澳門理工大學
Universidade Politécnica de Macau
Macao Polytechnic University

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	MATH1112		
Learning Module	Calculus		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Dr. Liam Lei	Email	liamli@mpu.edu.mo
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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.	Describe the concepts of derivative and its underlying concepts such as limits and continuity; (C2)
M2.	Compute derivative for various types of functions using definition and rules; (C2)
M3.	Discuss the various applications of derivative; (C1)
M4.	Describe the concepts of definite and indefinite integrals; (C2)
M5.	Demonstrate the ability to find indefinite integrals using various techniques; (C2)
M6.	Extend the ideas of definite integrals to solve geometric problems. (C1)

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 on common platforms, including the Internet platform;						
P2.	Acquire essential knowledge in specific fields of computing disciplines including networking, artificial						

	intelligence and security;						
P3.	Apply necessary mathematical techniques to model, analyse and devise solutions to complex problems;	✓	✓	✓	✓	✓	✓
P4.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support and mitigation of security risks of computer systems and networks;						
P5.	Design and implement relational database, with an emphasis on how to organise, maintain, retrieve and analyse information;						
P6.	Distinguish the fundamental and operational issues of computer systems, with considerations of user, business, ethical, societal and environmental needs;						
P7.	Evaluate, prepare and communicate effectively on technical information to both technical and non-technical audience;						
P8.	Work as an effective member of a team in the analysis, design and development of software systems, with recognition of requirement to support equality, diversity and inclusion;						
P9.	Use project planning, risk management and quality management techniques in solutions to complex problems;						
P10.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;						
P11.	(For Business Intelligence specialization) Gain an in-depth knowledge of technologies related to data analysis and management of information to support business processes in enterprises;						
P12.	(For Gaming Technology specialization) Acquire the general and advanced knowledge of current technologies and operating environment for the development of the gaming and tourism industry;						
P13.	(For Computer Education specialization) Acquire 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	
2-4	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	4. Curve Sketching	3
	4.1 Domain and range	
	4.2 Intercepts	
	4.3 Symmetry	
	4.4 Periodicity	
	4.5 Relative extrema	
	4.6 Discontinuity	
	4.7 Asymptotes	
9-11	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	
12-13	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	
14-15	7. Infinite Series	
	7.1 The Geometric Series	
	7.2 Convergence Tests	
	7.3 The Taylor Series for exp, sin, and cos	
	7.4 Power series	

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 (%)**	**AHEP4 LOs**	**ILOs to be Assessed**
A1. Assignment / Classwork	25%	C1, C2	M1,M2,M3, M4,M5,M6
A2. Tests	25%	C1, C2	M1,M2,M3, M4,M5,M6
A3. Examination	50%	C1, C2	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. Strauss, M.J., Bradley, G.L., & Smith, K.J. (2002). Calculus. NJ: Prentice Hall.
2. Anton, H. (1992). Calculus with Analytic Geometry. Singapore: Wiley.
3. 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/.