General Information.
Ponderation: 3-2-3 *Credits*: $2\frac{2}{3}$ *Prerequisite*: 201-NYA-05
Objectives:

- 00UP: To apply the methods of integral calculus to the study of functions and problem solving.
- 00UU: To apply acquired knowledge to one or more subjects in the sciences.

Students are strongly advised to seek help from their instructor as soon as they encounter difficulties in the course.

Introduction. Calculus II is the sequel to Calculus I, and so is the second Mathematics course in the Science Program. It is generally taken in the second semester. The Science student at John Abbott will already be familiar with the notions of definite and indefinite integration from Calculus I. In Calculus II these notions are studied to a greater depth, and their use in other areas of science, such as Physics and to a lesser extent Chemistry, is explored. In addition, the course introduces the student to the concept of infinite series, and to the representation of functions by power series.

The primary purpose of the course is the attainment of Objective 00UP ("To apply the methods of integral calculus to the study of functions and problem solving"). To achieve this goal, the course must help the student understand the following basic concepts: limits, derivatives, indefinite and definite integrals, improper integrals, sequences, infinite series, power series involving real-valued functions of one variable (including algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions).

Emphasis is placed on clarity and rigour in reasoning and in the application of methods. The student will learn to use the techniques of integration in several contexts, and to interpret the integral both as an antiderivative and as a limit of a sum of products. 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 the student to apply learning acquired in one context to problems arising in another.

Students may be encouraged to use some type of calculator for work in class. However, according to departmental policy neither graphing nor programmable calculators are permitted during tests **and for this course, no calculator is permitted for the final examination**. Students will have access to the Mathematics Lab where suitable mathematical software programs, including MAPLE, are available for student use. The course uses a standard college level Calculus textbook, chosen by the Calculus I and Calculus II course committees.

Course Objectives.

Integration, Comprehensive Assessment, and the Exit Profile. An assessment as to whether a student has attained, to a reasonable extent, the competencies outlined in the Science Program Exit Profile is a requirement of the Science Program. Many of these competencies are taught and assessed in virtually every science course in the Program (including this course) and will not be subject to a formal summative assessment, *e.g.*, application of a scientific method, problem-solving strategies, use of data processing technologies, *etc.* The assumption is made that a passing grade in the science courses guarantees that these outcomes have been attained. Several remaining competencies, though, will be assessed in the Option Courses of the Program and, in preparation for this assessment, the competency "To put in context the emergence and development of scientific concepts" (Exit Profile Standards 12.1–12.2) will be examined in Calculus II.

To this end, every student will undertake a project worth 10% of the Class Mark.

OBJECTIVES	STANDARDS
Statement of the competency To apply the methods of integral calculus to the study of functions and problem solving (00UP). **Elements of the Competency** 1. To determine the indefinite integral of a function. 2. To calculate the limits of functions presenting indeterminate forms. 3. To calculate the definite integral and the improper integral of a function on an interval. 4. To express concrete problems as differential equations and solve differential equations. 5. To calculate volumes, areas, and lengths, and to construct two and three dimensional drawings. 6. To analyze the convergence of series.	**General Performance Criteria** • Appropriate use of concepts • Adequate representation of surfaces and solids of revolution • Correct algebraic operations • Correct choice and application of integration techniques • Accurate calculations • Proper justification of steps in a solution • Correct interpretation of results • Appropriate use of terminology *Specific performance criteria for each of these elements of the competency are shown on the department website (under Description of Courses).*

Required Texts. The textbook for this course is *Single Variable Essential Calculus: Early Transcendentals*, by James Stewart (Thompson Brooks/Cole 2007); it is available from the college bookstore for about $80. Also, the student will need to consult the web page for the textbook (given below, under "Course Content").

Course Content (with selected exercises)**.** The exercises listed below 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.

