# Module Definition Form (MDF)

| Module code: MOD007113 | **Version:** 2 **Date Amended:** 09/Dec/2022 |
|---|---|

| 1. Module Title |
|---|
| Advanced Engineering Mathematics |

| 2a. Module Leader |
|---|
| Mohamed Yehia |

| 2b. School |
|---|
| School of Engineering and the Built Environment |

| 2c. Faculty |
|---|
| Faculty of Science and Engineering |

| 3a. Level |
|---|
| 5 |

| 3b. Module Type |
|---|
| Standard (fine graded) |

| 4a. Credits |
|---|
| 15 |

| 4b. Study Hours |
|---|
| 150 |

**5. Restrictions**

| Type | Module Code | Module Name | Condition |
|---|---|---|---|
| Pre-requisite: | MOD007035 | Applied Engineering Mathematics | Compulsory |
| Co-requisites: | None | | |
| Exclusions: | None | | |
| **Courses to which this module is restricted:** | | | |

## LEARNING, TEACHING AND ASSESSMENT INFORMATION

### 6a. Module Description

Building on previous modules, here you will continue applying mathematics to express and solve engineering problems, moving on to include more complex mathematical concepts. You'll be introduced to applications of calculus, complex numbers, Laplace transforms, and Fourier Series, helping you to develop an appreciation of the overwhelming influence that these concepts have had on engineering analysis and design, particularly with their application to specialist software. You'll learn to apply differentiation and integration technics to solve engineering problems in dynamics, control, structural analysis, engineering optimisations, and computational engineering. You'll also learn to analyse engineering concepts by solving complex equations and differential equations using analytical and numerical techniques. Coding is also used to develop your problem-solving skills and create solutions to complex mathematical problems; you'll apply this to engineering problems to create a logical sequence of steps or solutions after which you'll develop tests to check the solution is correct.

### 6b. Outline Content

- Applications of calculus
- Differential equations
- Laplace transform
- Fourier Series
- Complex numbers
- Numerical methods
- Introduction to coding

### 6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

### 6d. Specialist Learning Resources

Microsoft Office, Matlab

| 7. Learning Outcomes (threshold standards) | | |
|---|---|---|
| **No.** | **Type** | **On successful completion of this module the student will be expected to be able to:** |
| 1 | Knowledge and Understanding | Analyse complex problems to reach substantiated conclusions using the first principles of mathematics and engineering principles. |
| 2 | Intellectual, practical, affective and transferrable skills | Critically analyse the suitability of techniques for the solution of a range of routine and non-routine engineering problems. |
| 3 | Intellectual, practical, affective and transferrable skills | Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed. |
| 4 | Intellectual, practical, affective and transferrable skills | Use coding to develop solutions to complex mathematical problems. |

| 8a. Module Occurrence to which this MDF Refers | | | | |
|---|---|---|---|---|
| **Year** | **Occurrence** | **Period** | **Location** | **Mode of Delivery** |
| 2026/7 | ZZF | Template For Face To Face Learning Delivery | | Face to Face |

| 8b. Learning Activities for the above Module Occurrence | | | |
|---|---|---|---|
| **Learning Activities** | **Hours** | **Learning Outcomes** | **Details of Duration, frequency and other comments** |
| Lectures | 12 | 1-4 | 1 hour lecture per week |
| Other teacher managed learning | 24 | 1-4 | 2 hours per week of tutorials and workshops |
| Student managed learning | 114 | 1-4 | Self Directed Learning |
| TOTAL: | 150 | | |

**9. Assessment for the above Module Occurrence**

The assessment for some modules includes a presentation (see below for details on how this particular module is assessed). We recognise that presenting, especially to a large group, can cause significant anxiety or distress for some students. If this may affect you, please contact your Module Leader or the Disability and Neurodiversity Service as early as possible. We will work with you to consider appropriate reasonable adjustments. Depending on your individual needs, these might include, for example, presenting to a smaller group or presenting only to a member of academic staff.

| Assessment No. | Assessment Method | Learning Outcomes | Weighting (%) | Fine Grade or Pass/Fail | Qualifying Mark (%) |
|---|---|---|---|---|---|
| 010 | Coursework | 3, 4 | 30 (%) | Fine Grade | 30 (%) |
| **Maximum 1000-word equivalent report, aligned with the C2 Engineering Council's AHEP4 Learning Outcomes** | | | | | |

| Assessment No. | Assessment Method | Learning Outcomes | Weighting (%) | Fine Grade or Pass/Fail | Qualifying Mark (%) |
|---|---|---|---|---|---|
| 011 | Examination | 1-3 | 70 (%) | Fine Grade | 30 (%) |
| **2 hour closed book examination; aligned with the C3 Engineering Council's AHEP4 Learning Outcomes** | | | | | |

**In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).**

**In addition, students are required to:**
**(a) achieve the qualifying mark for each element of fine graded assessment as specified above**
**(b) pass any pass/fail elements**

**[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]**