DEREE COLLEGE SYLLABUS FOR: MA 2131 CALCULUS I	3/1/3
(Previously MA 2130 CALCULUS I) (Updated: Spring 2024)	**UK LEVEL: 4** **UK CREDITS: 15**
PREREQUISITES:	MA 1024 Algebra & Trigonometry **or** MA 1008 College Algebra **or** ITC 3006 Mathematics for Computing
CATALOG DESCRIPTION:	An introductory course in differential and integral calculus focusing on science and engineering applications. Differentiation and integration methods are applied to solve problems involving rates of change and optimization of univariate functions of various forms including polynomial, trigonometric, and transcendental functions.
RATIONALE:	This mathematics module aims to introduce the basic calculus concepts and techniques necessary for calculus-based science and engineering courses. The knowledge gained in this course will provide students with important transferable skills necessary to use the mathematics of calculus in real-life applications in related disciplines.
LEARNING OUTCOMES:	*As a result of taking this course, the student should be able to:* 1. Demonstrate understanding of the concepts of differential calculus and find the derivative of univariate functions. 2. Apply differentiation rules to solve approximation and max/min problems with applications in the sciences and interpret the results. 3. Demonstrate understanding of the concepts of integral calculus and evaluate indefinite and definite integrals of univariate functions with applications in science and technology. 4. Demonstrate understanding of the concepts of partial differentiation.
METHOD OF TEACHING AND LEARNING:	In congruence with the teaching and learning strategy of the college, the following tools are used: • Lectures and class discussions. • Homework assignments. • Office hours held by the instructor to provide further assistance to students. • Use of library facilities for further study and preparation for the exams • Use of the Blackboard course management platform to further support communication, by posting lecture notes, assignment instruction, timely announcements, formative quizzes and online submission of assignments.
ASSESSMENT:	**Summative:** 1st assessment: Midterm examination (written, 1 hour) — **40%** 2nd assessment: Portfolio of student work — **10%** Final assessment: Final examination (written, 2 hours) — **50%** **Formative:** Practice sets of exercises and word problems assigned through Blackboard. — **0%** ▪ The first assessment tests Learning Outcomes 1 and 2.

	▪ The second assessment tests Learning Outcomes 1, 2, 3, and 4. ▪ The final assessment tests Learning Outcomes 1, 2, 3, and 4. ▪ The formative assessment aims to prepare students for the examinations. 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.
INDICATIVE READING:	**REQUIRED READING:** • R. Larson, B. Edwards, *Calculus: Early Transcendental Functions*, 7th Ed. (Metric Version), 2019, Cengage **RECOMMENDED READING:** • J. Stewart, D. Clegg, S. Watson, *Calculus*, 9th Ed. (Metric Version), 2020, Cengage • R. Smith, R. Minton, *Calculus*, 4th Ed., 2011, McGraw Hill
INDICATIVE MATERIAL: *(e.g. audiovisual, digital material, etc.)*	**REQUIRED MATERIAL: N/A** **RECOMMENDED MATERIAL:** • College Mathematics • Mathematics Magazine • American Mathematical Monthly
COMMUNICATION REQUIREMENTS:	Oral and written communication skills using academic / professional English.
SOFTWARE REQUIREMENTS:	MS Office and Blackboard CMS. Any software distributed with the course textbook. Python (www.python.org) *or* Scilab (www.scilab.org)
WWW RESOURCES:	http://mathworld.wolfram.com http://sosmath.com https://www.khanacademy.org/math https://www.symbolab.com
INDICATIVE CONTENT:	**1. Functions and Limits** 1.1 Functions and graphs 1.2 Limits at real numbers – Continuous functions 1.3 Infinite limits **2. Differentiation** 2.1 The concept of the derivative as a limit 2.2 Basic rules of differentiation and rates of change 2.3 Higher order derivatives and the chain rule 2.4 Implicit differentiation and related rates 2.5 Differentiation of inverse functions 2.6 Monotonicity and extrema of functions 2.7 Concavity and inflection points of functions – Curve sketching 2.8 Optimization problems and approximations with differentials

	3. Integration 3.1 Antidifferentiation: The indefinite integral and its basic rules 3.2 The definite integral and the Fundamental Theorem of Calculus 3.3 Integration by substitution 3.4 The natural logarithmic function and its integration 3.5 Integration of trigonometric & inverse trigonometric functions 3.6 The hyperbolic functions and their calculus 3.7 Modeling with separable first order differential equations 3.8 Area of a region between two curves **4. Functions of Several Variables** 4.1 Functions of several variables 4.2 Partial derivatives