University of Macau
Undergraduate Computer Science Program

Coordinating Unit:	Department of Mathematics, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CISB212	Year of Study:	2
Course Title:	Numerical Methods and Computation		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	MATB110 Calculus I		
Prerequisite Knowledge:	Basic calculus		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture and one hours of tutorial per week.		
Laboratory/Software Usage:	Matlab (http://www.mathworks.com/)		
Course Description:	This course is an introduction to the concepts and methods of numerical methods. It covers most major topics in solving nonlinear equation, function interpolation, numerical calculus and linear regression. It is designed to develop the understanding the basic theory and to familiar with operations and Matlab programming of the subject.		
Course Objectives:	1. Understand the fundamental theories of numerical methods. 2. Be able to formulate and solve math problems numerically. 3. Understand to able to use Matlab developing platform.		
Learning Outcomes (LOs):	Upon completion of this course, students are expected to: 1. Understand and be able to solve nonlinear equations 2. Understand and be able to Lagrange and Newton interpolation. 3. Understand and able to use numerical differentiation. 4. Understand and be able to use numerical integration. 5. Understand basic of linear regression.		
Texts & References: *(* recommended textbook(s))*	1. Numerical Methods Using Matlab (4th Edition), J. Mathew and J. Fink, Prentice Hall; 4 edition (January 1, 2004)		
Student Assessment:	• Homework 10% • In – class Quizzes 10% • Mid-term 20% • Final Exam 60%		
Learning Outcome Assessment:	• Assignments, Quizzes, 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 (10%)							✓							
Quizzes (10%)												✓		
Midterm Exam (20%)												✓		
Final Exam (60%)												✓		
Others *(please specify)*														
Course Web: (if any)														

Course Content: (topic outline)

Week no.	Topics	Assignment no.	LO no.
1	**Introduction to numerical methods.**	--	
2	**Solving nonlinear equation by fixed point iteration.**	1	1
3,4	**Solving nonlinear equation by method of false position, Newton method, secant method and modified Newton method.**	2	1
5,6	**Taylor polynomials , Lagrange interpolation and Newton interpolation**	3,4	2
7,8,9	**Numerical differentiation**	5,6	3
10,11, 12	**Numerical integration**	7,8	4
13, 14	**Linear regression.**	9	5
TBA	**Final Examination**		

TBA: To be arranged by the Registry

<table>
<tr><td>Contribution to Program Outcomes:</td><td>
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<tr><th rowspan="2">Program Outcomes</th><th colspan="5">Contribution to POs[#]
5 ----------> 1
Significant Least</th></tr>
<tr><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>(a) apply knowledge of mathematics, science, and engineering</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>(b) design and conduct experiments, and analyze data</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(c) design components, systems or processes in presence of constraints</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(d) Function in a multi-disciplinary team</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(e) Engineering problem solving</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(f) Understand professional and ethical responsibility</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(g) Communicate effectively</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(h) Understand the impact of engineering solutions to the society</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(i) Recognize the need and have the ability for lifelong learning</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(j) Have knowledge of contemporary issues</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(k) Apply the skills, techniques, modern engineering tools</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(l) Use the computer/IT tools relevant to the discipline</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6"># Note 5: Significant contribution; 4: Supporting contribution; 3: Moderate contribution;
2: Marginal support; 1: Least support</td></tr>
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<tr><td>Course Instructor(s):</td><td>Sik-Chung Tam</td></tr>
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