



Course Code MATH-192	Course Title Calculus for the Life Sciences I	ECTS Credits 6
Department Computer Science	Semester Fall, Spring	Prerequisites MATH-180
Type of Course Required	Field Mathematics	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 1 st or 2 nd	Lecturer(s) Dr Nectarios Papanicolaou
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of this course are to:

- Introduce students to limits and continuity of a function of one real variable
- Provide students with a deep knowledge of differentiation techniques
- Cover in detail all aspects of curve sketching (including relative extrema, vertical and horizontal asymptotes)
- Thoroughly discuss essential integration techniques
- Make students aware of the applications of Calculus to basic biological problems

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Calculate limits algebraically
2. Determine whether a function is continuous
3. Compute derivatives using limits of difference quotients
4. Apply differentiation techniques to compute first and higher-order derivatives
5. Use derivatives to find maxima and minima. .
6. Sketch the graphs of polynomial and rational functions
7. Compute indefinite integrals using properties of integrals and the method of u-substitution.
8. Use the fundamental theorem of Calculus to evaluate definite integrals
9. Solve simple Biology problems with the aid of derivatives and integrals

Course Contents:

1. Review of Basic Functions
2. Limits and Continuity
 - a. Numerically and Graphically
 - b. Algebraic Computation of Limits
3. Derivatives

<ul style="list-style-type: none"> a. Average Rates of Change/ Difference Quotients b. Instantaneous Rates of Change c. Differentiation Techniques d. The Chain Rule e. Higher-Order Derivatives
<ul style="list-style-type: none"> 4. Applications of Differentiation <ul style="list-style-type: none"> a. Using First Derivatives for finding Maxima and Minima b. Using Second Derivatives for finding Maxima and Minima c. Graph Sketching: Asymptotes and Rational Functions d. Absolute Maxima and Minima e. Maximum-Minimum Problems, Biology applications f. Implicit Differentiation
<ul style="list-style-type: none"> 5. Integration <ul style="list-style-type: none"> a. Antiderivatives - Basic Integration Techniques b. Signed Area c. The Fundamental Theorem of Calculus d. Properties of Definite Integrals. Applications e. Integration by Substitution

Learning Activities and Teaching Methods:

Lectures, Homework.

Assessment Methods:

Assignments, quizzes, two mid-term exams, and a final exam
--

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
M. L. Bittinger, N.Brand, J.Quintanila	Calculus for the Life Sciences.	Addison Wesley	2006	0321279352

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Howard Anton, Irl Bivens, Stephen Davis	Calculus: Late Transcendentals, Combined (or Single Variable) <i>9th Edition</i>	Wiley	2009	0470183497
Frederick R. Adler	Modeling the Dynamics of Life: Calculus and Probability for Life Scientists, <i>2nd edit.</i>	Brooks/Cole	2004	0534404863
Claudia Neuhauser	Calculus for Biology and Medicine <i>3rd Edition</i>	Prentice-Hall	2010	0321644689