# MA2177: ENGINEERING MATHEMATICS AND STATISTICS

**Effective Term**
Semester A 2022/23

## Part I Course Overview

**Course Title**
Engineering Mathematics and Statistics

**Subject Code**
MA - Mathematics
**Course Number**
2177

**Academic Unit**
Mathematics (MA)

**College/School**
College of Science (SI)

**Course Duration**
One Semester

**Credit Units**
3

**Level**
B1, B2, B3, B4 - Bachelor's Degree

**Medium of Instruction**
English

**Medium of Assessment**
English

**Prerequisites**
MA1201 Calculus and Basic Linear Algebra II / MA1301 Enhanced Calculus and Linear Algebra II; or equivalent

**Precursors**
Nil

**Equivalent Courses**
Nil

**Exclusive Courses**
MA2506 Probability and Statistics
MA2510 Probability and Statistics
MA2172 Applied Statistics for Science and Engineering
MA2181 Mathematical Methods for Engineering

# Part II Course Details

**Abstract**

This course aims to develop a basic understanding of a range of mathematics tools with emphasis on engineering applications in order to support later courses in mechanical and electronic themes. It is intended for students to solve some statistical problems and ordinary differential equations by analytical methods. Fourier series and Laplace transforms are also introduced. The course will help students develop skills and the ability to think quantitatively and analyse problems critically.

**Course Intended Learning Outcomes (CILOs)**

|   | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | explain at high levels concepts from differential equations, probability and statistics. | 10 | x | | |
| 2 | implement basic operations in Fourier series, Laplace transforms and probability theory. | 20 | | x | |
| 3 | solve some differential equations, explicitly or by series and transforms. | 30 | | x | |
| 4 | perform statistical computations. | 30 | | x | |
| 5 | develop statistical models or mathematical models through differential equations and probability theory, and perform computations for some applications. | 10 | x | x | x |

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

**Teaching and Learning Activities (TLAs)**

|   | TLAs | Brief Description | CILO No. | Hours/week (if applicable) |
|---|---|---|---|---|
| 1 | Lectures | Learning through teaching is primarily based on lectures. | 1, 2, 3, 4, 5 | 39 hours in total |
| 2 | Tutorials | Learning through tutorials is primarily based on interactive problem solving allowing instant feedback. | 2 | 2 hours |
| 3 | Tutorials | Learning through tutorials is primarily based on interactive problem solving allowing instant feedback. | 3 | 2 hours |

| 4 | Tutorials | Learning through tutorials is primarily based on interactive problem solving allowing instant feedback. | 4 | 2 hours |
|---|---|---|---|---|
| 5 | Tutorials | Learning through tutorials is primarily based on interactive problem solving allowing instant feedback. | 5 | 1 hour |
| 6 | Take-home assignments | Learning through take-home assignments helps students understand basic concepts and techniques of ordinary differential equations, transforms, statistics, and some engineering applications. | 1, 2, 3, 4, 5 | after-class |
| 7 | Online applications | Learning through online examples for applications helps students apply statistical and computational methods to some problems in engineering applications. | 5 | after-class |
| 8 | Math Help Centre | Learning activities in Math Help Centre provides students extra help. | 2, 3, 4, 5 | after-class |

**Assessment Tasks / Activities (ATs)**

|  | ATs | CILO No. | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|---|---|---|---|---|
| 1 | One Test | 2, 3 | 18 | Questions are designed for the first part of the course to see how well the students have learned the basic concepts, and techniques of ordinary differential equations and transforms, probability theory and some applications. |
| 2 | Three Take-home Assignments | 1, 2, 3, 4, 5 | 12 | The assignments provide students chances to demonstrate their achievements on ordinary differential equations, transforms, and statistics and their applications learned in this course. |

**Continuous Assessment (%)**

30

**Examination (%)**

70

**Examination Duration (Hours)**

3

**Additional Information for ATs**

30% Coursework
70% Examination (Duration: 3 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 Rubrics (AR)**

**Assessment Task**

1. Test

**Criterion**

Ability to apply the methodology and procedure for solving some ordinary differential equations and statistical problems.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

2. Hand-in assignments

**Criterion**

Ability to apply the methodology and procedure for solving some ordinary differential equations and statistical problems.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**
Not even reaching marginal levels

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**Assessment Task**
3. Formative take-home assignments

**Criterion**
Ability to apply the methodology and procedure for solving some ordinary differential equations and statistical problems.

**Excellent (A+, A, A-)**
High

**Good (B+, B, B-)**
Significant

**Fair (C+, C, C-)**
Moderate

**Marginal (D)**
Basic

**Failure (F)**
Not even reaching marginal levels

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**Assessment Task**
4. Examination

**Criterion**
Ability to apply the methodology and procedure for solving some ordinary differential equations and statistical problems.

**Excellent (A+, A, A-)**
High

**Good (B+, B, B-)**
Significant

**Fair (C+, C, C-)**
Moderate

**Marginal (D)**
Basic

**Failure (F)**
Not even reaching marginal levels

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# Part III Other Information

**Keyword Syllabus**

Ordinary differential equations. Fourier series. Laplace transforms. Random variables. Probability. Distributions. Data and sample description. Estimation of parameters. Test of hypothesis. Simple linear regression.

**Reading List**

**Compulsory Readings**

|   | Title |
|---|---|
| 1 | For further detailed information, please refer to https://www.cityu.edu.hk/ma/programmes/undergraduate/non-BSCM-students/topics-recommended-readings-servicing-courses#heading12 |

**Additional Readings**

|   | Title |
|---|---|
| 1 | Nil |