THE SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ON

COURSE OUTLINE

Course Title: Calculus

Code No.: Mth 577-4 Semester: Four

Program: Electrical / Electronics

Author: The Mathematics Department

Date: August 2003 Previous Outline Dated: August 2002

Approved: _____ _____
Dean Date

Total Credits: 4
Prerequisite(s): Mth 551
Hours/Week: 4

I. COURSE DESCRIPTION:

This advanced course in calculus contains some special methods of integration, Maclaurin, Taylor and Fourier series, various types of first and second order differential equations, an introduction to Laplace transforms, and applications to the electrical/electronics area.

II. STUDENT PERFORMANCE OBJECTIVES:

The basic objectives are that the students develop an understanding of the methods studied, demonstrate knowledge of the facts presented and show an ability to use these in the solution of problems. To accomplish these objectives, exercises are assigned. Test questions will be of near equal difficulty to questions assigned in the exercises. The level of competency demanded is the level required to obtain an overall passing average on the tests. The material to be covered is listed below.

After studying each of the following topics, the student should be able to:

Topic 1:

1. Integrate any type of algebraic or transcendental function using the general power formula for integration.
2. Find integrals of some types of expressions using a short table of integrals.
3. Find integrals of some expressions leading to a natural logarithm form using integration tables.
4. Evaluate integrals of some exponential expressions using a table of integrals.
5. Evaluate integrals of some trigonometric functions using a table of integrals.
6. Find integrals of some other types of trigonometric functions using integration tables.
7. Find integrals of some algebraic functions leading to inverse trigonometric functions using integration tables.
8. Find integrals of expressions requiring the use of the integration by parts formula. Some of these integrals are also found in integration tables.
9. Find integrals of expressions requiring a trigonometric substitution. Some of these integrals are also found in integration tables.

Topic 2:

1. Recognize the difference between convergent and divergent series.
2. Expand a function using a Maclaurin series.
3. Find a Maclaurin series for a function using a known Maclaurin series, by substitution, integration or differentiation, multiplication or division.
4. Compute numerical values using a Maclaurin series.
5. Expand a function using a Taylor series and then compute numerical values with this series.
6. Find a Fourier series for some types of periodic waveforms.

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II. STUDENT PERFORMANCE OBJECTIVES (Continued):

Topic 3:

1. Identify a first order differential equation, and check a given solution to a differential equation.
2. Solve a first order differential equation by separating variables before integration.
3. Solve a first order differential equation by rearranging to isolate some form of integrable combination.
4. Find a solution (general or particular) for linear first order differential equations.
5. Solve some types of word problems involving differential equations.

Topic 4:

1. Identify a higher order differential equation, and solve any type requiring direct integration.
2. Solve homogeneous differential equations where the auxiliary equation has unequal real roots.
3. Solve homogeneous differential equations where the auxiliary equation has equal (repeated) or complex roots.
4. Solve non-homogeneous differential equations combining a complementary and particular solution.
5. Solve some types of word problems involving higher order differential equations.
6. Find Laplace transforms of algebraic and transcendental functions and derivatives.
7. Use Laplace transforms to solve some types of differential equations.

III. TOPICS TO BE COVERED: Approximate Time Frame

1. Methods of Integration	25 periods
2. Expansion of Functions in Series	15 periods
3. Differential Equations	20 periods

IV. LEARNING ACTIVITIES:

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
1.0	METHODS OF INTEGRATION	Chapter 28
1.1	The general power formula	All questions Page 813
1.2	The basic logarithmic form	All questions Page 817
1.3	The exponential form	All questions Page 820
1.4	Basic trigonometric forms	All questions Page 823
1.5	Other trigonometric forms	All questions Page 827
1.6	Inverse trigonometric forms	All questions Page 831
1.7	Integration by parts	All questions Page 835
1.8	Integration by trigonometric substitution	All questions Page 838
1.9	Integration by partial fractions	All questions Page 842 & 847
1.10	Integration by use of tables	All questions Page 849
1.11	Review exercise	All questions Page 851
2.0	EXPANSION OF FUNCTIONS IN SERIES	Chapter 29
2.1	Infinite series	All questions Page 856
2.2	Maclaurin series	All questions Page 861
2.3	Certain operations with series	All questions Page 865
2.4	Computations by use of series expansions	All questions Page 869
2.5	Taylor's series	All questions Page 872
2.6	Fourier series	All questions Page 878
2.7	Review exercises	All questions Page 884

