Course Specification
Part A

MSc Embedded Systems Engineering
ECT040

Faculty of Engineering, Environment and Computing
School of Computing, Electronics and Mathematics

Academic Year: from 2019/2020

Please note: 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 s/he takes full advantage of the learning opportunities that are provided.

We regularly review our course content, to make it relevant and current for the benefit of our students. For these reasons, course modules may be updated.

More detailed information on the learning outcomes, content, and teaching, learning and assessment methods of each module can be found in the Module Information Directory (MID), student module guide(s) and the course handbook.

The accuracy of the information contained in this document is reviewed by the University and may be verified by the Quality Assurance Agency for Higher Education.
PART A Course Specification
MSc Embedded Systems Engineering

1. Introduction

Embedded systems are computing devices that perform dedicated functions or are designed for use with specific embedded software applications. Embedded systems engineering is a discipline which designs and implements hardware and software of embedded systems. They are crucial to mobile communications, Internet of things (IoT), household robots and video game consoles, to name a few. Engineers capable of designing and implementing embedded systems and devices for such applications are in high demand all over the world.

Coventry University has a long tradition of teaching embedded systems engineering with a strong emphasis on its applications in practical situations. The School of Computing, Electronics and Mathematics in the Faculty of Engineering, Environment and Computing offers innovative degree courses in the study and practice of computing, electrical and electronic engineering and mathematics. The School actively collaborates with many commercial partners and organises a full calendar of events to enable students to interact with potential employers. The School is committed to providing its students with the highest standards in teaching and prides itself on its motivating, supportive, safe and inclusive learning environment. The courses provide students with the opportunity to become highly qualified professionals who can think creatively and independently, ready to meet the challenges of the rapidly changing technological environment.

The course is designed for graduates with an electronics and computing background. It provides a leading edge MSc degree education in the embedded systems engineering and meets the associated learning outcomes of the Quality Assurance Agency for Higher Education (QAA) Engineering Subject Benchmark. It is consistent with the general and specific learning outcomes of the UK Standard for Professional Engineering Competence (UK-SPEC 2014) and the Accreditation of Higher Education Programmes (AHEP 2014).

The technical focus of the course concentrates on a combination of advanced electronics including Field Programmable Gate Arrays (FPGA) based digital system design, image and signal processing, digital communications, wireless intelligent systems, and robotics as well as the subject specific knowledge in embedded systems including embedded systems programming, embedded operating systems, and embedded hardware engineering.

An emphasis on applied technical work will strengthen the engineering development skills of students from an academic background. Such work will provide the demonstrable expertise necessary to help secure professional level employment in related industries. The topic areas also provide opportunities for interaction with the Faculty Research Centres who will source some of the individual projects for the programme.

Students can progress onto further study in the forms of a PhD or can begin a career in the areas of consumer electronics industry, for examples, household robots, IoT, mobile communication devices, video game consoles, etc.

The distinctive features of the course are:

- Coverage of a significant body of science relevant to the subject area of embedded systems engineering along with associated mathematical methods and analytical techniques.
- Coverage of a wide range of management, social, legal, and professional topics relevant to engineering and its application in the real world.
- The ability to solve problems related to both the technical and management aspects of engineering and to design innovative products.
- Experience with project oriented work both on an individual and group basis.
- Work with real components, materials and processes in a practical setting that enables the theory to be put into practice.
- Experience with contemporary software and information technology tools relevant to the embedded systems engineering profession and with real world information sources such as standard documents and commercial component data sheets.
### 2 Available Award(s) and Modes of Study

