

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

COURSE OUTLINE

COURSE TITLE: CALCULUS
CODE NO MTH367-4 SEMESTER:
PROGRAM; ELECTRICAL/ELECTRONICS/COMPUTER TECHNOLOGY
AUTHOR JOHN REAL
DATE JULY 1993 PREVIOUS OUTLINE DATED: JULY 1992

APPROVED: :^^.
DEM "

!}MUW' '' ^

CALCULUS

MTH367-4

COURSE NAME

COURSE NUMBER

TOTAL CREDIT HOURS: 64

PREREQUISITE{S): MTH577 OR MTH578

I. PHILOSOPHY/GOALS:

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, Laplace transform methods of solution, and applications to the electrical/electronics area.

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. Methods of Integration. | 16 periods |
| 2. Expansion of Functions in Series | 18 periods |
| 3. Differential Equations. | 26 periods |

TERMINAL PERFORMANCE OBJECTIVES - MTH367

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 the 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.

CALCULUS

KTH367-4

COURSE NAME**COURSE NUMBER****IV, LEARNING ACTIVITIES:****REQUIRED RESOURCES**

1.0	<u>Methods of Integration</u>	Chapter 27
1.1	The general power formula, (review)	Questions 1 - 24 , p.843
1.2	Integration by use of tables.	Questions 1 - 32 , p.872
1.3	The basic logarithmic form. (review)	Questions 1 - 28 , p.846
1.4	The exponential form, (review)	Questions 1 - 24 , p.850
1.5	Basic trigonometric forms. (review)	Questions 1 - 24, p.853
1.6	Other trigonometric forms. (review)	Questions 1 - 28, p.858
1.7	Inverse trigonometric forms. (review)	Questions 1 - 28, p.862
1.8	Integration by parts.	Questions 1 - 16, p.866
1.9	Integration by trigonometric substitution.	Questions 1 - 16, p.870
1.10	Integration by partial fractions.	Questions 1 12, p. 992 1 12, p. 997
1.11	Review exercise.	Questions 1 - 36, p. 874

CALCULUS

MTH367-4

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

2.0 <u>Expansion of Functions in Series</u>	Chapter 2 8
2.1 Infinite series.	Questions 1 - 28, p.880
2.2 Maclaurin series.	Questions 1 - 30, p.887
2.3 Certain operations with series.	Questions 1 - 26, p.891
2.4 Computations by use of series expansions.	Questions 1 - 26, p.894
2.5 Taylor's series.	Questions 1 - 28, p.898
2.6 Fourier series.	Questions 1 - 12, p.905
2.7 Review exercise.	Questions 1 - 42, p. 907
3.0 <u>First Order Differential Equations</u>	Chapter 2 9
3.1 Solutions of differential equations.	Questions 1 - 28, p.912
3.2 Separation of variables.	Questions 1 32, p.917
3.3 Integrable combinations.	Questions 1 33, p.919
3.4 Linear first order DE.	Questions 1 32, p.922
3.5 Elementary applications.	Questions 1 40, p. 927 Handout

COURSE NAME**COURSE NUMBER**

4.0	<u>Higher Order Differential Equations</u>	Chapter 2 9
4.1	Homogeneous equations with constant coefficients.	Questions 1 - 28, p.933
4.2	Auxiliary equations with repeated or complex roots.	Questions 1 - 32, p.937
4.3	Solutions of nonhomogeneous equations.	Questions 1 - 28, p.942
4.4	Applications of second-order differential equations.	Questions 11 - 20, p.948 Hand-out
4.5	Laplace transforms.	Questions 1 - 24, p.953
4.6	Solving differential equations.	Questions 1 - 16, p.956
4.7	Review exercise.	Questions 1 - 72, p.957

V. METHOD OF EVALUATION:

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

85 - 100 - A+

75 - 84 = A

65 - 74 = B

55 - 64 = C

0 - 54 = R (or X)

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.

CALCULUS

MTH367-4

COURSE NAME

COURSE NUMBER

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.