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| UniofGlasgow_black | **Course Specification¹** |
| Please note: there may be some adjustments to the teaching arrangements published in this course specification. Given current circumstances related to the Covid-19 pandemic it is anticipated that some usual arrangements for teaching on campus will be modified to ensure the safety and wellbeing of students and staff on campus; further adjustments may also be necessary, or beneficial, during the course of the academic year as national requirements relating to management of the pandemic are revised.**1. Course Code:**  |
| ENG1064 |
| **2. Course Title:**   |
| Microelectronic Systems 1 |
| **3. Academic Session:**  |
| 2021-22 |
| **4. Academic Level (see [Scottish Credit and Qualifications Framework Levels](https://scqf.org.uk/about-the-framework)):**  |
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| **5. Credits:**  |
| 10 |
| **6. Short Description of the Course:**  |

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| This course introduces the basic concepts of digital microelectronic systems to level 1 students. Both theoretical and practical aspects of the design of digital systems are covered. Based around programming a modern microcontroller, and interfacing it with peripheral components, the course also introduces the concepts of embedded systems including digital and analogue input and output. |

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| **7. Requirements of Entry:**   |

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| Mandatory Entry RequirementsNoneRecommended Entry RequirementsNone |

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| **8. Co-requisites (courses that must be taken in the same session as this course as a condition of enrolment):**  |

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| None |

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| **9. Excluded Courses:**  |

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| None |

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| **10. Associated Programmes:**   |

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| Aerospace Systems BEng H402-2200Aerospace Systems MEng H401-2204Mechatronics BEng H315-2200Mechatronics MEng H316-2204 |

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| **11. Available to visiting students:**  |
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| **12. Available to Erasmus students:**  |
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| **13. Typically offered:**  |
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| **14. Timetable (if known) and length and frequency of teaching sessions:**  |

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| 2 lectures per week5 laboratories  |

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| **15. Course Aims:** |

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| The aims of this course are to:* give practical experience of designing, building and testing embedded systems based around a modern microcontroller;
* develop skills in systematic design and documentation.
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| **16. Intended Learning Outcomes of Course*:***  |

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| By the end of this course students will be able to:* explain concept of embedded electronic systems and give examples; describe a microcontroller (MCU), how it differs from a microprocessor, how memory is organised, and different architectures in common use;
* explain basic architecture of a modern microcontroller (eg ARM LPC1768) , including arithmetic logic unit, program memory, data memory and input/output ports;
* identify regions of memory map, which are volatile and non-volatile; understand significance of memory-mapped input and output;
* introduce programming in C to enable the control of a modern microcontroller;
* describe process of writing a program in C to control analogue and digital input and output to and from a modern microcontroller using an ARM mbed as the testbed ;
* connect LEDs to the ports and calculate the value of series resistors;
* connect pushbuttons and explain the need for pullup resistors;
* write programs to control analogue and digital inputs and outputs using an ARM mbed;
* have knowledge of writing a program in assembly language and its relationship with both a C program for a microcontroller, and how the programs relate to movement of data within the microcontroller;
* use ARM mbed development environment;
* write C programs for an ARM mbed, compile them and demonstrate control of analogue and digital inputs and outputs to and from the microcontroller;
* interface peripherals to an ARM mbed, and control their operation;
* maintain an adequate laboratory record.
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| **17. Learning and Teaching Methods:**   |
| **Method** | **Formal Contact Hours** | **Notional Learning Hours** (including formal contact hours) |
| Lecture | 17.00 | 34.00 |
| Seminar | 0.00 | 0.00 |
| Tutorial  | 4.00 | 16.00 |
| Project Supervision | 0.00 | 0.00 |
| Demonstration | 0.00 | 0.00 |
| Practical Classes and Workshops  | 15.00 | 15.00 |
| Supervised time in studio / Workshop | 0.00 | 0.00 |
| Fieldwork | 0.00 | 0.00 |
| External Visits | 0.00 | 0.00 |
| Work Based Learning | 0.00 | 0.00 |
| Guided Independent Study | Not Applicable | 35.00 |
| Placement | 0.00 | 0.00 |
| Year Abroad | 0.00 | 0.00 |
| **TOTAL** | **36.00** | **100.00** |
| **18. Minimum Requirement for Award of Credits:** |

