exam 20%	A final, written examination, covering all curriculum expectations for the course.	K,T,C,A
Culminating Project 10%	A comprehensive project, covering all overall curriculum expectations for the course.	K,T,C,A

AFL/AAL/AOL TRACKING SHEET

Unit 1 & 2: Exponential Functions & Logarithmic Functions

AAL	AFL	AOL
0.1 Course Notes **1.1 Course Notes** **1.2 Course Notes** **1.3 Course Notes** **1.4 Course Notes** **2.1 Course Notes** **2.2 Course Notes** **2.3 Course Notes** **2.4 Course Notes**	**0.1 Problem Set** **1.1 Problem Set** **1.2 Problem Set** **1.3 Problem Set** **1.4 Problem Set** **2.1 Problem Set** **2.2 Problem Set** **2.3 Problem Set** **2.4 Problem Set**	**Unit Project: History of Springfield & Shelbyville** **Video Conference** **Learning Log** **Unit Project: How to Survive a Zombie Attack**

Unit 3: Polynomial Functions

AAL	AFL	AOL
3.1 Course Notes **3.2 Course Notes** **3.3 Course Notes** **3.4 Course Notes** **3.5 Course Notes** **3.6 Course Notes**	**3.1 Problem Set** **3.2 Problem Set** **3.3 Problem Set** **3.4 Problem Set** **3.5 Problem Set** **3.6 Problem Set**	**Video Conference** **Learning Log** **Unit Test**

Unit 4: Trigonometric Functions

AAL	AFL	AOL
4.1 Course Notes **4.2 Course Notes**	**4.1 Problem Set** **4.2 Problem Set**	**Video Conference**

4.3 Course Notes **4.4 Course Notes** **4.5 Course Notes** **4.6 Course Notes** **4.7 Course Notes** **4.8 Course Notes** **4.9 Course Notes**	**4.3 Problem Set** **4.4 Problem Set** **4.5 Problem Set** **4.6 Problem Set** **4.7 Problem Set** **4.8 Problem Set** **4.9 Problem Set**	**Learning Log** **Unit Test**

Unit 5: Vectors and Applications of Geometry

AAL	AFL	AOL
5.1 Course Notes **5.2 Course Notes** **5.3 Course Notes** **5.4 Course Notes** **5.5 Course Notes** **5.6 Course Notes** **5.7 Course Notes**	**5.1 Problem Set** **5.2 Problem Set** **5.3 Problem Set** **5.4 Problem Set** **5.5 Problem Set** **5.6 Problem Set** **5.7 Problem Set**	**Video Conference** **Learning Log** **Unit Project**

Finals

AOL (30% of Final Mark)
Culminating Activity (10%)
Final Exam (20%)

CONSIDERATION FOR PROGRAM PLANNING

PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario's English language schools is a language other

than English. Ontario's linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. 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. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. The following three types of accommodations may be provided:

- ***Instructional accommodations:*** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- ***Assessment accommodations:*** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- Provide step-by-step instructions.
- Help students create organizers for planning writing tasks.
- Allow students to report verbally to a scribe (teacher/ student) who can help in note taking.
- Permit students a range of options for reading and writing tasks.
- Where an activity requires reading, provide it in advance.
- Provide opportunities for enrichment.