<table>
<thead>
<tr>
<th>Title of Award</th>
<th>Mode of attendance</th>
<th>UCAS Code</th>
<th>FHEQ Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSc Embedded Systems Engineering</td>
<td>FT - 1 year PT - 2 years</td>
<td>N/A</td>
<td>7</td>
</tr>
<tr>
<td>PgDip Embedded Systems Engineering</td>
<td>Fall-back</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>PgCert Embedded Systems Engineering</td>
<td>Fall-back</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

| 3 Awarding Institution/Body       | Coventry University         |           |            |
| 4 Collaboration                  | N/A                         |           |            |
| 5 Teaching Institution and Location of delivery | Coventry University |           |            |

| 6 Internal Approval/ Review Dates | Date of approval*/latest review*: March 2019 | Date for next review: Academic year 2024/25 |            |

| 7 Course Accredited by            | N/A                         |           |            |
| 8 Accreditation Date and Duration | N/A                         |           |            |


| 10 Date of Course Specification   | March 2019                   |           |            |
| 11 Course Director               | Dr Qin Zhou                  |           |            |
12 Outline and Educational Aims of the Course

The course aims to:

- provide a relevant and useful course, that can meet the needs of the individual, containing both theoretical and practical subjects within the broad areas of embedded systems engineering including embedded hardware engineering and embedded systems programming;
- further the students’ skills and knowledge acquired through relevant previous study and experience, to enhance their transferable and professional skills and thereby improve their wider employment prospects;
- enable students to further develop their analytical, critical communication and presentation skills in the context of their taught modules;
- familiarise students with contemporary applied and theoretical aspects of the course’s subject areas to enable them to operate as effective professionals in these areas;
- provide relevant and topical subject content for personal professional development that promotes good practice in the workplace, relating to subjects within the broad domains of the course’s subject areas;
- provide an education consistent with Masters level of the QAA’s Framework for Higher Education Qualifications and to further the University mission statement by providing an excellent education enriched by work-related learning.
- enhance the awareness of the professional, legal, ethical and social issues along with commercial risk and management in the role of an embedded systems engineering professional.

13 Course Learning Outcomes

A student who successfully completes the course will have achieved the following Course Learning Outcomes.

1. **Advanced principles and concepts**
   - Demonstrate a comprehensive understanding of advanced principles and concepts of embedded systems engineering.
   - Critically evaluate and effectively apply them, including in engineering projects. Be critically aware of current problems and new insights.

2. **Engineering analysis**
   - Apply appropriate engineering analysis methods for solving complex problems in embedded systems engineering and assess their limitations.
   - Use fundamental embedded systems engineering knowledge to investigate new and emerging technologies, collect and analyse research data and use appropriate engineering analysis tools in tackling unfamiliar problems.

3. **Design**
   - Demonstrate knowledge and comprehensive understanding of design processes and methodologies.
   - Apply those methodologies and adapt them in unfamiliar situations, generate innovative designs for embedded products, systems, components or processes to fulfil new needs.

4. **Economic, legal, social, ethical and environmental context**
   - Demonstrate knowledge and understanding of management and business practices, their limitations, and how these may be applied in the context of the particular specialisation.

5. **Engineering practice**
   - Demonstrate advanced level knowledge and understanding of a wide range of embedded systems engineering materials and components.
   - Exhibit a thorough understanding of current practice and its limitations.

6. **Transferable skills**
   - Apply analytical, critical and communication skills in problem solving, communication, information retrieval, working with others, and the effective use of general IT facilities.
14 Course Structure and Requirements, Levels, Modules, Credits and Awards

The course structure reflects its main aims and has been designed to match the research interests and expertise of the electronics and embedded systems engineering academics as well as the latest issues and technologies in embedded systems engineering with the requirements of the Accreditation of Higher Education Programmes (AHEP) for a master's degree in engineering curriculum. The modules provide the critical understanding, comprehensive knowledge and technical skills of the core embedded systems engineering areas covered by the course. The individual project will require the students to perform research into and analysis of the current embedded systems engineering issues and undertake a substantial work in addressing those issues. A Chartered Management Institute (CMI) module, Global Professional Development - Consultancy, will involve students working together across disciplines to facilitate an appreciation of how different sectors solve internal issues and how different sectors can learn and adopt or adapt solutions from other fields. Students who successfully complete the CMI module and meet the CMI evidence requirements will gain a Level 7 certificate in Strategic Management and Leadership and a Level 7 Award in Professional Consulting.