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| Students must attend the degree examination and submit at least 75% by weight of the other components of the course’s summative assessment.Students must attend the timetabled laboratory classes.Students should attend at least 75% of the timetabled classes of the course.Note that these are minimum requirements: good students will achieve far higher participation/submission rates. Any student who misses an assessment or a significant number of classes because of illness or other good cause should report this by completing a MyCampus absence report. |

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| **19. Summative Assessment Methods:**  |
| **Method** | **%** |
| Written Exam | 85.00% |
| Written Assignment, including Essay | 0.00% |
| Report | 0.00% |
| Dissertation | 0.00% |
| Portfolio | 0.00% |
| Project Output (Other than dissertation) | 0.00% |
| Oral Assessment & Presentation | 0.00% |
| Practical Skills Assessment | 15.00% |
| Set Exercise | 0.00% |
| **TOTAL** | **100.00** |
| **20. Description of Summative Assessment:**  |

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| Assessment70% Examination15% Laboratories15% Class TestReassessmentIn accordance with the University’s Code of Assessment reassessments are normally set for all courses which do not contribute to the honours classifications. For non honours courses, students are offered reassessment in all or any of the components of assessment if the satisfactory (threshold) grade for the overall course is not achieved at the first attempt. This is normally grade D3 for undergraduate students, and grade C3 for postgraduate students. Exceptionally it may not be possible to offer reassessment of some coursework items, in which case the mark achieved at the first attempt will be counted towards the final course grade. Any such exceptions are listed below in this box.It is not possible to offer reassessment in group project work in this course. Students failing to complete the group project work, without good cause, will be receive a Credit Refused (CR) grade and will be required to re-attend the course the following year. |

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| **21. Are reassessment opportunities normally available for all summative assessments in this course?:**  |
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| Reassessments are normally available for all courses, except those which contribute to the Honours classification. For non Honours courses, students are offered reassessment in all or any of the components of assessment if the satisfactory (threshold) grade for the overall course is not achieved at the first attempt. This is normally grade D3 for undergraduate students and grade C3 for postgraduate students. Exceptionally it may not be possible to offer reassessment of some coursework items, in which case the mark achieved at the first attempt will be counted towards the final course grade. Any such exceptions for this course are described below.  |

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| **22. Formative Assessment & Feedback:**  |

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| Each ‘milestone’ in the laboratory includes a brief question-and-answer session between a demonstrator and the student, which provides immediate feedback on progress. |

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| **23. Grading Basis (see University Calendar):**  |
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| **24. Examination Diet:**  |
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| **25. Total Exam Duration (Excluding in-class tests):** |
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| **26. Short Title:**  |
| Microelectronic Systems 1 |
| **27. Independent Work (i.e. the result for this course can be used to meet the generic Honours requirement to achieve a grade D3 or better in a piece of independent work worth at least 20 credits or the generic PGT requirement to achieve a D3 or better in a piece of independent work worth at least 60 credits – normally a Dissertation or Project):**  |
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| **28. Subject:**  |
| Engineering |
| **29. Location(s):**  |
| Main Campus |
| **30. College:**  |
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| **31. Lead School/Institute:**  |
| Engineering [REG30300000] |
| **32. Cost Centre:**  |
| ENG - Micro and Nanotechnology [30305000] |
| **33. Is this course collaborative with another institution?:**  |
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| **34. Teaching Institutions:**  |

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| University of Glasgow |

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| **35. Taught wholly by distance learning:**  |
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| **36. Open Studies Credit Bearing:**  |
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| **37. Represents a work placement or period of study abroad:**  |
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| **41. Additional Relevant Information (if applicable):**  |

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| Recommended books

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| **Authors** | **Title, edition** | **Publisher** | **Year** | **ISBN** | **Cost** | **Code** |
| R. Toulson and T. Wilmshurst | Fast and Effective Embedded Systems Design - Applying the ARM mbed (1 ed) | Newnes | 2012 | 9780080977683 | £34 | B |
| B. Kernighan and D. Ritchie | The C Programming Language (2 ed) | Prentice Hall | 1988 | 0131103628 | £40 | C |
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Codes: A = compulsory; B = strongly recommended; C = recommended; D = wider reading |

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| **42. Date of approval:**  | 23/07/2019  |