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# Module Definition Form (MDF)

| Module code: MOD004430 | **Version:** 3 **Date Amended:** 09/Dec/2022 |
|---|---|

| 1. Module Title |
|---|
| Embedded Systems |

| 2a. Module Leader |
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| Sufian Yousef |

| 2b. School |
|---|
| School of Engineering and the Built Environment at Anglia Ruskin University |

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

| 3a. Level |
|---|
| 4 |

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

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

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

**5. Restrictions**

| Type | Module Code | Module Name | Condition |
|---|---|---|---|
| Pre-requisites: | None | | |
| Co-requisites: | None | | |
| Exclusions: | None | | |
| **Courses to which this module is restricted:** | | | |

## LEARNING, TEACHING AND ASSESSMENT INFORMATION

### 6a. Module Description

The module focuses on the design and operational characteristics and internal architecture of Embedded Systems . It examines the programming techniques that can be applied to real time systems using different programming languages such as C programming and Ladder Logic. The unit also provides you with Workshop and laboratory skills. You will be given the opportunity to develop Real Time embedded Operating system on dedicated hardware platforms (such us PLC) in order to solve given engineering problems (for example produce a programme for an engineering application, store, evaluate and justify approaches taken). This module forms the basis of embedded controllers for electrical machines and it is a key development of workplace practice and employment. You will investigate how to design embedded systems for monitoring inputs and changes outputs using specialised software (such as Siemens Ladder logic and Microchip MPLAB IDE). The created program can include Boolean logic, counting, timing, complex math operations, and communications with other devices such as wireless GSM or WIFI modules. This unit will introduce you to the principles of microprocessors and give you experience of using and programming a microprocessor system for the operation or control of peripheral devices . This unit will provide an introduction to the terminology (e.g. bits, bytes, words) and concepts related to microprocessor applications. The unit will also develop your understanding of the architecture and operation of real time embedded microprocessor-based systems and the use of decimal, binary and hexadecimal number systems, and functions for programming. Successful completion of this module will provide a range of knowledge and skills of value to employers with an interest in microprocessors programming.

### 6b. Outline Content

- Overview of Embedded Systems architecture.
- Development and Testing of Real time Software for Embedded Controllers and PLCs.

### 6c. Key Texts/Literature

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

### 6d. Specialist Learning Resources

- PLC programming software
- Siemens PLC Programming Software 4.0, for use with SIMATIC S7-200 Programmable Logic Controller
- Siemens S2-700 PLC Input and Output devices & wireless embedded microprocessor based module MX20

| 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 | Understand the design and operational characteristics of an embedded system. |
| 2 | Knowledge and Understanding | Apply an integrated or systems approach to the solution of electronic problems related to embedded systems. |
| 3 | Intellectual, practical, affective and transferrable skills | Adopt a holistic and proportionate approach in identifying and mitigating security risks. |
| 4 | Intellectual, practical, affective and transferrable skills | Use practical laboratory and workshop skills to investigate problems related to embedded systems. |

| 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 | 1-3 | Lecture 1 hr x 12 weeks |
| Other teacher managed learning | 24 | 4 | Lab 2 hrs x 12 weeks |
| 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 | 2-4 | 50 (%) | Fine Grade | 30 (%) |
| **Coursework: 1500 words maps to Engineering Council Learning Outcomes C10, C12** | | | | | |
| **Assessment No.** | **Assessment Method** | **Learning Outcomes** | **Weighting (%)** | **Fine Grade or Pass/Fail** | **Qualifying Mark (%)** |
| 011 | Examination | 1,2 | 50 (%) | Fine Grade | 30 (%) |
| **Examination: 1.5 hours maps to Engineering Council Learning Outcome C6** | | | | | |

**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]**