

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:** Calculus  
**CODE NO. :** MTH551 **SEMESTER:** 3 / 4  
**PROGRAM:** Electrical/Electronics/Computer Studies  
**AUTHOR:** Updated by B. Hamel  
for The Mathematics Department  
**DATE:** December 20, 2008 **PREVIOUS OUTLINE DATED:** Dec. 2007

**APPROVED:**

	<hr/>	<hr/>	<hr/>
	<b>CHAIR</b>		<b>DATE</b>
<b>TOTAL CREDITS:</b>	4		
<b>PREREQUISITE(S):</b>	MTH143		
<b>HOURS/WEEK:</b>	4		

**Copyright ©2008 The Sault College of Applied Arts & Technology**  
*Reproduction of this document by any means, in whole or in part, without prior written permission of Sault College of Applied Arts & Technology is prohibited.*  
*For additional information, please contact B. Punch, Dean*  
*The School of the Natural Environment, Technology and Skilled Trades*  
*(705) 759-2554, Ext.2681*

**I. COURSE DESCRIPTION:**

The basic concepts of calculus are introduced through an emphasis on applications and examples. Topics include limits, simple derivatives, derivatives of trigonometric and logarithmic functions, applications of derivatives, curve sketching, integration, and applications of integration.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

**Topic 1:**

1. Evaluate limits of algebraic functions.
2. Approximate the slope of a tangent to a curve.
3. Find the derivative of an algebraic function using the delta method.
4. Find instantaneous rates of change of a function using derivatives.
5. Find the derivative of a polynomial using a rule.
6. Find derivatives of other algebraic functions (products and quotients) using rules for differentiation.
7. Find the derivative of a power of a function - Chain rule.
8. Find the derivative of an implicit function.
9. Find higher derivatives of algebraic functions

**Topic 2:**

1. Find slopes and equations of tangent and normal lines.
2. Compute velocities and accelerations for curvilinear motion.
3. Solve related rate problems.
4. Make graphs of non-linear functions using derivatives.
5. Make graphs of discontinuous functions using derivatives, asymptotes, intercepts.
6. Solve applied maximum-minimum problems.

**Topic 3:**

1. Use differentials to compute small change in a function.
2. Find an anti-derivative using derivative rules.
3. Use the basic rule for integration of algebraic functions.
4. Determine approximate areas under curves from graphs.
5. Determine exact areas under curves by integration - the fundamental theorem of integral calculus.
6. Evaluate other algebraic definite integrals.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE  
Continued.....****Topic 4:**

1. Solve problems involving distance-velocity-acceleration, current-voltage-charge using integration.
2. Find areas (between two curves) using horizontal and vertical elements and definite integrals.
3. Find the volume of a solid of revolution using the disk or shell method.

**Topic 5:**

1. Find derivatives of expressions containing sine or cosine functions.
2. Find derivatives of other trigonometric functions.
3. Find derivatives of inverse trigonometric functions
4. Solve worded problems which involve trigonometric functions.
5. Find derivatives of logarithmic functions - and constant base.
6. Find derivatives of exponential functions - any constant base.
7. Solve worded problems involving logarithmic of exponential functions.

**III. TOPICS:**

1. The Derivative
2. Applications of the Derivative
3. Integration
4. Applications of Integration
5. Differentiation of Transcendental Functions

**IV. LEARNING ACTIVITIES**

<b>TOPIC NUMBER</b>	<b>TOPIC DESCRIPTION</b>	<b>REFERENCE CHAPTER ASSIGNMENTS</b>
1.0	THE DERIVATIVE	Chapter 23
1.1	Limits	Questions: 1-44 Page 634
1.2	The slope of a tangent to a curve	Questions: 1-24 Page 639
1.3	The derivative	Questions: 1-32 Page 643
1.4	Derivatives of polynomials	Questions: 1-32 Page 652
1.5	Derivatives of products and quotients of functions	Questions: 1-32 Page 656
1.6	The derivative of a power of a function	Questions: 1-38 Page 662
1.7	Differentiation of implicit functions	Questions: 1-32 Page 666
1.8	Higher derivatives	Questions: 1-34 Page 669
2.0	APPLICATIONS OF THE DERIVATIVE	Chapter 24
2.1	Tangents and normals	Questions: 1-24 Page 677
2.2	Curvilinear motion	Questions: 1-24 Page 685
2.3	Related rates	Questions: 1-24 Page 688
2.4	Using derivatives in curve sketching	Questions: 1-28 Page 695
2.5	Applied maximum and minimum problems	Questions: 1-30 Page 704
2.6	Differentials	Questions: 1-20 Page 704
3.0	INTEGRATION	Chapter 25
3.1	Anti-derivatives	Questions: 1-32 Page 717
3.2	The indefinite integral	Questions: 1-44 Page 722
3.3	The area under a curve	Questions: 1-20 Page 727
3.4	The definite integral	Questions: 1-36 Page 730

**IV. LEARNING ACTIVITIES CONTINUED.....**

<b>TOPIC NUMBER</b>	<b>TOPIC DESCRIPTION</b>	<b>REFERENCE CHAPTER ASSIGNMENTS</b>
4.0	APPLICATION OF INTEGRATION	Chapter 26
4.1	Applications of the indefinite integral	Questions: 1-20 Page 745
4.2	Areas by integration	Questions: 1-28 Page 751
4.3	Volumes by integration	Questions: 1-32 Page 756
5.0	DIFFERENTIATION OF TRANSCENDENTAL FUNCTIONS	Chapter 27
5.1	Derivatives of sine and cosine functions	Questions: 1-50 Page 782
5.2	Derivatives of other trigonometric functions	Questions: 1-48 Page 786
5.3	Derivatives of inverse trigonometric functions	Questions: 1-48 Page 790
5.4	Applications	Questions: 1-8, 11-23 Page 794
5.5	Derivatives of logarithmic functions	Questions: 1-48 Page 799
5.6	Derivatives of exponential functions	Questions: 1-52 Page 802
5.7	Applications	Questions: 1-32 Page 806

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

1. Text: Washington, "Basic Technical Mathematics With Calculus", Seventh Edition, Metric Version. Addison Wesley 2000.
2. Calculator: (Recommended) SHARP Scientific Calculator EL-531G. The use of some kinds of calculators may be restricted during tests.

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS Continued.....****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.

**V. EVALUATION PROCESS/GRADING SYSTEM:**

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 “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 following semester grades will be assigned to students:

<b>Grade</b>	<b><u>Definition</u></b>	<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 without academic penalty.	

## 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 professor and/or the Special Needs office. Visit Room E1101 or call Extension 703 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. 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.