The Hong Kong Polytechnic University

Subject Description Form

Subject Code	AMA1703
Subject Title	Honors Calculus
Credit Value	3
Level	1
Pre-requisite	Nil
Exclusion	Calculus (AMA1131) Foundation Mathematics for Accounting and Finance (AMA1500) Calculus (AMA1702) Introduction to Calculus (AMA1707)
Objectives	The subject will introduce students to the fundamental concepts in single-variable calculus and their applications with a rigorous approach.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) understand the fundamental concepts of single-variable calculus and their applications in various fields; b) comprehend the proofs of theorems and know when and how to apply the theorems in problems; c) construct rigorous mathematical proofs in calculus; d) enhance logical reasoning and critical thinking skills for further study in mathematics and related fields.
Subject Synopsis/ Indicative Syllabus	1. Sets, functions and cardinality. 2. Axioms of real numbers; open, closed, compact and connected sets on the real line. 3. Limits of sequences; Cauchy sequence; subsequences; limsup and liminf; series. 4. Limits of functions; continuity and uniform continuity; properties of continuous functions. 5. Derivatives; differentiation rules; The Mean Value Theorem; Taylor's Theorem; L'Hospital's rule; applications of the derivative. 6. Riemann integral; integrability; properties and applications of the integral; The Fundamental Theorem of Calculus.
Teaching/Learning Methodology	Concepts, theorems, examples and techniques of single-variable calculus will be taught in lectures and students will learn the skills of problem solving in the tutorials.

<table>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignments and Test</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Exam</td><td>60%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td></td><td></td><td></td><td></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The subject focuses on knowledge, skills and understanding of calculus, thus exam-based assessment is the most appropriate assessment method, including test and examination. Continuous Assessment comprises of assignments and test. A written examination is held at the end of the semester.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Homework and self-study</td><td>91 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>130 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>Elementary Analysis: The Theory of Calculus, 2nd ed, Kenneth Ross, Springer, 2013
Honors Calculus, Charles R. MacCluer, Princeton University Press, 2006
Introduction to Calculus and Classical Analysis, 4th ed, Omar Hijab, Springer, 2016</td></tr>
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