The Hong Kong Polytechnic University
Hong Kong Community College

Subject Description Form

Subject Code	SEHH1069
Subject Title	Calculus and Linear Algebra
Level	1
Credit Value	3
Medium of Instruction	English
Pre-requisite / Co-requisite/ Exclusion	**Pre-requisite** Level 2 or above in HKDSE Mathematics Extended Module One / Two or SEHH1068 Foundation Mathematics
Objectives	This subject equips students with the basic skills of calculus and linear algebra, which are applicable in diverse disciplines. Emphasis is on the understanding of fundamental concepts, techniques and applications.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) describe the concepts of limit and continuity of functions, derivatives of functions, indefinite and definite integrals; (b) evaluate limits, derivatives and integrals of functions in a single variable; (c) implement techniques of solving systems of linear equations; (d) perform basic operations of matrix algebra and determinants; (e) apply methods of calculus and linear algebra to solve a range of practical problems.
Subject Synopsis/ Indicative Syllabus	**Preliminaries** Limit and continuity. **Differentiation** Derivatives; L' Hôpital's rule; Increasing/decreasing functions; Maxima and minima; Curve sketching; Applications. **Integration** Indefinite and definite integrals; Methods of integration; Fundamental theorem of calculus; Applications. **Systems of Linear Equations** Elementary row operations; Row echelon forms; Gaussian elimination; Gauss-Jordan reduction; Cramer's rule.

<table>
<tr><td></td><td>Matrix Algebra
Matrix arithmetic; Determinants; Matrix inverses.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures will focus on the introduction and explanation of mathematical concepts and methods in calculus and linear algebra as well as on the demonstration of how they can be applied to solve practical problems in science and engineering.

Tutorials will provide students with the opportunity to reinforce their understanding of methods taught in lectures and implement appropriate techniques to solve applied problems. These sessions will develop effective problem-solving skills of students.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>A variety of assessment tools will be used to develop and assess students' achievement of the subject intended learning outcomes.

<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>Continuous Assessment*</td><td>40</td><td colspan="5"></td></tr>
<tr><td>▪ Test</td><td>20</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>▪ Individual Assignment 1</td><td>10</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>▪ Individual Assignment 2</td><td>10</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Final Examination</td><td>60</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="5"></td></tr>
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*Continuous assessment items and/or weighting may be adjusted by the subject team subject to the approval of the College Programme Committee.

To pass this subject, students are required to obtain Grade D or above in <u>both</u> the Continuous Assessment and Final Examination.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact</td><td>Hours</td></tr>
<tr><td>▪ Lecture</td><td>26</td></tr>
<tr><td>▪ Tutorial</td><td>13</td></tr>
<tr><td>Other student study effort</td><td></td></tr>
<tr><td>▪ Self-study to preview and review lectures' materials</td><td>52</td></tr>
<tr><td>▪ Continuous Assessment</td><td>39</td></tr>
<tr><td>Total student study effort</td><td>130</td></tr>
</table>
</td></tr>
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Reading List and References	**References**

Hung K.F., Kwan W.C.K. & Pong G.T.Y. (2013). *Foundation Mathematics & Statistics*, McGraw-Hill.

Chung K.C. (2013). *A Short Course in Calculus and Matrices*. McGraw-Hill.

Thomas, G.B., Weir, M.D., & Hass, J. (2010). *Thomas' Calculus.* (12th ed.), Pearson Education.

Stewart, J. (2012). *Calculus.* (7th ed.), Cengage Learning.

Lo, C.O. & Mak, K.L. (2016). *Calculus Done Right.* McGraw-Hill.

Anton, H. (2010). *Elementary Linear Algebra.* (11th ed.), Wiley.

Lay, D.C. (2012). *Linear Algebra and Its Applications.* (4th ed.), Pearson/Addison-Wesley.

Lipschutz, S. & Lipson, M. (2001). *Schaum's Outline of Theory and Problems of Linear Algebra*. (3rd ed.), McGraw-Hill.