SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ONTARIO

SAULT COLLEGE

COURSE OUTLINE

Course Title: Calculus II

Code No.: MTH 577-4   **Semester:** Four

Program: Electrical / Electronics

Author: The Mathematics Department

Date: June 2011   **Previous Outline Dated:** June 2010

Approved: _____   _____
                        Chair   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. LEARNING OUTCOMES:

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.

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   29 periods

2. Expansion of Functions in Series   15 periods

3. Differential Equations and Laplace transforms   20 periods

Total: 64 hours

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
1.0	METHODS OF INTEGRATION	Chapter 28
1.1	The general power formula	Exercise 28-1
1.2	The basic logarithmic form	Ex. 28-2
1.3	The exponential form	Ex. 28-3
1.4	Basic trigonometric forms	Ex. 28-4
1.5	Other trigonometric forms	Ex. 28-5
1.6	Inverse trigonometric forms	Ex. 28-6
1.7	Integration by parts	Ex. 28-7
1.8	Integration by trigonometric substitution	Ex. 28-8
1.9	Integration by partial fractions	Ex. 28-9, 28-10
1.10	Integration by use of tables	Ex. 28-11
1.11	Review exercise	
2.0	EXPANSION OF FUNCTIONS IN SERIES	Chapter 30
2.1	Infinite series	Ex.30-1
2.2	Maclaurin series	Ex. 30-2
2.3	Certain operations with series	Ex. 30-3
2.4	Computations by use of series expansions	Ex. 30-4
2.5	Taylor's series	Ex. 30-5
2.6	Fourier series	Ex. 30-6
2.7	Review exercises	

3.0	FIRST ORDER DIFFERENTIAL EQUATIONS	Chapter 31
3.1	Solutions of differential equations.	Ex. 31-1
3.2	Separation of variables	Ex. 31-2
3.3	Integrable combinations	Ex. 31-3
3.4	Linear first order differential equations	Ex. 31-4
3.5	Elementary applications	Ex. 31-5
4.0	HIGHER ORDER DIFFERENTIAL EQUATIONS	Chapter 31
4.1	Homogeneous equations with constant	Ex. 31-6

	coefficients	
4.2	Auxiliary equations with repeated or complex roots	Ex. 31-7
4.3	Solutions of non-homogeneous equations	Ex. 31-8
4.4	Applications of second-order differential equations	Ex. 31-9
4.5	Laplace transforms	Ex. 31-10
4.6	Solving differential equations by Laplace transformers.	Ex. 31-11
4.7	Review exercise	

IV. REQUIRED RESOURCES / TEXTS / MATERIALS:

1.   Text: Washington, "Basic Technical Mathematics With Calculus", 9th Edition, Metric Version. Benjamin/Cummings Pub. Co., 2009.

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

V. EVALUATION PROCESS/GRADING SYSTEM:

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.

The following semester grades will be assigned to students:

Grade	Definition	Grade Point Equivalent
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% 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.
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.

"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.

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Evaluation Device	**Topics Covered** (reference topic numbers from the course outline)	**% weight of Final Average**
Test 1	1.1-1.7	25%
Test 2	1.8-1.10, 2	25%
Test 3	3	25%
Test 4	4	25%

VI. SPECIAL NOTES:

Attendance:
Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

VII.   COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal, form part of this course outline.