

**University of Macau**  
**Undergraduate Mathematics Program**

Coordinating Unit:	Department of Mathematics, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	MATB110	Year of Study:	1
Course Title:	Calculus I		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	Nil		
Prerequisite Knowledge:	Nil		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture and one hour of tutorial per week.		
Laboratory/Software Usage:	Nil		
Course Description:	This course, together with Calculus II, aims at providing students with a solid foundation of one variable calculus. The topics include limit and continuity, derivative and its application, integral and its applications.		
Course Objectives:	<ol style="list-style-type: none"> <li>1. To introduce the fundamental theories of calculus.</li> <li>2. Be able to formulate and solve problems using derivatives.</li> <li>3. Be able to formulate and solve problems using integrals.</li> </ol>		
Learning Outcomes (LOs):	<p>Upon completion of this course, students are expected to:</p> <ol style="list-style-type: none"> <li>1. understand and be able to evaluate limits</li> <li>2. understand and be able to find the derivatives of functions</li> <li>3. be able to use derivative in applied problems</li> <li>4. understand and be able to find the integrals of functions</li> <li>5. be able use integral in applied problems</li> </ol>		
Related CIS Program Outcome(s) in <i>Italics</i> : (a)	<ol style="list-style-type: none"> <li>a. <i>an ability to apply knowledge of computing, mathematics, science, and engineering</i></li> <li>b. <i>an ability to design and conduct experiments, as well as to analyze and interpret data</i></li> <li>c. <i>an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</i></li> <li>d. <i>an ability to function effectively on multi-disciplinary teams</i></li> <li>e. <i>an ability to analyze a problem, and identify, formulate and use the appropriate application requirements for obtaining its computing solution</i></li> <li>f. <i>an understanding of professional, ethical, legal, security and social issues and responsibilities</i></li> <li>g. <i>an ability to communicate effectively</i></li> <li>h. <i>the broad education necessary to understand the impact of computing solutions in a global, economic, environmental, and societal context</i></li> <li>i. <i>a recognition of the need for, and an ability to engage in life-long learning</i></li> <li>j. <i>a knowledge of contemporary issues</i></li> </ol>		

	<p>k. an ability to use the techniques, skills, and modern computer tools necessary for engineering practice</p> <p>l. an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations</p>
<p>Texts &amp; References:</p> <p>(* recommended textbook(s))</p>	<p>1. *Calculus, Early Transcendentals Version, 7<sup>th</sup> Ed, C. H. Edwards and D. E. Penney, Prentice Hall</p> <p>2. Calculus and analytical geometry, 9<sup>th</sup> Ed. Thomas and Finney, Addison Wesley.</p>
<p>Student Assessment:</p>	<ul style="list-style-type: none"> <li>• Assignments: 10%</li> <li>• Quizzes: 15%</li> <li>• Journals for Note-Taking: 10%</li> <li>• Midterm Test: 20%</li> <li>• Final Examination: 45%</li> </ul>
<p>Learning Outcome(s) Assessment:</p>	<ul style="list-style-type: none"> <li>• Assignments, quizzes, journals (note-taking), midterm test and final examination</li> </ul>

Pedagogical Methods:	<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Guest speakers <input type="checkbox"/> Case study <input type="checkbox"/> Role playing <input type="checkbox"/> Student presentation <input type="checkbox"/> Project <input type="checkbox"/> Simulation game <input checked="" type="checkbox"/> Exercises and problems	<input type="checkbox"/> Service learning <input type="checkbox"/> Internship <input type="checkbox"/> Field study <input type="checkbox"/> Company visits <input checked="" type="checkbox"/> e-learning <input checked="" type="checkbox"/> Independent study <input type="checkbox"/> Others: _____
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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) Note-Taking Journals
Class Participation/ Discussion (0%)														
Assignments (10%)							✓							
Quizzes (15%)												✓		
Midterm Exam (20%)												✓		
Final Exam (40%)												✓		
Others ( <i>Journals for Note-Taking</i> ) (15%)														✓
Course Web: (if any)	UMMoodle site for MATB110 Calculus I													

Course Content: (topic outline)	Week no.	Topics	Assignment no.	LO no.
	1	<b>Introduction</b> A brief review of functions. Tangent lines and slope predictors.	--	1,2
	2	<b>Limit and continuity</b> The concept and operations of limit. The concept of continuity.	1	1
	3	<b>The derivative</b> The derivative and rate of change, basic differentiation rule, the chain rule, derivative of algebraic functions	2	2
	4, 5	<b>Applications of derivative</b> Optimization on closed intervals, applied optimization problems, derivatives of trigonometric functions, Newton's method	3,4	3
	6, 7, 8	<b>More applications of derivatives</b> Differentials and linear approximation, increasing and decreasing functions and the Mean Value Theorem, first derivative test, curve sketching.	5,6,7	3
	9	<b>Midterm examination</b>		
	10, 11, 12	<b>The integral</b> 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, numerical integration.	8, 9, 10	4
	13, 14	<b>Applications of integral</b> Riemann sum approximation, volumes by method of cross sections and method of cylindrical shells, arc length and surface area of revolution. Natural logarithm as an integral, inverse trigonometric functions, hyperbolic functions.	11, 12	5
	TBA	<b>Final Examination</b>		

TBA: To be arranged by the Registry

Course Instructor(s):	Dr. K. H. Vat
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### STUDENT DISABILITIES SUPPORT SERVICE

The University of Macau is committed to providing an equal opportunity in education to persons with disabilities. If you are a student with a physical, visual, hearing, speech, learning or psychological impairment(s) which substantially limit your learning and/or activities of daily living, you are encouraged to communicate with your instructors about your impairment(s) and the accommodations you need in your studies. You are also encouraged to contact the Student Disability Support Service of the Student Counselling and Development Section (SCD), which provides appropriate resources and accommodations to allow each student with a disability to have an equal opportunity in education, university life activities and services at the University of Macau. To learn more about the service, please contact SCD at [scd.disability@umac.mo](mailto:scd.disability@umac.mo), or 8397 4901 or visit the following website: [http://www.umac.mo/sao/scd/sds/aboutus/en/scd\\_mission.php](http://www.umac.mo/sao/scd/sds/aboutus/en/scd_mission.php)