An item beginning with a decimal number (*e.g.*, 3.5) refers to a section in a textbook; if the number is marked with an asterisk (*) then relevant examples are available on the web page for the textbook, under Additional Examples. The web page for the textbook is:

`http://stewartcalculus.com/media/6_home.php`

Inverse trigonometric functions.

- *3.5 Inverse trigonometric functions (1–9, 17–29)
- 4.7 Antiderivatives [inverse trigonometric functions] (11, 14, 22)
- 5.3 Evaluating definite integrals [inverse trigonometric functions] (19, 20)

Techniques of integration.

- *5.5 The substitution rule (7–49, 57, 61–65)
- 6.1 Integration by parts (3–27)
- *6.2 Trigonometric integrals and substitutions (1–33, 41–57)
- *6.3 Partial fractions (1–31)

Improper integrals.

- 3.7 Indeterminate forms and l'Hôpital's rule (1–37)
- *6.6 Improper integrals (1–33)

Applications of integration.

- *7.1 Areas between curves (1–15, 21)
- 7.2 Volumes (1–15)
- 7.3 Volumes by cylindrical shells (1–25, 33–37)
- *7.6 Differential equations (1–15)

Sequences and series.

- *8.1 Sequences (1–27, 43–45)
- 8.2 Series (1–29)
- *8.3 The integral and comparison tests (1–27, 37, 39)
- 8.4 Other convergence tests (1–7, 19–37)
- 8.5 Power series (3–21)
- *8.7 Taylor and Maclaurin series (3–7, 11–17, 27–35)

Teaching Methods. This course will be 75 hours, meeting three times per week for a total of five hours per week. This course relies mainly on the lecture method, although at least one of the following techniques is used as well: question-and-answer sessions, labs, problem-solving periods, class discussions, and assigned reading for independent study. Generally, each class session begins with a question period of previous topics, then new material is introduced, followed by worked examples. No marks are deducted for absenteeism (however, see below). Failure to keep pace with the lectures results in a cumulative inability to cope with the material, and a failure in the course. A student will generally succeed or fail depending on how many problems have been attempted and solved successfully. It is entirely the student's responsibility to complete suggested homework assignments as soon as possible following the lecture. This allows the student the maximum benefit from any discussion of the homework (which usually occurs in the following class). The answers to a selected number of problems can be found in the back of the text. Individual teachers will provide supplementary notes and problems as they see fit.

Math webpage. Go to `http://www.johnabbott.qc.ca/` and click on "Departments" under "Student Zone"; then look for "Math".

Math Lab. The Math Lab is located in H 203 and is open from 11h until 16h (during weekdays) for borrowing course materials or using the computers and printers for mathematics assignments.

Math Help Centre. The Math Help Centre is located in H 203 from 9h until 11h, and in H 222 after 11h. There is usually a teacher available for individual help (see the posted schedule).

Learning Centre. The Learning Centre, located in H 117A, offers student skills classes and individual tutoring.

Departmental Attendance Policy. Regular attendance is expected. Missing six classes is grounds for automatic failure in this course. Many of the failures in this course are due to students missing classes.

Evaluation Plan. 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 tests (worth 70% of the Class Mark), homework, quizzes or other assignments/tests (worth 20% of the Class Mark) and a comprehensive assessment (worth 10% 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 and 50% Final Exam Mark

or

25% Class Mark and 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.

Course Costs. Apart from the text listed above, there are no additional costs.

College Policies.

College Policy on Cheating and Plagiarism. Cheating and plagiarism are not accepted at John Abbott College. Students are expected to conduct themselves accordingly and must be responsible for all their actions. For more information, students should consult the Institutional Policy on the Evaluation of Student Achievement (IPESA), which is reprinted in the College Calendar and/or Student Agenda.

Re: Mid-semester assessment. Students in their first and second semester have the right to feedback on basic skills in the first weeks of the semester so that they can seek extra help if necessary.

Notice to students. It is the responsibility of students to keep all assessed material for at least one month past the grade review deadline in the event that they would want to request a grade review. Students can learn more about their rights and responsibilities by reading the IPESA.