

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE, MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: MATHEMATICS

CODE NO.: MTH551-4 SEMESTER; III

PROGRAM: MECHANICAL/ELECTRICAL/ELECTRONICS/COMPUTER TECHNOLOGY

AUTHOR: JOHN REAL

DATE: JULY 1993 PREVIOUS OUTLINE DATED: JULY 1992

APPROVED: D<sup>AN</sup> -r<sup>^</sup>y<sup>^</sup> DAT<sup>^</sup> /O/<sup>^</sup>S

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MATHEMATICS

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**COURSE NAME****COURSE NUMBER****TOTAL CREDIT HOURS: 64****PREREQUISITE(S): MTH426****I. PHILOSOPHY/GOALS:**

This introductory course in calculus contains a topic on analytic geometry of the straight line and conic sections, the derivative of algebraic functions and some traditional applications, including related rate problems, curvilinear motion and maximum/minimum problems. The differential is introduced, leading to the antiderivative or integral - indefinite and definite.

**II. STUDENT PERFORMANCE OBJECTIVES:**

The basic objectives are that the student develop an understanding of the methods studied, demonstrate a 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.

**III. TOPICS TO BE COVERED:****TIME FRAME:**

- |                                    |            |
|------------------------------------|------------|
| 1. Plane Analytic Geometry,        | 18 periods |
| 2. The Derivative.                 | 18 periods |
| 3. Applications of the Derivative. | 18 periods |
| 4. Integration.                    | 10 periods |

## TERMINAL PERFORMANCE OBJECTIVES - MTH551

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

### Topic 1:

1. Calculate the distance between two points, determine the slope of a line, recognize parallel and perpendicular lines.
2. Write the equation of a line using slope-intercept form, the point-slope form, or the two-point form.
3. Write the equation of a circle from given information, rewrite an equation in standard form and determine features of interest to make a graph.
4. Write the equation of a parabola from given information, rewrite an equation in standard form and determine features of interest to make a graph.
5. Write the equation of an ellipse "from given information, rewrite an equation in standard form and determine features of interest to make a graph.
6. Write the equation of a hyperbola from given information, rewrite an equation in standard form and determine features of interest to make a graph.
7. Write equations of conic sections offset from the origin.
8. Recognize type of conic section from the equation and rewrite offset conic sections in standard form to make a graph.

### Topic 2:

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 3:

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 4:

1. Use differentials to compute small changes in a function.
2. Find an antiderivative 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.

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**IV. LEARNING ACTIVITIES:**

**REQUIRED RESOURCES**

1.0	<u>Plane Analytic Geometry</u>	Chapter 20
1.1	Basic definitions.	Questions 1 - 48, p- 563
1.2	The straight line.	Questions 1 - 52, p- 569
1.3	The circle.	Questions 1 - 44, p- 574
1.4	The parabola.	Questions 1 - 36, p- 579
1.5	The ellipse.	Questions 1 - 36, p- 585
1.6	The hyperbola.	Questions 1 - 36, p- 592
1.7	Translation of axes.	Questions 1 - 31, p- 596
1.8	The second degree equation.	Questions 1 - 26 p- 600
1.9	Review exercise.	Questions 1 24, p- 609 41 - 76,
2.0	<u>The Derivative</u>	Chapter 2z)
2.1	Limits,	Questions 1 - 44 p- 649
2.2	The slope of a tangent to a curve.	Questions 1 - 24 <sub>r</sub> p- 655
2.3	The derivative.	Questions 1 - 32 <sub>r</sub> p. 660
2.4	The meaning of the derivative.	Questions 1 - 32 <sub>r</sub> p- 664
2.5	Derivatives of polynomials.	Questions 1 - 44 <sub>r</sub> p- 669
2.6	Derivatives of products and quotients of functions.	Questions 1 - 44 <sub>r</sub> p- 674
2.7	The derivative of a power of a function.	Questions 1 - 44 <sub>f</sub> p- 680

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**IV. LEARNING ACTIVITIES: (cont'd)      REQUIRED RESOURCES**

The Derivative      Cont'd

*2.8	Differentiation of implicit functions.	Questions 1 - 32, p. 684
2.9	Higher derivatives	Questions 1 - 36, p. 688
2.10	Review exercise	Questions 1 - 68, p. 689
3.0	<u>Applications of the Derivative</u>	Chapter 2 3
3.1	Tangents and normals.	Questions 1 - 24 p. 696
3.2	Curvilinear motion.	Questions 1 - 24 p. 705
3.3	Related rates.	Questions 1 - 24 p. 709
3.4	Using derivatives in curve sketching.	Questions 1 - 32 p. 716
3.5	More on curves.	Questions 1 - 18 p. 720
3.6	Applied maximum and minimum problems.	Questions 1 - 32 p. 727
3.7	Review exercise.	Questions 1 - 48 p. 728
4.0	<u>Integration</u>	Chapter 24
4.1	Differentials	Questions 1 - 32 p. 735
4.2	Antiderivatives	Questions 1 - 32 p. 738
4.3	The indefinite integral	Questions 1 - 44 p. 744
4.4	The area under a curve	Questions 1 - 16 p. 750
4.5	The definite integral	Questions 1 - 36 p. 753
4.6	Review exercise	Questions 1 - 36 p. 761 45 - 32

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**V. METHOD OF EVALUATION:**

1. Three - four tests per semester.
2. Final grade is a weighted average of these tests

90 - 100	=	A+
80 - 89	=	A
65 - 79	=	B
55 - 64	=	C
0 - 54	=	R (or X)

Under special circumstances an X grade may be assigned to allow the student to continue with the next math, course. If unsuccessful with this next course, both courses would have to be repeated.

All tests are scheduled in advance. Hence, attendance is mandatory. Unexcused absence from a test will result in a mark of zero for that test. If a student is prevented from writing a test by illness, the instructor should be notified before the time of the test. Upon return to class, the student should see the instructor immediately to arrange a time for a make-up test. The student should have a note from the college nurse or a doctor.

**VI. REQUIRED STUDENT RESOURCES:**

Washington, Basic Technical Mathematics With Calculus, fifth edition, metric version. Benjamin/Cummings Pub. Co. 1990

**VII. SPECIAL NOTES:**

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.