

DEREE COLLEGE SYLLABUS FOR: MA 2105 APPLIED CALCULUS

UK LEVEL: 4
UK CREDITS: 15
US CREDITS: 3/1/3

(Updated Spring 2021)

PREREQUISITES:	MA1008 LE College Algebra											
CATALOG DESCRIPTION:	Introduction to calculus and its application to the solution of problems arising in business, economics, and related fields. Differentiation, Marginal analysis, Integration, Optimization, Partial differentiation, Lagrange multipliers.											
RATIONALE:	The course introduces the basic concepts of differentiation and integration for polynomial, rational, exponential, and logarithmic functions involving one or two variables. Students have the opportunity to analyze the behaviors of functions regarding rates of change, solve marginal analysis and optimization problems, evaluate definite and indefinite integrals, find and evaluate partial derivatives to solve constrained and unconstrained optimization problems with functions of two variables.											
LEARNING OUTCOMES:	<p>As a result of taking this course, the student should be able to:</p> <ol style="list-style-type: none"> 1. Show understanding of the concept of the derivative of a univariate function as a rate of change and calculate the first and second order derivatives. 2. Apply direct or implicit differentiation to solve marginal analysis problems and to optimize functions arising in economics, business, and related fields. 3. Apply indefinite and/or definite integration to solve problems related to applications in economics, business, and related fields. 4. Show understanding of the concept of a function of two variables and calculate the first and second order partial derivatives. 5. Solve optimization problems involving functions of two variables. 											
METHOD OF TEACHING AND LEARNING:	<p>In congruence with the teaching and learning strategy of the college, the following tools are used:</p> <ul style="list-style-type: none"> ➤ Classes will consist of lectures where the concepts of the course will be introduced. Their application to the solution of problems arising from business, economics and related fields will be illustrated through several examples. Coursework will be regularly assigned and discussed in class with students actively participating in the discussion. Computer software will be available both as a teaching aid and as the medium for solving problems. ➤ Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture material. ➤ Use of a Blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources. 											
ASSESSMENT:	<p>Summative:</p> <table border="1" data-bbox="662 1766 1442 2020"> <tr> <td data-bbox="662 1766 992 1829">First assessment: Midterm examination</td> <td data-bbox="992 1766 1073 1829">40%</td> <td data-bbox="1073 1766 1442 1829">Solving calculus problems, interpretation of results.</td> </tr> <tr> <td data-bbox="662 1829 992 1955">Second assessment: Portfolio of student work</td> <td data-bbox="992 1829 1073 1955">10%</td> <td data-bbox="1073 1829 1442 1955">Problem solving using software to promote critical thinking in applications of calculus.</td> </tr> <tr> <td data-bbox="662 1955 992 2020">Final assessment: Final examination</td> <td data-bbox="992 1955 1073 2020">50%</td> <td data-bbox="1073 1955 1442 2020">Solving calculus problems, interpretation of results.</td> </tr> </table>			First assessment: Midterm examination	40%	Solving calculus problems, interpretation of results.	Second assessment: Portfolio of student work	10%	Problem solving using software to promote critical thinking in applications of calculus.	Final assessment: Final examination	50%	Solving calculus problems, interpretation of results.
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Final assessment: Final examination	50%	Solving calculus problems, interpretation of results.										

	<p>Formative:</p> <table border="1" data-bbox="662 132 1442 262"> <tr> <td data-bbox="662 132 993 262">Practice sets of exercises and word-problems assigned through Blackboard</td> <td data-bbox="993 132 1075 262">0%</td> <td data-bbox="1075 132 1442 262">Solving calculus problems, interpretation of results.</td> </tr> </table> <p>The formative practice sets aim to prepare students for the examinations and ensure that students are actively engaged during the term.</p> <p>The first assessment (midterm exam) tests Learning Outcomes 1 and 2. The second assessment (portfolio) tests Learning Outcomes 1, 2, 3, 4, 5. The final assessment (final exam) tests Learning Outcomes 1, 2, 3, 4, 5.</p> <p>The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment. If students pass the comprehensive assessment that tests all Learning Outcomes for this module and the average grade for the module is 40 or higher, students are not required to resit any failed assessments. Students are required to resit failed assessments in this module.</p>	Practice sets of exercises and word-problems assigned through Blackboard	0%	Solving calculus problems, interpretation of results.
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<p>INDICATIVE READING:</p>	<p>REQUIRED READING:</p> <p>Soo T. Tan, <i>Applied Calculus for the Managerial, Life, and Social Sciences: A brief approach</i>, 10th Edition 2015, Cengage</p> <p>RECOMMENDED READING:</p> <p>Hoffmann L., Bradley G., Sobecki D., and Price M., <i>Calculus for Business, Economics and the Social and Life Sciences</i>, 11th Brief Edition (2013), McGraw Hill.</p> <p>Ron Larson, <i>Applied Calculus for the Life and Social Sciences</i>, 1st Edition (2010), Cengage</p>			
<p>INDICATIVE MATERIAL:</p>	<p>REQUIRED MATERIAL: N/A</p> <p>RECOMMENDED MATERIAL: College Mathematics Mathematics Magazine American Mathematical Monthly</p>			
<p>COMMUNICATION REQUIREMENTS:</p>	<p>Oral and written communication skills using academic / professional English.</p>			
<p>SOFTWARE REQUIREMENTS:</p>	<p>Software associated with the course textbook's digital learning resources. Opensource math software <i>SCILAB</i>.</p>			
<p>WWW RESOURCES:</p>	<p>http://mathworld.wolfram.com http://mathacademy.com https://www.khanacademy.org/math https://www.scilab.org</p>			

INDICATIVE CONTENT:

1. Graphs, and Limits

- 1.1. Functions
- 1.2. The graph of a function
- 1.3. Linear functions

2. Differentiation: Basic Rules

- 2.1. Introduction of the derivative as a limit
- 2.2. Rules of differentiation
- 2.3. Higher-order derivatives
- 2.4. The chain rule
- 2.5. Marginal analysis and approximations using increments
- 2.6. Implicit differentiation and related rates

3. Additional Applications of the Derivative

- 3.1. Increasing and decreasing functions; relative extrema
- 3.2. Concavity and points of inflection
- 3.3. Curve sketching
- 3.4. Optimization

4. Exponential and Logarithmic Functions

- 4.1. Differentiation of exponential and logarithmic functions

5. Integration

- 5.1. Antidifferentiation: The indefinite integral
- 5.2. Integration by substitution
- 5.3. The definite integral and the fundamental theorem of calculus
- 5.4. Applying definite integration: Area between curves and average value
- 5.5. Additional applications to business and economics

6. Calculus of Several Variables

- 6.1. Functions of several variables
- 6.2. Partial derivatives
- 6.3. Optimizing functions of two variables
- 6.4. Constrained optimization: The method of Lagrange multipliers