Course Specification[1]

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:

ENG5220

2. Course Title:

Real Time Embedded Programming

3. Academic Session:

2022-23

4. Academic Level (see Scottish Credit and Qualifications Framework Levels):

Level 5 (SCQF level 11)

5. Credits:

20

6. Short Description of the Course:

This course develops in students an understanding of the theory and practice of real-time embedded systems firmware and application programming, and introduces students to the techniques and standards of software design, implementation and development for such systems.

7. Requirements of Entry:

Mandatory Entry Requirements

None

Recommended Entry Requirements

None

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

None

9. Excluded Courses:

[1] This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course can be found in course handbooks and other course documentation and online at www.gla.ac.uk

None

10. Associated Programmes:

Computer Systems Engineering MSc HG55-5200
Electronics and Electrical Engineering MSc HH56-5200
Mechatronics MSc H313-5200

11. Available to visiting students:

Yes

12. Available to Erasmus students:

Yes

13. Typically offered:

Semester 2

14. Timetable (if known) and length and frequency of teaching sessions:

4 hour teaching and lab sessions per week

15. Course Aims:

The aims of this course are to:

- introduce students to advanced hardware design and development of Linux based real-time embedded systems in C++;
- demonstrate the functional interactions between embedded software, hardware peripherals and communications in real time systems;
- undertake project based design, development, documentation and dissemination of an embedded system meeting a given specification.

16. Intended Learning Outcomes of Course*:*

By the end of this course students will be able to:

- write C++/object oriented programs on a Linux based embedded system (e.g. Raspberry PI) and use suitable tools to optimise and debug them;
- explain the difference between polling, interrupt-driven and collaborative/preemptive real time operating systems programming and select the most appropriate for each application;
- write multi-threaded applications;
- write a GUI in C++ which allows user interaction;
- use industry standards such as RS232, SPI, I2C, I2S, LIN, CAN and Ethernet to interface with peripherals and other systems;
- design and test data acquisition hardware and analogue frontends;
- write code that conforms to industrial coding standards and techniques (such as MISRA-C ISO 26262);
- employ different project management techniques used in developing software for embedded systems;
- document code to industry standards
- deploy open source code and publicise it on social media

17. Learning and Teaching Methods:

Method	**Formal Contact Hours**	**Notional Learning Hours** (including formal contact hours)
Lecture	12.00	24.00
Seminar	0.00	0.00
Tutorial	0.00	0.00
Project Supervision	0.00	0.00
Demonstration	0.00	0.00
Practical Classes and Workshops	18.00	36.00
Supervised time in studio / Workshop	15.00	30.00
Fieldwork	0.00	0.00
External Visits	0.00	0.00
Work Based Learning	0.00	0.00
Guided Independent Study	Not Applicable	110.00
Placement	0.00	0.00
Year Abroad	0.00	0.00
TOTAL	**45.00**	**200.00**

18. Minimum Requirement for Award of Credits:

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.

19. Summative Assessment Methods:

Method	**%**
Written Exam	0.00%
Written Assignment, including Essay	80.00%
Report	0.00%
Dissertation	0.00%
Portfolio	0.00%
Project Output (Other than dissertation)	0.00%
Oral Assessment & Presentation	20.00%
Practical Skills Assessment	0.00%
Set Exercise	0.00%
TOTAL	**100.00**

20. Description of Summative Assessment:

100% from continuous assessment

21. Are reassessment opportunities normally available for all summative assessments in this course?:

Yes

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 grade D3 for both undergraduate students and 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.

The grade can only be improved by re-submitting the report which then re-assessed but anything related to practical work cannot be improved because neither the teams will exist by the time of resubmission nor the hardware.

22. Formative Assessment & Feedback:

Feedback will be provided in laboratories.

23. Grading Basis (see University Calendar):

Schedule A

24. Examination Diet:

April/May

25. Total Exam Duration (Excluding in-class tests):

0 minutes

26. Short Title:

Real Time Embedded Programming

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):

No

28. Subject:

Engineering

29. Location(s):

Main Campus

30. College:

College of Science and Engineering

31. Lead School/Institute:

Engineering [REG30300000]

32. Cost Centre:

ENG - Micro and Nanotechnology [30305000]

33. Is this course collaborative with another institution?:

No

34. Teaching Institutions:

University of Glasgow

35. Taught wholly by distance learning:

No

36. Open Studies Credit Bearing:

No

37. Represents a work placement or period of study abroad:

No

41. Additional Relevant Information (if applicable):

42. Date of approval:	14/12/2018