City University of Hong Kong

Information on a Course
offered by Department of Mathematics
with effect from Semester A in 2012 / 2013

Part I

Course Title: Calculus and Basic Linear Algebra I
Course Code: MA1200
Course Duration: One Semester
No. of Credit Units: 3
Level: B1
Medium of Instruction: English

Prerequisites: (Course Code and Title)
(i) HKDSE Mathematics Compulsory Part, or
(ii) HKDSE Mathematics Compulsory Part and Extended Part Module 1, or
(iii) HKDSE Mathematics Compulsory Part and Extended Part Module 2 (Levels 1 – 3); or equivalent

Notes to Students: Students with HKDSE Mathematics Extended Part Module 2 (Levels 4 – 5) are required to take MA1300 instead.

Precursors: (Course Code and Title) Nil

Equivalent Courses: (Course Code and Title) MA1001, MA1002

Exclusive Courses: (Course Code and Title) MA1100 Foundation Mathematics I, MA1300 Enhanced Calculus and Linear Algebra I

Part II

1. Course Aims:

This is the first of two required courses designed for students pursuing studies in engineering or science. It aims to
• equip students with mathematical skills and methods essential for study of calculus and linear algebra,
• develop fluency in concepts and techniques from differential calculus, and
• provide students with mathematical training for all further study in science/engineering and its applications.

2. Course Intended Learning Outcomes (CILOs)
Upon successful completion of this course, students should be able to:

<table>
<thead>
<tr>
<th>No.</th>
<th>CILOs</th>
<th>Weighting (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>implement basic mathematical techniques of algebra, trigonometry and coordinate geometry.</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>describe properties of functions and manipulate expressions involving standard functions and their inverses.</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>explain concepts of limit, continuity and differentiability of functions.</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>perform techniques of differentiation to obtain derivatives and Taylor series expansions of functions.</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>apply methods of differential calculus to dynamical and optimization problems as well as applications in science and engineering.</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Teaching and Learning Activities (TLAs)
(designed to facilitate students' achievement of the CILOs)

Indicative of likely activities and tasks students will undertake to learn in this course. Final details will be provided to students in their first week of attendance in this course.

Students are assigned to lecture sessions according to mathematical background and/or results in HKDSE mathematics. Students of Section C and D benefit from extra tuition hours.

<table>
<thead>
<tr>
<th>HKDSE Mathematics</th>
<th>Module 1</th>
<th>Module 2</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Part</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td></td>
<td>✓ (Levels 2 – 3)</td>
<td>A</td>
</tr>
<tr>
<td>✓</td>
<td></td>
<td>U or ✓ (Level 1)</td>
<td>B</td>
</tr>
<tr>
<td>✓</td>
<td>✓ (Levels 3 – 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>✓ (Levels 1 – 2)</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

Note: ✓ = passed U = unclassified
**TLAs** | **ILO No.** | **Hours/week** |
--- | --- | --- |
Learning through **teaching** is primarily based on lectures. | 1 – 5 | 39 hours in total (A/B); 46 hours in total (C/D) |
Learning through **tutorials** is primarily based on interactive problem solving allowing instant feedback. | 1 | 3 hours in total (A/B); 4 hours in total (C/D) |
| 2 | 2 hours in total (A/B); 3 hours in total (C/D) |
| 3 | 2 hours in total (A/B); 3 hours in total (C/D) |
| 4 | 3 hours in total (A/B); 5 hours in total (C/D) |
| 5 | 3 hours in total (A/B); 4 hours in total (C/D) |
Learning through **take-home assignments** helps students implement basic concepts of functions and techniques of differential calculus, as well as apply knowledge of which to problems in science and engineering. | 1 – 5 | after class |
Learning through **online examples for applications** helps students apply methods of differential calculus to practical problems in science and engineering. | 5 | after class |
Learning activities in **Math Help Centre** provides students extra assistance in study. | 1 – 5 | after-class, depending on need |

4. **Assessment Tasks/Activities**
   *(designed to assess how well the students achieve the CILOs)*

30% Coursework
70% Examination (Duration: 2 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

| Assessment Tasks/Activities | ILO No. | Weighting (if applicable) | Remarks |
--- | --- | --- | --- |
Quizzes/Test(s) | 1 – 5 | 15 – 30% | Questions are designed to see how well students have learned basic mathematical methods, concepts of functions, limits and continuity, as well as techniques and applications of differential calculus. These assessment tasks monitor students’ progress and reveal gaps in knowledge. |
<table>
<thead>
<tr>
<th>Assessment Tasks/Activities</th>
<th>ILO No.</th>
<th>Weighting (if applicable)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand-in assignment(s)</td>
<td>1 – 5</td>
<td>0 – 15%</td>
<td>These are skills based assessment to see whether students are familiar with essential mathematical methods, properties of functions, techniques and applications of differential calculus.</td>
</tr>
<tr>
<td>Examination</td>
<td>1 – 5</td>
<td>70%</td>
<td>Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills based to assess the extent to which students have mastered methods of the course and synthesized mathematical knowledge in practical applications.</td>
</tr>
</tbody>
</table>

5. **Grading of Student Achievement:** Refer to Grading of Courses in the Academic Regulations.

**A−, A, A+**

To achieve a grade of A, a student should
- have complete, or close to complete, mastery of all of the core components (CILOs 1 – 4),
- and have demonstrated high levels of fluency in mathematical writing and synthesis of core components, as evidenced by the successful use of mathematical techniques in applications (CILO 5).

**B−, B, B+**

To achieve a grade of B, a student should
- have good or very good mastery of all of the core components (CILOs 1 – 4),
- and have demonstrated good to very good levels of fluency in mathematical writing and synthesis of core components in applications (CILO 5).

**C−, C, C+**

To achieve a grade of C, a student should have good working knowledge
- of all of the core components of the course (CILOs 1 – 4);
- or, alternatively, of most of the core components of the course together with some demonstrated ability to synthesise them in applications (CILO 5).

**D**

To achieve a grade of D, a student should have some working knowledge
- of most of the core components of the course (CILOs 1 – 4);
- or, alternatively, of some of the core components of the course together with some demonstrated ability to synthesise them in at least an application (CILO 5).
Part III

Keyword Syllabus:

A) Polynomials; Mathematical induction; Binomial theorem
B) Coordinate geometry and conic sections; Basic trigonometry
C) Functions and inverses; Limits, continuity and differentiability
D) Techniques of differentiation, implicit, logarithmic and parametric differentiation; Successive differentiation
E) Applications of differentiation: rate of change, local extrema, optimization problems, Taylor series, l'Hôpital rule

Recommended Reading:

For further detailed information, please refer to http://www6.cityu.edu.hk/ma/teaching/teaching_readings.asp