FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2024/2025	Semester	2
Module Code	COMP406		
Learning Module	Selected Topics I (Calculus)		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Liam Lei	Email	liamli@mpu.edu.mo
Office	Rm. N46B, Wui Chi, Building	Office Phone	8599-6808

MODULE DESCRIPTION

This module introduces the basic concepts of differential and integral calculus. Topics include functions, limits and continuity, techniques of differentiation, applications of differentiation to practical problems, curve sketching, definite and indefinite integration, and applications of integral calculus.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Tell the concept of limits of functions; (SM2p, EA3p)
M2.	Utilize the derivative as an important problem-solving tool; (SM2p, EA3p)
M3.	Assess the properties of curves from their derivatives; (SM2p, EA3p)
M4.	Construct graphs of advanced functions by analyzing the function behaviour; (D4p)
M5.	Utilize definite and indefinite integral as an important problem-solving tool; (SM2p, EA3p)
M6.	Combine geometric ideas of area and analytic concepts of the indefinite integral to give a unified perspective of mathematics. (SM2p, EA3p)

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
P1.	Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems;						

P2.	Evaluate computer systems in a local area network, and understand the additional requirements for connection to other networks through wide area networks;						
P3.	Be competent in system development in the Internet and the web platform;						
P4.	Work independently to design and implement a relational database, with an emphasis on how to organise, maintain and retrieve information from a DBMS;						
P5.	Acquire essential knowledge in specific fields of computing disciplines including multimedia, security and artificial intelligence;						
P6.	Acquire the perceptive skills needed to understand information presented in the form of UML diagram, flow chart or other industry standard formats;						
P7.	Understand the need for and use of the necessary mathematical techniques;	✓	✓	✓	✓	✓	✓
P8.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support of computer systems and networks;						
P9.	Work as an effective member of a team in the analysis, design and development of software systems;						
P10.	Use project planning and management techniques in systems development;						
P11.	Understand the fundamental and operational issues of computer systems in business environments;						
P12.	Equip with adequate written, oral communication and interpersonal skills;						
P13.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;						
P14.	(For Enterprise Information Systems specialization) Gain an in-depth understanding of the information technology related to enterprise information systems, with an emphasis on development of such systems to support business processes;						
P15.	(For Gaming Technology specialization) Acquire the general and advanced knowledge of current technologies and operating environment in the gaming industry;						
P16.	(For Computer Education specialization) Acquire the general and practical knowledge of computer education and its practicing environment in secondary education.						

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1. Limits of Functions	3
	1.1 One-sided limits	

	1.2 Properties of limits	
	1.3 Limits at infinity	
4	2. Differential Calculus	9
	2.1 The derivative	
	2.2 Derivatives of the sum, difference, product and quotient	
	2.3 The inverse rule and the chain rule	
	2.4 Derivatives of trigonometric functions	
	2.5 Derivatives of logarithmic and exponential functions	
	2.6 Implicit differentiation and parametric differentiation	
	2.7 Higher-order derivatives	
5-7	3. Applications of Differential Calculus	9
	3.1 L'Hopital's rule for indeterminate forms	
	3.2 Maxima, minima and inflection points	
	3.3 First and second derivative tests	
	3.4 Newton's method for approximating solutions of equations	
8-10	4. Curve Sketching	9
	4.1 Domain and range	
	4.2 Intercepts	
	4.3 Symmetry	
	4.4 Periodicity	
	4.5 Relative extrema	
	4.6 Discontinuity	
	4.7 Asymptotes	
11-13	5. Integral Calculus	9
	5.1 The indefinite integral	
	5.2 The definite integral	
	5.3 Basic integration formulas	
	5.4 Integration by substitution	
	5.5 Integration by parts	

	5.6 Integration of rational functions by completing the square	
	5.7 Integration of rational functions by partial fractions	
14-15	6. Applications of Integral Calculus	6
	6.1 Area under a curve	
	6.2 Area between two curves	
	6.3 Area of surface of revolution	
	6.4 Volume of solid of revolution	

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
T1. Lectures	✓	✓	✓	✓	✓	✓
T2. In-class exercises	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	**Weighting (%)**	**AHEP3 LOs**	**ILOs to be Assessed**
A1. Assignment / Classwork	10%	SM2p, EA3p, D4p	M1,M2,M3,M4, M5,M6
A2. Tests	40%	SM2p, EA3p, D4p	M1,M2,M3,M4, M5
A3. Examination	50%	SM2p, EA3p, D4p	M1,M2,M3,M4, M5,M6

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

REQUIRED READINGS

1. Hass, J.R., Heil, C.E., & Weir, M.D. (2017). Thomas' Calculus (14th ed.). New York: Pearson.

REFERENCES

1. Anton, H. (1992). Calculus with Analytic Geometry. Singapore: Wiley.
2. Stein, S.K., & Barcellos. A. (1992). Calculus and Analytic Geometry. Singapore: McGraw-Hill.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.