

Module Guide

Engineering Computing

ENG_4_405

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School of Engineering

2015/16

Level 4

Module Title	Engineering Computing
Module Code	ENG_4_405
Level	4
Prerequisites	None
Course	BEng (Hons) Electrical & Electronic Engineering BEng (Hons) Electrical Engineering and Power Electronics BEng (Hons) Computer Systems and Networks BEng (Hons) Mechanical Engineering BEng (Hons) Petroleum Engineering
Organisation	78 hours lecture/laboratory 122 hours self study.
Lecturers	Perry Xiao T404, xiaop@lsbu.ac.uk , 02078157569 Mrs Fang Duan T802, duanf@lsbu.ac.uk , 020 7815 7578
Module Co-ordinator	Perry Xiao

1. Introduction

This is an introductory module, which addresses the engineering formation as well as programming knowledge and skills. Its role is to enable students to appreciate the role and importance of software and computers in Engineering, and so provide students with the impetus to quickly become competent in their use.

2 Aims and Objectives

Aims

The aim of this module is to introduce the fundamentals of computer programming using MATLAB. It enables students to articulate specifications for requirements, which they understand, to gain experience in decomposing problems, and to design and realise programmes in MATLAB on a standard PC system and use standard methods in doing so. It encourages them to use a logbook, work systematically and make good use of their time, so helping to develop good engineering habits and the skills for self-learning.

Objectives

After studying this module, students will be able to understand the operation of MATLAB programs, as well as using MATLAB for solving engineering problems. They will also be capable of designing such programs to operate to pre-determined specifications in a structured manner.

3 Learning Outcomes

At the end of the module, students will be able to undertake the actions described in each of the four areas below.

Knowledge and Understanding

- Know the fundamentals of computers
- Know the fundamentals of software engineering.
- Know the fundamentals of software programming.
- Develop an understanding of MATLAB programming.
- Be able to design, implement, test and document modular programs of moderate size, from given specifications.

Intellectual Skills

- Understand the principles of computers.
- Understand MATLAB IDE software.
- Understand basics of software programming.

Practical Skills

- Know how to work with computers.
- Know how to use the software tools for MATLAB.
- Create programs of moderate complexity, essentially with a procedural/imperative approach in MATLAB.

Transferable Skills

- Communication of observed results in technical format.
- Logbook maintaining.
- Communication and presentation skills.
- Learning how to learn by exploring a variety of learning styles and methods during both class sessions and in self-managed study activities.
- Use of information technology (IT) and qualitative skills.
- Mathematical manipulation and analysis of data.
- Numeracy skills that are developed in analyzing and evaluating data.
- Abilities of solving complex problems using engineering approach.
- Organization and self management skills.

4 Employability

This module is suitable for students who intend to work in organisations that specify, design and implement software solutions to the real time applications in MATLAB. The module aims to equip graduates with concrete knowledge and understanding of software programming skills to develop solutions for complex engineering problems. It will prepare graduates with relevant skills for various possible jobs in this field.

5 Teaching and learning methods

The semester is of 15 weeks duration, 12 weeks of which are allocated to teaching. This is followed by a week in which their software is tested, a revision week and the final End of Module examination. Teaching is by 26 hours lectures and 26 hours laboratory sessions.

Students will be expected to supplement this with self study to bring the total study time up to the full 200 hrs. Self study will be by directed learning material in the form of lab sheets and assignments handed out at the appropriate time throughout the module. There will be an additional 2 hour tutorial session where no new material will be covered and instead it will be used to reinforce the knowledge from the lecture material by solving tutorial questions.

6 Textbooks

Core reading

1. Holly Moore, "MATLAB for engineers", Fourth edition, Pearson, 2014.
2. Roger S. Pressman, "Software engineering : a practitioner's approach", 8th international edition, McGraw-Hill, 2015.