IV. LEARNING ACTIVITIES (Continued):

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
3.0	FIRST ORDER DIFFERENTIAL EQUATIONS	Chapter 30
3.1	Solutions of differential equations.	All questions Page 888
3.2	Separation of variables	All questions Page 892
3.3	Integrable combinations	All questions Page 894
3.4	Linear first order differential equations	All questions Page 897
3.5	Elementary applications	All questions Page 902
4.0	HIGHER ORDER DIFFERENTIAL EQUATIONS	Chapter 30
4.1	Homogeneous equations with constant coefficients	All questions Page 907
4.2	Auxiliary equations with repeated or complex roots	All questions Page 911
4.3	Solutions of nonhomogeneous equations	All questions Page 915
4.4	Applications of second-order differential equations	All questions Page 922
4.5	Laplace transforms	All questions Page 927
4.6	Solving differential equations by Laplace transformers.	All questions Page 931
4.7	Review exercise	All questions Page 933

V. REQUIRED RESOURCES / TEXTS / MATERIALS:

1. Text: Washington, "Basic Technical Mathematics With Calculus", 7th Edition, Metric Version. Benjamin/Cummings Pub. Co 1999.

2. Calculator: (Recommended) SHARP Scientific Calculator EL-506L. The use of some kinds of calculators may be restricted during tests.

VI. EVALUATION PROCESS/GRADING SYSTEM:

MAJOR ASSIGNMENTS AND TESTS

Regular topic tests will contribute a minimum of **60%** of the overall mark.

While regular tests will normally be scheduled and announced beforehand, there may be an unannounced test on current work at any time. Such tests, at the discretion of the instructor, may be used for up to **30%** of the overall mark.

The instructor will provide you with a list of test dates and other required evaluation information for your class section. Tests may be scheduled out of regular class time.

ATTENDANCE

It is your responsibility to attend all classes during the semester. Research indicates there is a high correlation between attendance and student success.

If you are absent from class, it is your responsibility to find out what work was covered and assigned and to complete this work before the next class. Your absence indicates your acceptance of this responsibility.

Unexcused absence from a test may result in a mark of zero ("0"). Absence may be excused on compassionate grounds such as verified illness or bereavement. On return from an excused absence, you should ask your instructor to schedule the writing of a make-up test. Failure to do so will be considered as an unexcused absence.

METHOD OF ASSESSMENT (GRADING METHOD)

The following semester grades will be assigned to students in postsecondary courses:

Grade	Definition	Grade Point Equivalent
A+	90 - 100%	4.00
A	80 - 89%	3.75
B	70 - 79%	3.00
C	60 - 69%	2.00
F (Fail)	59% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.

VI. EVALUATION PROCESS/GRADING SYSTEM (Continued):

X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

The method of calculating your weighted average will be defined by your instructor. Since grades are based upon averages, it follows that good marks in some tests can compensate for a failing mark in another test.

Make-Up Test (if applicable)
An "X" grade may be assigned at the end of the regular semester if you have met ***ALL*** of the following criteria for the course:

- an overall average between 50% and 59% was achieved
- at least 50% of the tests were passed
- at least 80% of the scheduled classes were attended
- at least 80% of quizzes and assignments were submitted
- all of the topic tests were written

If you are assigned an "X" grade, you may convert it to a "C" grade by writing a make-up test on topics agreed to by the instructor. This test will be available at the time agreed to by your instructor.

At the end of the regular term, it is your responsibility to obtain your results from your instructor and, in the event of an "X" grade, to inquire when the make-up test will be available.

The score you receive on this make-up test will replace your original test score and be used to re-calculate your weighted average. If the re-calculated average is 60% or greater, a "C" grade will be assigned. If the re-calculated average is 59% or less, an "F" grade will be assigned.

"F" and "X" Grades at the end of the Semester
If an "X" grade is not cleared by the specified date, it will become an "F" grade. Except for extenuating circumstances, an "X" grade in Math will not be carried into the next semester.

VII. SPECIAL NOTES:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493 so that support services can be arranged for you.

Retention of course outlines:
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Rights and Responsibilities*. Students who engage in "academic dishonesty" will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:
The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor or the Coordinator, Mathematics Department. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who have completed an equivalent post-secondary course must bring relevant documents to the Coordinator, Mathematics Department:

- a copy of course outline
- a copy of the transcript verifying successful completion of the equivalent course

Note: A copy of the transcript must be on file in the Registrar's Office.