

Department:

Mathematics

Course Description:

This course provides an introduction to calculus and linear algebra concepts that are particularly useful in the study of economics and business administration. The course will cover the basic theorems and concepts of differential and integral calculus and linear algebra and will emphasize working problems with applications in economics and business.

Course Competencies:

The learning outcomes and competencies detailed in this syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups for this course as approved by the Kansas Board of Regents. (Kansas Regents Shared Number Course and Title: **MAT 1015 General/Business /Applied Calculus.**)

Upon completion of the course, the student should be able to:

1. Define and explain what a function is and work with linear, power, polynomial, exponential, and natural logarithmic functions using words, tables, graphs, and formulas.
2. Solve problems by applying functions to business and economics.
3. Solve systems of linear equations using substitution, elimination, augmented matrix, row echelon form, and reduced row echelon form methods.
4. Use an inverse matrix to find the solution to a matrix equation.
5. Apply elementary techniques of linear algebra to solve multivariable business problems, including the open and closed Leontief models.
6. Evaluate limits of functions.
7. Use limits to determine continuity of a function at a point.
8. Determine differentiability of a function at a point.
9. Differentiate algebraic, exponential, and logarithmic functions.
10. Interpret derivatives as the slopes of tangent lines, instantaneous rates of change, and marginals.
11. Use derivatives to describe the behavior of a function.
12. Apply derivatives to problems, including finding maxima and minima, finding inflection points, and applying the first and second derivative tests.
13. Apply the derivative knowledge obtained in finding maxima and minima to solve business problems, including optimization of profit and revenue functions.
14. Apply derivatives to problems in economics, business, and the physical, social, and life sciences.
15. Antidifferentiate algebraic and exponential functions.
16. Use left and right hand sums to estimate definite integrals from a table, graph, and formula.
17. Evaluate definite integrals.
18. Apply antiderivatives to problems in economics, business, and the physical, social, and life sciences.
19. Find the average value of a function.
20. Evaluate and analyze functions of two variables.

21. Compute first and second order partial derivatives.
22. Use the second derivative test to classify critical points.
23. Solve constrained optimization problems using various methods.

Course Content:

- A. Theory of Functions
 1. Linear Functions and Models
 - a. Functions from the Numerical Viewpoint
 - b. Functions from the Algebraic Viewpoint
 - c. Functions from the Graphical Viewpoint
 - d. Linear Functions
 - e. Linear Models
 2. Business Functions
 - a. Simple Interest
 - b. Compound Interest
 - c. Annuities, Loans, Bonds
 3. Nonlinear Models
 - a. Quadratic Functions and Models
 - b. Exponential Functions and Models
 - c. Logarithmic Functions and Models
 - d. Logistic Functions and Models
- B. Linear Systems and Matrices
 1. Systems of Equations
 - a. Systems of Two Equations and Two Unknowns
 - b. Using Matrices to Solve Systems of Equations
 - c. Applications of Systems of Equations
 2. Matrix Algebra and Applications
 - a. Matrix Inversion
 - b. Input-Output Models
- C. Derivatives
 1. Limits and continuity
 2. Introduction to the Derivative
 - a. Average Rate of Change
 - b. Derivative from the Numerical and Graphical Viewpoint
 - c. Derivative from the Algebraic Viewpoint
 3. Techniques of Differentiation
 - a. Derivative of Powers, Sums, and Constant Multiples
 - b. Derivatives of Products and Quotients
 - c. Derivative of Compositions (The Chain Rule)
 - d. Derivatives of Logarithmic and Exponential Functions
 4. Applications of the Derivative
 - a. Marginal Analysis
 - b. First and Second Derivative Test
 - c. Finding Maxima and Minima
 - d. Applications of Maxima and Minima
 - e. Analyzing Graphs
- D. Integrals
 1. Indefinite Integral
 2. Definite Integral
 3. Average Value
- E. Functions of Several Variables
 1. Functions of Several Variables from the Numerical and Algebraic Viewpoints

2. Partial Derivatives
3. Maxima and Minima of Multi-Variable Functions
4. Constrained Maxima and Minima and Applications

Learning Assessments:

Course competencies will be assessed by written examinations covering all course material, including regular hour-long exams and a required, comprehensive final exam. Assessment may also include homework assignments, in-class work, quizzes, and projects.

Instructional Materials:

Textbook: Waner, S., & Costenoble, S. (2014). *Finite Mathematics and Applied Calculus* (6th ed.). Boston, MA: Cengage Learning. ISBN-13: 978-1133607700

Guidelines for Requesting Accommodations Based on Documented Disability or Medical Condition

It is the intention of Highland Community College to work toward full compliance with the Americans with Disabilities Act, to make instructional programs accessible to all people, and to provide reasonable accommodations according to the law.

Students should understand that it is their responsibility to self-identify their need(s) for accommodation and that they must provide current, comprehensive diagnosis of a specific disability or medical condition from a qualified professional in order to receive services. Documentation must include specific recommendations for accommodation(s). Documentation should be provided in a timely manner prior to or early in the semester so that the requested accommodation can be considered and, if warranted, arranged.

In order to begin the process all students **must** complete the “Disabilities Self-Identification Form” on our [Disability Services website](#).

This form can also be accessed at the Highland Community College homepage under Students Services/Student Resources/Disability Service or by contacting the Disabilities Coordinator.

A Note on Harassment, Discrimination and Sexual Misconduct

Highland Community College seeks to assure all community members learn and work in a welcoming and inclusive environment. Title VII, Title IX, and College policy prohibit harassment, discrimination and sexual misconduct. Highland Community College encourages anyone experiencing harassment, discrimination or sexual misconduct to talk to report to the Vice President for Student Services, the Human Resources Director or complete an [online report](#) about what happened so that they can get the support they need and Highland Community College can respond appropriately.

There are both confidential and non-confidential resources and reporting options available to you. Highland Community College is legally obligated to respond to reports of sexual misconduct, and therefore we cannot guarantee the confidentiality of a report, unless made to a confidential resource. Responses may vary from support services to formal investigations. As a faculty member, I am required to report incidents of sexual misconduct and thus cannot guarantee confidentiality. I must provide our Title IX coordinator with relevant details such as the names of those involved in the incident. For more information about policies and resources or reporting options, please review our [Equity Grievance Policy](#).