General Information.

Discipline: Mathematics   *Course code*: 201-115-AB

Ponderation: 3-2-3   *Credits*: $2\frac{2}{3}$

Prerequisite: Admission to program

Competency Code: 027B (in progress)

Competency information is explained in your Engineering Technologies program CD.

Introduction. Mathematical Models I is the first Mathematics course in the Engineering Technology Program. Therefore, students taking this course are expected to have an adequate knowledge of basic algebra from secondary school. This is essential so that those basic skills can be further developed during this course. Some topics of study include algebraic notions of, vectors, complex numbers, and systems of equations. Furthermore, the basics of Differential Calculus are introduced to prepare students for further study of Calculus in Mathematical Models II. As a result, a general theme of this course is to use mathematical concepts in applied areas of science and engineering. The primary purpose of the course is the partial attainment of Objective 027B (To organize information of the working environment of engineering technology). To achieve this objective, the course covers vectors, complex numbers, trigonometric, exponential, and logarithmic functions, and the mathematical modeling of physical situations. The course emphasizes clarity in reasoning and in application of methods. The basic concepts are illustrated by applying them to various problems where their application helps arrive at a solution. In this way, the course encourages students to apply learning acquired in one context to problems arising in another.

Teaching Methods. This course is 75 hours, meeting three times a week for a total of 5 hours a week. Classes are primarily lectures, with discussions and problem-solving. If a student is absent from class, it is their responsibility to get the material covered that day. In addition, it is very important that students spend several hours per week reviewing the course material and solving suggested exercises. In the event that a student is experiencing difficulty, contact your instructor as soon a possible or one of the other resources listed directly below.

Other Resources.

Math Website.
http://departments.johnabbott.qc.ca/departments/mathematics

Math Study Area. Located in H-200A and H-200B; the common area is usually open from 8:30 to 17:30 on weekdays as a quiet study space. Computers and printers are available for math-related assignments. It is also possible to borrow course materials when the attendant is present.

Math Help Centre. Located in H-216; teachers are on duty from 8:30 until 15:30 to give math help on a drop-in basis.

Academic Success Centre. The Academic Success Centre, located in H-139, offers study skills workshops and individual tutoring.

Evaluation Plan. The Final Evaluation in this course consists of the Final Exam, which covers all elements of the competency. The Final Grade is a combination of the Class Mark and the mark on the Final Exam. The Class Mark will include results from three or more in-class written tests (worth a maximum 75% of the Class Mark), homework, quizzes or other assignments/tests (worth a minimum 25% of the Class Mark). The specifics of the Class Mark will be given by each instructor during the first week of classes in an appendix to this outline. Every effort is made to ensure equivalence between the various sections of this course. The Final Exam is set by the Course Committee (which consists of all instructors currently teaching this course), and is marked by each individual instructor.

The Final Grade will be the better of:

50% Class Mark, 50% Final Exam Mark
or
25% Class Mark, 75% Final Exam Mark

A student *choosing not to write* the Final Exam will receive a failing grade of 50% or their Class Mark, whichever is less.

Students must be available until the end of the final examination period to write exams.

Note that in the event of unexpected changes to the academic calendar, the evaluation plan may be modified.

Textbook. Your teacher may require *Basic Technical Mathematics with Calculus, 11th Edition*, by Ally J. Washington (Pearson); it is available from the college bookstore for about $190.

Course Costs. In addition to the cost of the text (about $190), the instructor may recommend purchase of a scientific, non-programmable calculator (about $25).

College Policies.

Policy No. 7 - IPESA, Institutional Policy on the Evaluation of Student Achievement: https://www.johnabbott.qc.ca/wp-content/uploads/2021/05/Policy-No.-7-IPESA-FINAL.pdf.

Religious Holidays (Article 3.2.13 and 4.1.6). Students who wish to miss classes in order to observe religious holidays must inform their teacher of their intent in writing within the first two weeks of the semester.

Student Rights and Responsibilities: (Article 3.2.18). It is the responsibility of students to keep all assessed material returned to them and/or all digital work submitted to the teacher in the event of a grade review. (The deadline for a Grade Review is 4 weeks after the start of the next regular semester.)

Student Rights and Responsibilities: (Article 3.3.6). Students have the right to receive graded evaluations, for regular day division courses, within two weeks after the due date or exam/test date, except in extenuating circumstances. A maximum of three (3) weeks may apply in certain circumstances (ex. major essays) if approved by the department and stated on the course outline. For evaluations at the end of the semester/course, the results must be given to the student by the grade submission deadline (see current Academic Calendar). For intensive courses (i.e.: intersession, abridged courses) and AEC courses, timely feedback must be adjusted accordingly.

