A POLYTECHNIC INSTITUTION

Course Outline

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

MATH 3342
Transform Calculus

Start Date:	September 5, 2006					**End Date:**	December 15, 2006		
Total Hours:	60	**Total Weeks:**	15			**Term/Level:**	3	**Course Credits:**	4.0
Hours/Week:	4	**Lecture:**	3	**Lab:**	1	**Shop:**		**Seminar:**	**Other:**

Prerequisites

Course No.	Course Name
MATH 2342	Calculus for Robotics

MATH 3342 is a Prerequisite for:

Course No.	Course Name
ELEX 4336	Feedback Systems

Course Description

First and second order differential equations. Step and impulse functions. Laplace transforms and inverse transforms. Solutions of differential equations by transforms. Z–transforms of discrete signals and inverse Z-transforms. Applications to electrical circuits, signal processing, analysis of circuits and systems. MAPLE software used.

Detailed Course Description

The goals of this course are to provide the student with mathematical tools and skills that are essential in circuit analysis and signal processing.

Evaluation

Final Examination	35%
Term Test	60%
Quizzes/Assignments	5%
TOTAL	100%

Comments: Minimum passing grade for this course is 50%

Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. solve first- and second-order differential equations, or systems of equations, obtained from the analysis of circuits or networks, and identify and describe solution components such as free response and forces response, zero input response and zero state response, steady state and transient response.
2. set up differential equations for RL, RC, and RCL circuits or circuit networks, with constant or variable driving functions.
3. write the Laplace transform for many functions including the impulse and unit step functions.
4. solve differential equations using the Laplace transform methods and derive the Laplace transform using circuit information.
5. use the system transfer function (s-domain) to describe circuit response and stability.
6. work with discrete time systems using simple z-transform techniques.

Verification

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

R Bradbeer — Authoring Instructor
August 28, 2006 — Date

I verify that this course outline has been reviewed.

(FOR LOUISE ROUTLEDGE) — Program Head/Chief Instructor (Math)
September 1, 2006 — Date

Program Head/Chief Instructor (Technology)
Sept 11, 2006 — Date

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean (Math)
Sept 5/06 — Date

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

Instructor(s)

R. Bradbeer
Office Location: SW2-221
Office Hrs.: TBA
Office Phone: 604-451-7172
E-mail Address: rbradbee@bcit.ca
Office Fax: 604-432-9173

Learning Resources

Text(s) and Equipment:

Required:

Eric Hiob, *Mathematics for Electronics III – Laplace Transforms*

(Hand-out notes will be provided for many parts of the course.)

Recommended:

J.A. Edminister, *Electric Circuits* (Schaum Outline Series)
W.D. Stanley, *Transform Circuit Analysis for Engineering and Technology*

References:

C.L. Phillips & J.M. Parr, *Signals Systems and Transformations (second edition)*

J.A. Cadzow, *Discrete Time Systems*

J. H. McClellan, R.W. Schafer, M.A. Yoder, *DSP First A Multimedia Approach*

Information for Students

(*Information below can be adapted and supplemented as necessary.*)

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).

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

N/A

Schedule

Week of/ Number	Outcome/Material Covered	Reference/ Reading
1–5	**DIFFERENTIAL EQUATIONS** – First Order Linear DE's – Applications to RC and RL circuits – Second Order Linear DE's – Applications to RCL circuits – Systems of DE's – Applications to circuit networks	Hiob II, Ch. 18
6–11	**LAPLACE TRANSFORMS** – Waveform Analysis - Step, Impulse, and Shifted functions – Laplace Transforms – Inverse Laplace Transforms – Solution of DE's using Transforms – Application of Laplace Transforms to circuit analysis – Transfer functions and Stability	Hiob III, Ch. 19
12–14	**Z-TRANSFORMS** – Discrete-time functions – Difference equations – z-transforms and inverse z-transforms – Transfer Functions and Stability	Hand-Out Notes

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