University of Macau

Undergraduate Civil Engineering, Electrical and Electronic Engineering, Electromechanical Engineering, Software Engineering Programs

Coordinating Unit:	Department of Mathematics, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	MATH101	Year of Study:	1
Course Title:	Mathematical Analysis I		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	Nil		
Prerequisite Knowledge:	Nil		
Duration:	One semester	Credit Units:	5
Class/Laboratory Schedule:	Four hours of lecture and two hours of tutorial per week.		
Laboratory/Software Usage:	Nil		
Course Description:	This course, together with Mathematical Analysis II, aim at providing students with a solid foundation of one variable calculus. The topics include limit and continuity, derivative and its application, integral and it applications.		
Course Objectives:	1. To introduce the fundamental theories of calculus. 2. Be able to formulate and solve problems using derivatives. 3. Be able to formulate and solve problems using integrals.		
Learning Outcomes (LOs):	Upon completion of this course, students are expected to: 1. understand and be able to evaluate limits [PO: a] 2. understand and be able to find the derivatives of functions [PO: a] 3. be able to use derivative in applied problems [PO: a] 4. understand and be able to find the integrals of functions [PO: a] 5. be able use integral in applied problems [PO: a]		
Texts & References: *(* recommended textbook(s))*	1. Calculus, 6th Ed, C. H. Edwards and D. E. Penney, Prentice Hall* 2. Calculus and analytical geometry, 9th Ed. Thomas and Finney, Addison Wesley.		
Student Assessment:	• Assignments: 15% • Midterm examination: 25% • Final examination: 60%		
Learning Outcome Assessment:	• Assignments, midterm and final examination		

Pedagogical Methods:	☑ Lecture	☐ Service learning
	☐ Guest speakers	☐ Internship
	☐ Case study	☐ Field study
	☐ Role playing	☐ Company visits
	☐ Student presentation	☐ e-learning
	☐ Project	☐ Independent study
	☐ Simulation game	☐ Others: _____
	☑ Exercises and problems	

Major Assessment Methods: For each Major Assessment Method below, please indicate the specific pedagogical methods involved (by putting a ✓ in the relevant box(es) on the right-hand side).	Case Study	Role Playing	Student Presentation	Individual project/paper	Group project/paper	Simulation Game	Exercises & problems	Service learning	Internship	Field Study	Company visits	Written examination	Oral examination	Others (please specify)
Class Participation/ Discussion (0%)														
Assignments (15%)							✓							
Quizzes (0%)														
Midterm Exam (25%)												✓		
Final Exam (60%)												✓		
Others *(please specify)*														
Course Web: (if any)	http://www.sftw.umac.mo/~fstcmc/math101.html													

Course Content: (topic outline)

Week no.	Topics	Assignment no.	LO no.
1	**Introduction** A brief review of functions. Tangent lines and slope predictors.	--	1,2
2	**Limit and continuity** The concept and operations of limit. The concept of continuity.	1	1
3, 4	**The derivative** The derivative and rate of change, basic differentiation rule, the chain rule, derivative of algebraic functions	2,3	2
5, 6	**Applications of derivative** Optimization on closed intervals, applied optimization problems, derivatives of trigonometric functions, Newton's method	4,5	3
7, 8	**More applications of derivatives** Differentials and linear approximation, increasing and decreasing functions and the Mean Value Theorem, first derivative test, curve sketching	6,7	3
9	**Midterm examination**		
10, 11	**The integral** Antiderivative and initial value problem, elementary area computations, Riemann Sums and the integral, evaluation of integrals, the fundamental theorem of calculus, integration by substitution, area of plane regions.	8,9	4
12	**Applications of integral** Riemann sum approximation, volumes by method of cross sections and method of cylindrical shells, arc length and surface area of revolution.	10	5
13, 14	**Calculus of transcendental functions** Exponential and logarithmic functions, indeterminate forms and L'Hopital rule, the natural logarithm as an integral, inverse trigonometric functions, hyperbolic functions		1-5
TBA	**Final Examination**		

TBA: To be arranged by the Registry

Contribution to Program Outcomes:	

Program Outcomes	Contribution to POs[#] 5 ----------> 1 Significant Least				
	5	4	3	2	1
(a) apply knowledge of mathematics, science, and engineering	✓				
(b) design and conduct experiments, and analyze data					
(c) design components, systems or processes in presence of constraints					
(d) Function in a multi-disciplinary team					
(e) Engineering problem solving					
(f) Understand professional and ethical responsibility					
(g) Communicate effectively					
(h) Understand the impact of engineering solutions to the society					
(i) Recognize the need and have the ability for lifelong learning					
(j) Have knowledge of contemporary issues					
(k) Apply the skills, techniques, modern engineering tools					
(l) Use the computer/IT tools relevant to the discipline					
# Note 5: Significant contribution; 4: Supporting contribution; 3: Moderate contribution; 2: Marginal support; 1: Least support					

Course Instructor(s):	Dr. C. M. Cheng