

MAT 172: Calculus II

I. Catalog Description:

MAT 172: Calculus II

3 ch/3 sh

This course is one of a series intended for students who major in mathematics, the sciences, or engineering. The topics include the definition, properties, and applications of definite integrals, properties, derivatives, and integrals of exponential, logarithmic, trigonometric, inverse trigonometric, and hyperbolic functions with applications; and techniques of integration. A graphing calculator is required for this course. MAT 171 is the prerequisite for MAT 172.

II. Rationale

This course prepares students who major in mathematics, the sciences, or engineering with the mathematical background they need to address problems that arise in those majors. It could be counted in Category IV-A, IV-D, or V of General Education. The course addresses General Education Goal #3: "Students will apply mathematical functions and numeric data interpretation to problem solving."

III. Course Objectives:

The student will:

- A. Develop an understanding of the basic concepts and application of the definite integral.
- B. Develop an understanding of the basic concepts of the differentiation and integration of the logarithmic, exponential, trigonometric, inverse trigonometric, and hyperbolic functions.
- C. Strike a judicious balance between theory and application, between computational skills and mathematical sophistication, and between intuition and rigor.
- D. Develop an appreciation of applications of the definite integral and of derivatives and show how and why these concepts are mathematical models for many phenomena in the physical world.

IV. Course Outline

A. The Definite Integral

1. Antiderivatives and indefinite integration
2. Change of variables
3. Summation notation and area
4. The definite integral
5. Properties of the definite integral
6. The fundamental theorem of calculus
7. Numerical integration

B. Applications of the Definite Integral

1. Area of a region in a plane
2. Volume of a solid of revolution
3. Work
4. Liquid pressure

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5. Arc length
6. Other applications

C. Logarithmic and Exponential

1. The inverse of a function
2. The natural logarithmic function
3. The natural exponential function
4. Differentiation and integration of the logarithmic and exponential functions.
5. Logarithmic differentiation

D. Inverse Trigonometric and Hyperbolic Functions

1. Inverse trigonometric functions
2. Differentiation of and integrals involving the inverse trigonometric function
3. Hyperbolic and inverse hyperbolic functions.

E. Techniques of Integration

1. Integration by parts
2. Trigonometric integrals
3. Integration by trigonometric substitution
4. Integration of rational functions
5. Integration by substitution
6. Integration by trapezoidal and Simpson's rules
7. Table of integrals.

V. Instructional Resources

Anton, Bivens, Davis. *Calculus, Early Transcendentals*. (8th edition) New York, NY: John Wiley & Sons (2005).

Smith, Minton. *Calculus*. (2nd edition). McGraw Hill (2002).

Larson, Hostetler and Edwards. *Calculus*. (7th edition). St. Charles, IL: Houghton Mifflin Publishing (2002).

Anton, Howard. *Calculus with Analytic Geometry*. (5th edition). New York, NY: John Wiley & Sons (1995).

Berkey, D. D. *Calculus*. New York, NY: Saunders College Publishing Company (1984).

Boggess, Albert, et. al. *CalcLabs with Maple V*. Belmont, CA: Brooks/Cole Publishing Company (1995).

Char, B. W., Geddes, K. O., et. al. *First Leaves: A Tutorial Introduction to Maple V*. New York, NY: (1992).

Devitt, John S. *Calculus with Maple V*. Belmont, CA: Brooks/Cole Publishing Company (1993).

Edwards, C. H. and Penney, David E. *Calculus and Analytic Geometry*. (4th edition) Englewood Cliffs, NJ: Prentice Hall (1994).

Finney, Ross, Maurice Weir and Frank Giordano. *Thomas' Calculus*. (10th edition). Boston, MA: Addison Welsey Longman (2001).

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Goldstein, Larry, David Lay, and David Schneider. *Calculus and its Applications*. (9th edition). Upper Saddle River, NJ: Prentice Hall (2001).

Harris, Kent, Lopez, Robert J. *Discovering Calculus with Maple*. (2nd Edition). New York, NY: John Wiley & Sons (1995).

Holder, Leonard I., *Calculus with Analytic Geometry*. Belmont, CA: Wadsworth Publishing Co. (1988).

Hughes-Hallett, Deborah and Gleason, Andrew. *Calculus*. (2nd Edition). New York, NY: John Wiley & Sons (1998).

McCarter, John H. *Discovering Calculus with Graphing Calculators*. New York, NY: John Wiley & Sons (1995).

Salas, S. L. and Hille, Einar. *Calculus - One and Several Variables*. (7th edition). New York, NY: John Wiley and Sons (1995).

Varberg, Dale, Edwin Purcell, and Steven Ridgon. *Calculus* (8th edition). Upper Saddle River, NJ: Prentice Hall (2001).

Zill, Dennis G. *Calculus with Analytic Geometry*. (3rd edition). Boston, MA: Prindle, Weber & Schmidt, Inc. (1992).

VI. Methods of Presentation and Evaluation

Those methods of presentation are used which lead the student to an understanding of both the theory and the applications of calculus. Lecture, discussion, problem-solving are included in the approaches which are used when appropriate. Maple V and Graphing calculators are used when appropriate. Student performance is evaluated on the basis of test results.

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