

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 2006

Previous Outline Dated: August 2005

Approved: _____

Dean

Date

Total Credits: 4

Prerequisite(s): Mth 551

Hours/Week: 4

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School of Technology, Skilled Trades and Natural Resources,

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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.

II. LEARNING OUTCOMES (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	29 periods
2. Expansion of Functions in Series	15 periods
3. Differential Equations	20 periods

Total: 64 hours

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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 29
2.1	Infinite series	Ex. 29-1
2.2	Maclaurin series	Ex. 29-2
2.3	Certain operations with series	Ex. 29-3
2.4	Computations by use of series expansions	Ex. 29-4
2.5	Taylor's series	Ex. 29-5
2.6	Fourier series	Ex. 29-6
2.7	Review exercises	

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
3.0	FIRST ORDER DIFFERENTIAL EQUATIONS	Chapter 30
3.1	Solutions of differential equations.	Ex. 30-1
3.2	Separation of variables	Ex. 30-2
3.3	Integrable combinations	Ex. 30-3
3.4	Linear first order differential equations	Ex. 30-4
3.5	Elementary applications	Ex. 30-5
4.0	HIGHER ORDER DIFFERENTIAL EQUATIONS	Chapter 30
4.1	Homogeneous equations with constant coefficients	Ex. 30-6
4.2	Auxiliary equations with repeated or complex roots	Ex. 30-7
4.3	Solutions of nonhomogeneous equations	Ex. 30-8
4.4	Applications of second-order differential equations	Ex. 30-9
4.5	Laplace transforms	Ex. 30-10
4.6	Solving differential equations by Laplace transformers.	Ex. 30-11
4.7	Review exercise	

IV. REQUIRED RESOURCES / TEXTS / MATERIALS:

1. Text: Washington, "Basic Technical Mathematics With Calculus", 8th Edition, Metric Version. Benjamin/Cummings Pub. Co 2005.
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:**MAJOR ASSIGNMENTS AND TESTS**

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)

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
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	

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without academic penalty.

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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 3	4	25%

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 40% and 49% 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 "D" 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 50% or greater, a "D" grade will be assigned. If the re-calculated average is 49% 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.

VI. 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 E1101 or call Extension 2703 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 wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.