

MATH 115
 COURSE NAME/NUMBER

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Building upon their pre-requisite calculation skills and knowledge of functions and function notation, successful students will:

- Learn to be proficient with the technology chosen for the delivery at the extent required to perform the mathematical analysis learned in this course.
- Learn to make mathematical models from real data from their fields of interest, where the models are linear, exponential, logarithmic, logistic, polynomial, cyclical or combinations of these that are piecewise continuous. Interpret and apply these models.
- Learn the fundamental techniques of differential calculus to analyze the present and future behaviour of models.
- Learn the fundamental techniques of integral calculus to reconstruct total change in a quantity and model of a quantity from rate of change data or a rate of change model for the quantity.
- Be able to demonstrate the ability to immediately interpret all results in real and practical terms in the field of interest from which the model being analyzed arose.

METHODS:

All class sessions will be held in a lab/classroom setting using the latest technology that is available for our use. At present we will use MAPLE (a Computer Algebra System) in an IBM compatible lab. Students will learn to use the technology as an everyday tool for accomplishing the mathematical analysis.

Students will do regular group and individual assignments.

Progress will be evaluated with regular short tests, midterms and a 3-hour comprehensive final exam.

As much of the time as possible, real data is used as a starting point for modeling behaviour with continuous mathematical functions so that the methods of calculus can be applied to real problems of interest to students in the various areas of study.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR

Yes

No

METHODS OF OBTAINING PLAR:

Course challenge.

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

The text is chosen by a departmental curriculum committee.

Example of texts for this course might be:

Latorre, Kenelly, et al., *Calculus Concepts*, third edition, Houghton Mifflin, 2002.

Ostebee, Zorn, *Calculus from Graphical, Numerical and Symbolic Points of View*, Volume 1, first edition, Saunders.

SUPPLIES / MATERIALS:

Student version of MAPLE V current release is recommended.

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STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Quizzes, assignments and projects	20%
Term tests	30%
Final exam	40%

Students must achieve at least 40% on the final exam in order to receive credit for this course.

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

1. **FUNDAMENTALS OF MODELING:**
Linear, Exponential, Logarithmic, Logistic, Polynomial, Cyclical (trigonometric) models. Reversing input/output variables in a model. Inverses. How to choose and/or build a model. Constructing a model from two or more models. Piecewise continuous modeling. Modeling with Splines (linear, quadratic or cubic).
2. **DESCRIBING CHANGE:**
Rates of change.
3. **DETERMINING CHANGE:**
Derivatives.
4. **ANALYSING CHANGE:**
Optimisation, curvature and inflection points, approximating change.
5. **ACCUMULATING CHANGE:**
Approximating total change, Limits of Sums, definite integrals, indefinite integrals, the Fundamental Theorem.
6. **APPLICATIONS OF MEASURING THE EFFECTS OF CHANGE:**
Averages, integrals in Economics, integrals in Biological Sciences, very simple differential equations.