

ENGINEERING ANALYSIS H61ENA - (20 CREDITS)

INTRODUCTION TO THE MODULE

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AIM OF THE MODULE:

To introduce you to the analytical (maths) tools required to solve problems you will meet as engineers.

The aim will be to cover only those tools/topics that will be of use to you and to cover them in a way that emphasises their applicability. In other words, we will try not to cover any maths content (for example derivation of results or calculations that are not related to EEE) that is not of help.

Maths *can* appear to be a set of rather complicated processes that can seem unrelated to the engineering you are here to study. The aim of this module will be to try to convince you that maths can actually make **studying engineering easier!** Although **you** will need to put in some initial effort before that happens.

As a practising engineer, most of the maths you do will actually be done using a not paper and a pen or pencil but rather using a computer. Hence we will introduce you to the use of computing to **simplify** mathematical operations thorough giving examples of MATLAB code to find solutions to problems.

THERE ARE FOUR MAIN TOPICS (ENGINEERING AREAS) IN THE MODULE:

- SIGNALS AND SYSTEMS
- NETWORK ANALYSIS
- FIELDS AND WAVES
- DATA PRESENTATION

RECOMMENDED RESOURCE:

There is an excellent set of 'Work Books' available online called **HELM** (HELPING ENGINEERS LEARN MATHEMATICS) THAT WE HAVE USED EXTENSIVELY IN PUTTING THIS MODULE TOGETHER AND WE RECOMMEND THAT YOU SUPPLEMENT THE LECTURES, NOTES, PROBLEMS CLASSES ETC. OF THIS MODULE BY USING THIS RESOURCE.

You will also be able to find many books in the library to assist you, the lecture notes you will be given (also available to download from MOODLE) will be comprehensive, so additional reading will not be necessary but some students find a different perspective can be of assistance.

LEARNING OUTCOMES:

By the end of this module, students should be able to

- 1. Select and make appropriate use of the basic terms and concepts used to describe signals and systems
- 2. Select and employ suitable techniques for the analysis of electrical and electronic systems
- 3. Select and employ suitable techniques for the processing and presentation of data
- 4. Select and employ suitable software tools for the analysis of basic engineering problems

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1: SIGNALS AND SYSTEMS

1.1 Signals, Functions and Variables	Week 2
1.2 Function Gradients and Differentiation	Week 4
1.3 Area under a function and Integration	Week 6
1.4 Representation of Signals in Time and Frequency	Week 11

2: NETWORK ANALYSIS

2.1 Complex Numbers in Cartesian and Polar Form	Week 7
2.2 Complex Numbers in Exponential Form, and Phasors	Week 8
2.3 Application to Passive Networks, Resonance and Filters	Week 10
2.4 Matrices	TBD
2.5 Transient Circuits and ODEs	TBD

3: DATA PRESENTATION

3.1 Logarithmic Presentation, Uncertainty, Errors and Statistics	TBD
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4: FIELDS AND WAVES

4.1 3D Coordinate Systems and Vectors	TBD
4.2 Scalar and Vector Products	TBD
4.3 Vector Fields, EM Fields and Waves	TBD