University of Macau

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

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	MATB 210	Year of Study:	2
Course Title:	Engineering Mathematics I		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	MATH 102 or Calculus II		
Prerequisite Knowledge:	Differential and Integral Calculus of a variable		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture and 1 hour of tutorial per week.		
Laboratory/Software Usage:	N/A		
Course Description:	Functions of two or more variables and their derivatives, applications of partial derivatives. Multiple integrals. Introduction to vector fields and line integrals. Surface integrals.		
Course Objectives:	1. Understand the fundamental theories of multivariable calculus. [a] 2. Be able to formulate and solve problems using partial derivatives. [a] 3. Be able to formulate and solve problems using multiple integrals. [a]		
Learning Outcomes (LOs):	Upon completion of this course, students are expected to: 1. be able to compute partial derivatives [POs: a]; 2. be able to calculate double, triple and line integrals [POs: a]; 3. have basic understanding of conservative field and potential functions [PO: a]		
Texts & References: *(* recommended textbook(s))*	1. Calculus with Analytic Geometry, 7th edition, by C. H. Edwards and D. E. Penney, Prentice Hall * 2. Calculus and analytical geometry, 10th ed. Thomas and Finney, Addison Wesley.		
Student Assessment:	• 12 Homework: 15%; • Midterm examination: 40% • Final examination: 45%		

Learning Outcome Assessment:	• Midterm and final examination • Course evaluation	
Pedagogical Methods:	☑ Lecture ☐ Guest speakers ☐ Case study ☐ Role playing ☐ Student presentation ☐ Project ☐ Simulation game ☑ Exercises and problems	☐ Service learning ☐ Internship ☐ Field study ☐ Company visits ☑ e-learning ☐ Independent study ☐ Others: <u>Experiments and reports</u>

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%)														
Assignment(s) (15%)							✓							
Quizzes (0%)														
Midterm Exam (40%)												✓		
Final Exam (45%)												✓		
Others (please specify) Lab reports (0 %)														
Course Web: (if any)	http://www.cis.umac.mo/~fstitl/Calculus2012													

	Week no.	Topics	Assignment no.	LO no.
Course Content: (topic outline)	1	Introduction: Coordinate system, vector and scalar products Equation of straight lines, planes and quadratic surfaces, cylinders Interior and Boundary points,	1	1
	2	12.1-2 Functions of several variables Domain and Range of functions, Graph and Level curves, Limits 12.3 Limits and Continuity Laws of limits, Composition and continuity of functions.	2	1
	3	12.4 Partial and Mixed Derivatives 12.4 Tangent Planes Tangent planes, and Geometric Meaning, Differentials	3	1
	4	12.5 Global and Local Minimum and Maximum 12.5 Existence Theorem, Critical Points, Derivative Tests 12.6 1st order approximation, 12.7 Chain Rules 12.8 Directional Derivatives,	4	1
	5	Rate of Most Rapid Changes, Geometric meaning of Gradients, Lagrange Multipliers 13.1 Double Integral, 13.2 Iterated integral	5	1
	6	13.3 Area, Volume and Double Integrals Cross section and Interchange of order of integration		2
	7	13.4 Polar coordinates 13.5 Application of double integral 13.6 Triple integral, Cross section Method	6	2
	8	13.7 Cylindrical Coordinates Spherical Coordinates, and Jacobian Review and Midterm Examination	7	2
	8-9	13.8 Surface Area 14.1 Vector Fields and their operators, Review of Parameterization of Curve	8	
	9-10	14.2 Line integral 14.2 Evaluation of Line Integral 14.3 Fundamental Theorem of line integral 14.3 Potential functions and Independence of Path 14.4 Green's Theorem and its applications	9,10	2
	11-12	14.4 Geometric meaning of divergence and flux of vector fields 14.5 Surface Integrals 14.6 Divergence Theorem 14.7 Stokes' Theorem	10, 11	3
	12-13	Complex numbers, Power Series, Analytic Functions, Cauchy-Riemann Equation.	12	3
	13-14	Review and Final Examination (TBA)	No need to hand in	

TBA: To be arranged by the registry