Academic Procedure: Academic Integrity, Cheating and Plagiarism (Article 9.1 and 9.2). Cheating and plagiarism are unacceptable at John Abbott College. They represent infractions against academic integrity. Students are expected to conduct themselves accordingly and must be responsible for all of their actions.

College definition of Cheating: Cheating means any dishonest or deceptive practice relative to examinations, tests, quizzes, lab assignments, research papers or other forms of evaluation tasks. Cheating includes, but is not restricted to, making use of or being in possession of unauthorized material or devices and/or obtaining or providing unauthorized assistance in writing examinations, papers or any other evaluation task and submitting the same work in more than one course without the teacher's permission. It is incumbent upon the department through the teacher to ensure students are forewarned about unauthorized material, devices or practices that are not permitted.

College definition of Plagiarism: Plagiarism is a form of cheating. It includes copying or paraphrasing (expressing the ideas of someone else in one's own words), of another person's work or the use of another person's work or ideas without acknowledgement of its source. Plagiarism can be from any source including books, magazines, electronic or photographic media or another student's paper or work.

Course Content (with selected exercises)**.** The exercises listed should help you practice and learn the material taught in this course; they form a good basis for homework. Your teacher may supplement this list during the semester. Regular work done as the course progresses should make it easier for you to master the course.

Review.

1.3 Significant Digits including use with Scientific Notation 13-30, 45-80

2.4 Radians, Degrees and Steradians, 5-8,17-32,43,44 and instructors examples

2.6 Solids 28-40

System of Linear Equations.

5.4 Two Equations in 2 variables algebraically 41-56

5.5 Two Equations in 2 variables by determinants 5,10,16,21,22,25,26,35-39,41,42

5.6 Three Equations in 3 variables algebraically 3,13,15,20,21,22,23

5.7 Three Equations in 3 variables by determinants 3,11,12,15,24,31-37

Vectors and Oblique Triangles.

9.1 Introduction 5-9,14,16,18,41,42,44,46,47,48 (also use rads)

9.2 Components 5-10,23,26,28,30 (also use rads)

9.3 Addition 25-34

9.4 Application 7-13,16,18,19,22,28,30

9.5 Law of Sines 3-5,23-45

9.6 Law of Cosines 3,7,21,23-40

Graphs of the Trigonometric Functions.

10.3 Trigonometric Graphs of sine and cosine (review) 3-26

10.5 Applications 7-22

Additional topics in Trigonometry.

20.5 Solving Trigonometric Equations 5-38

Complex Numbers.

12.1 Basics Definitions of Complex Numbers 7,11,15,17,20,25-27,30,33,36,40,43,45,48,49-59

12.2 Basic Operations with Complex Numbers 7,11,18,20,29,30,32,35,36,38,40-43,50,53,56,58

12.3 Graphs 3-18

12.4 Polar Form 3,4,8,15,18-21,27-29,32

12.5 Exponential Form 5-9,13,16,25,26,33,36

12.6 Products, Quotients, Powers and Roots 6,7,9,11,14,16,21,22,26,29,34,39,40

12.7 Application 3-16

Exponentials and Logarithmic Functions.

13.1 Review of Exponentials Functions

13.2 Review of Logarithmic Functions

13.3 Properties of exponentials and logs 10,13,16,22,24,27,29,34,36,45-62

13.4 Common logs 3,5,7,12,13,16,17,19,21

13.5 Natural logs 4,10,12,13,16,19

13.6 Equations 3-44

The Derivative.

23.1 Limits 31-48,57-60

23.2 Slope of Tangent 9

23.3 Derivative (using h) 8,19,27,30,34-38

23.5 Polynomials 10,15,22,24,27,28,37-53

23.6 Product and Quotient Rule 13,19,22,24,35,38,41,43,45,47,52,54,55

23.7 Power Rule 14,22,26,28,30,32,41,43,46,53

23.8 Implicit Differentiation using Differentials 11,18,21,26,31,32,35,36,41,45

23.9 Higher Derivatives 3-26, 31-36

Differentiation of Transcendental Functions.

27.1 Derivatives of Sine and Cosine 3-34

27.2 Derivatives of other Trigonometric Functions 3-38

27.5 Derivative of the Logarithmic Function 3-23,25-34

27.6 Derivative of the Exponential Function 3-30