A POLYTECHNIC INSTITUTION

Course Outline

School of Manufacturing, Electronics and Industrial Processes
Program: Robotics and Automation
Option:

MATH 2342
Calculus for Robotics Technology

Start Date:	January 4 , 2006				**End Date:**	May 26, 2006		
Total Hours:	120	**Total Weeks:**	20		**Term/Level:**	2	**Course Credits:**	8.0
Hours/Week:	6	**Lecture:**	4	**Lab:** 2	**Shop:**		**Seminar:**	**Other:**

Prerequisites

Course No.	Course Name
MATH 1342	Technical Math for Robotics

MATH 2342 is a Prerequisite for:

Course No.	Course Name
MATH 3342	Transform Calculus (Robotics)
ROBT 3341	Robot Applications
ROBT 3351	Automation Equipment
ELEX 3321	Electronics Circuits 2 (Robotics)

Course Description

MATH 2342 - Calculus for Robotics: Covers discrete math, the derivative, differentiation, rules, applied maxima/minima and implicit differentiation. Anti-differentiation, the indefinite and the definite integral including area, mean value and RMS value. Differentiation and integration of trigonometric, logarithmic and exponential functions. Infinite series. Fourier series, evaluation of Fourier coefficients and line spectrum. Applications to DC and AC circuits and waveform analysis. **Prerequisites**: MATH 1342

Detailed Course Description

The purpose of this course is to introduce, to the student, important concepts that can only be appreciated by studying calculus. The stress is on a physical appreciation of the concepts rather than a mathematical abstraction. The basic concepts of calculus are developed heuristically. The student will be required to master fundamental algebraic manipulations and will be expected to solve problems in a systematic and organized manner.

Evaluation

Final Examination	30%
Term Tests	65%
Quizzes/Other	5%
TOTAL	100%

Comments: Minimum passing grade for this course is 50%.

v Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. Find the derivatives of continuous and discrete functions involving polynomials, sines, cosines and exponentials.
2. Use the concept of a limit and simple differentiation to solve problems relating to the Robotic Engineering Technology.
3. Apply differentiation to solve problems involving maxima/minima, curve sketching and related rates, and application of differentials.
4. Integrate polynomials and basic functions involving sines, cosines and exponentials using both the indefinite and definite integrals. Apply the above concepts to integrate simple time signals.
5. Understand the differentiation and integration of important trigonometric and logarithmic functions with application to calculating mean and RMS values of periodic functions, moments of inertia and centroids.
6. Perform integration by parts, by partial fractions decomposition and by making certain substitutions.
7. Obtain the Fourier expansion of standard waveforms such as pulses and triangular waves.
8. Solve problems in the (complex) frequency domain by calculating the Fourier series for simple periodic signals and relate these ideas to signal filtering.
9. Use the mathematical package MAPLE to perform many of the above techniques. (Optional)

v Verification

I verify that the content of this course outline is current.

R Bradbeer — Authoring Instructor
December. 20 2005 — Date

I verify that this course outline has been reviewed.

Louise Rathbone — Program Head/Chief Instructor (Math)
Dec 21 2005 — Date

Dan Lewis — Program Head/Chief Instructor (Technology)
Dec. 31, 05 — Date

I verify that this course outline complies with BCIT policy.

Louise Rathbone — Dean/Associate Dean (Math)
for Elaine Decker
Dec 21, 2005 — Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

Instructor(s)

Ross Bradbeer

Office Location: SW2–221
Office Hrs.: Posted Office Door

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Learning Resources

Text(s) and Equipment:

Required:

Mathematics for Electronics, Part II – Calculus, Eric Hiob.

Reference or Recommended:

Basic Technical Mathematics with Calculus, A.J. Washington.
Mathematics for Electronics, Part II – Calculus, Eric Hiob.
Technical Mathematics with Calculus, P. Kuhfittig.
Technical Mathematics with Calculus, SI edition, P. Calter and D. Egerton.

Scientific Calculator.

Information for Students

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

Makeup Tests, Exams or Quizzes: There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

Ethics: BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam or project for all parties involved and/or expulsion from the course.

Attendance: The attendance policy as outlined in the current BCIT Calendar will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

Illness: A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

Attempts: Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the appropriate program.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.

Course Credit: Applications for course credit or course exemption on the basis of previously completed mathematics courses are assessed on a case-by-case basis by the BCIT Mathematics Dept. taking into account **all** of the following:

- the correspondence between topics, content and level
- recency (generally no more than 3–5 years)
- the grade (generally at least a C+ or 65%)
- the context (course taken as part of a university or college science or engineering program, rather than, for example, an arts or social science program).

Information for Students (cont'd.)

Course Makeup — Equivalents: In most cases, students who fail a math course or withdraw from a math course may make up the course by taking makeup courses. These courses may be BCIT evening or correspondence courses, or equivalent courses from another institution. In some cases, students may be required to take more than one course or several distance education modules to gain credit. In some cases, students may be required to achieve a mark of greater than 50% in the makeup course in order to achieve credit for the failed course. If a student fails a course, a makeup letter signed by the mathematics program head will be sent to the student, the technology program head, and to Student Records. Any course substitutions would require prior written approval of the mathematics program head.

Accommodation: Any student who may require accommodation from BCIT because of a physical or mental disability should refer to BCIT's Policy on Accommodation for Students with Disabilities (Policy #4501), and contact BCIT's Disability Resource Centre (SW1-2300, 604-451-6963) at the earliest possible time. Requests for accommodation must be made to the Disability Resource Centre, and should not be made to a course instructor or Program area.

Any student who needs special assistance in the event of a medical emergency or building evacuation (either because of a disability or for any other reason) should also promptly inform their course instructor(s) and the Disability Resource Centre of their personal circumstances.

I.D. Required in Examination Centres: In order to write exams, students will be required to produce photo identification at examination centres. Photo I.D. must be placed on the desk and must remain in view on the desk while writing the exam, for inspection by invigilators. Students should bring a BCIT OneCard or alternatively two pieces of identification, one of which must be government photo I.D. such as a driver's licence. Please see BCIT Policy #5300, Formal Invigilation Procedures.

Assignment Details

There will typically be a weekly quiz, written in the lab session. A 100% attendance is required in both the lecture and the weekly labs.

Schedule

This schedule is subject to change at the discretion of the instructor.

Week	Topics	Reference/ Reading
1–5	Rates of Change (Simple continuous/discrete functions) Limits Delta method of Differentiation Differentiation Rules Maxima/Minima Related Rates Applications	
6–9	Antidifferentiation Integration Rules Definite Integrals Applications	
10–14	Calculus of Log and Exponential Functions Calculus of Trigonometric Functions Applications	
15–16	Integration by Parts Integration by Partial Fractions Integration by Substitution	
16–20	Series Fourier Series	
21	First Order and Second Order Differential Equations (Time Allowing)	