Background reading

3. Behrouz Forouzan, "Foundations of computer science", 3rd edition, Cengage Learning, 2014.
4. D. M. Etter, "Introduction to MATLAB: International Version", 2nd edition, ISBN: 0132170655, Pearson, 2010.
5. Hahn, Brian; Valentine, Dan, "Essential MATLAB for Engineers and Scientists", 4th ed., Elsevier/Academic Press, c2010.
6. Chapman, Stephen J., "MATLAB programming for engineers / 4th ed., Thomson Learning [distributor], 2008.
7. I. Sommerville, "Software Engineering: International Version", 9th edition, ISBN: 0137053460, Pearson, 2010.
8. Mohapatra, P.K.J., Software Engineering, New Age International, 2010, MIL EAN/ISBN: 9781282501232

7 Assessment Schedule

The assessment for this module consists: 100% Coursework.

This includes one Phase Test (50%) in week 8 and the main Coursework (50%) - 30% for the logbook and 20% for the formal report (assignment).

Coursework includes two separate components the sum-total of which comprises 50% of this 20 credit module. These two components will be entered into the student record system.

1. Workshop logbook detailing the practical work will constitute 30% of the module mark.

2. Formal assignment report should not be exceeding 1600 words. This component will constitute 20% of the module mark.

All coursework assignments are summative, formal reports will contain formative feedback.

All assignments must be your own individual work.

8 Teaching Schedule

A timetable is given below which sets out the week by week teaching schedule which we hope to follow. A detailed schedule follows which will enable you to be aware of what you should be able to do after completing your study on each topic.

Weeks 1-2 Introduction

Introduction to computer, software engineering, MATLAB IDE, variables, arrays and plots.

Learning outcome: You should understand the concept of MATLAB programmes and be familiar with the graphical user interface of MATLAB IDE. You should understand the concept of variables and arrays, and be able to do simple plots

Weeks 3-4 Built-in MATLAB functions and Matrices

Introduction to built-in MATLAB functions and Matrix operations.

Learning outcome: You should be familiar with different built-in MATLAB functions such as $\sin(x)$, $\cos(x)$, $\tan(x)$, $\exp(x)$ and $\text{rand}(x)$ etc. You should be able to understand the concept of matrices and matrix operations.

Weeks 5-6 Plotting and User Defined Functions

Introduction to the concepts of plotting and user defined functions.

Learning outcome: You should be able to understand the concept of MATLAB plotting and should be able to use 2D and 3D plotting where appropriate. You should be able to understand the concept of modular programs and appreciate why they are used. You should be able to construct and document relevant user defined MATLAB functions using M-files.

Weeks 7 Input and Output

Introduction to input and output in MATLAB.

Learning outcome: You should be able understand the concept of MATLAB input and output. You should be familiar with different types of input and output. You should also be to read and write from files.

Weeks 8-9 Control Structure

Introduction to different control structures and the various ways in which they are used.

Learning outcome: You should be able understand the concept of control structures and how and why they are used. You should be familiar with different types of control structures such as sequences, selections, and iterations. You should be aware of their respective strengths and weakness. You should also be capable of nesting various structures together to meet specific requirements.

Weeks 9-10 More Matrices and Arrays

Introduction to waveform special matrices, matrix algebra and other types of arrays.

Learning outcome: You should be able to understand the concept of matrix algebra and how and why they are used. You should be able to use special matrices and solve linear equations. You should be familiar with the different types of arrays, such as character arrays, cell arrays and structure arrays etc.

Weeks 11-12 Symbolic Mathematics and Numerical Techniques

Introduction to the various aspects of Symbolic Mathematics and Numerical Techniques.

Learning outcome: You should be able to understand the concept of the symbolic mathematics and appreciate how it is used. You should be able to solve expressions and equations. You should be able to understand the concept of numerical techniques and be able to perform interpolation, curve fitting, and numerical differentiation.

Weeks 13 Revision

The last week is run as tutorials to help the students with their assignment. Code design, I/O issues and software documentation are usually covered in these sessions.