

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: May 2011 **PREVIOUS OUTLINE DATED:** May 2010
APPROVED:

“Brian Punch”

CHAIR

DATE

TOTAL CREDITS: 4

PREREQUISITE(S): MTH143

HOURS/WEEK: 4

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*For additional information, please contact Brian Punch, Chair,
Natural Environment/Outdoor Studies & Technology Programs
(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, derivatives of algebraic, trigonometric and logarithmic functions, integration, and applications of differentiation and 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.

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

| TOPIC NUMBER | TOPIC DESCRIPTION | REFERENCE CHAPTER ASSIGNMENTS |
|---------------------|--|--------------------------------------|
| 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 |
| TOPIC NUMBER | TOPIC DESCRIPTION | REFERENCE CHAPTER ASSIGNMENTS |
| 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 |

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| 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 |

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| 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", Ninth Edition, Metric Version. Addison Wesley 2010.
2. Scientific calculator

V. EVALUATION PROCESS/GRADING SYSTEM:

The following semester grades will be assigned to students:

| | Grade | Definition | <i>Grade Point Equivalent</i> |
|--|--------------|--|-------------------------------|
| | 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. | |

VI. SPECIAL NOTES:

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.