This is a highly technical course where most modules incorporate substantial practical elements. The course adopts a combination of activity-led and flipped teaching and learning methodologies. Modules will be delivered as a combination of lectures, laboratory sessions, online learning, problems solving, discussions and tutorials. These are designed and set by the module leaders reflecting the specific topics with the aim of maximising attainment and learning.

Cascade of Awards:

MSc Embedded Systems Engineering (all modules must be passed -180 credits)  ↓
PgDip Embedded Systems Engineering (any 120 credits from the programme of study)  ↓
PgCert Embedded Systems Engineering (any 60 credits from the programme of study)

The table below shows the list of module and indicative delivery pattern over three semesters.
<table>
<thead>
<tr>
<th>Module credit level</th>
<th>Module Code</th>
<th>Title</th>
<th>Credit Value</th>
<th>Mandatory/Optional</th>
<th>Semester</th>
<th>Course Learning Outcomes *</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7059CEM</td>
<td>Digital Signal and Image Processing</td>
<td>15</td>
<td>M</td>
<td>A</td>
<td>1, 2, 3, 5, 6</td>
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<tr>
<td>7</td>
<td>7062CEM</td>
<td>Wireless Intelligent Systems</td>
<td>15</td>
<td>M</td>
<td>A</td>
<td>1, 2, 3, 5, 6</td>
</tr>
<tr>
<td>7</td>
<td>7073CEM</td>
<td>Robotics: Kinematics, Dynamics and Applications</td>
<td>15</td>
<td>M</td>
<td>A</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>7</td>
<td>7074CEM</td>
<td>Embedded Hardware Engineering</td>
<td>15</td>
<td>M</td>
<td>A</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>7</td>
<td>7002CRB</td>
<td>Global Professional Development - Consultancy</td>
<td>10</td>
<td>M</td>
<td>B</td>
<td>4, 6</td>
</tr>
<tr>
<td>7</td>
<td>7041CEM</td>
<td>Embedded Operating Systems</td>
<td>10</td>
<td>M</td>
<td>B</td>
<td>1, 2, 3, 5, 6</td>
</tr>
<tr>
<td>7</td>
<td>7057CEM</td>
<td>Digital Communication Systems</td>
<td>10</td>
<td>M</td>
<td>B</td>
<td>1, 2, 3, 5</td>
</tr>
<tr>
<td>7</td>
<td>7058CEM</td>
<td>Embedded Systems Programming</td>
<td>15</td>
<td>M</td>
<td>B</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>7</td>
<td>7067CEM</td>
<td>FPGA-Based Digital System Design</td>
<td>15</td>
<td>M</td>
<td>B</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>7</td>
<td>7011CEM</td>
<td>Individual Project</td>
<td>60</td>
<td>M</td>
<td>C</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

* Each module mapping matches partial or all of the statements presented under each category of Course Learning Outcomes.
15 Criteria for Admission and Selection Procedure

An applicant for the course will normally be expected to possess at least one of the following:

- A minimum of a second class honours degree in a relevant subject such as Electronic Engineering, or Physics, etc.
- A lower qualification plus appropriate and relevant experience at a professional level.
- Satisfactory independent evidence of working for several years in a position that would normally be occupied by an honours graduate, in a relevant area (such as the engineering sector), which would lead to gaining benefit from the course.

Students whose first language is not English must demonstrate proficiency in the English language equivalent to IELTS 6.5. Alternatively students may be admitted with IELTS 6.0 if they attend and pass a compulsory five week pre-sessional English course, operated by Coventry University, before joining their master’s programme.

Applications from those not possessing the equivalent of an honours degree in electronic related subject will be considered on individual merit and decisions will be based on careful evaluation of the capacity of the applicant to complete the programme successfully.

The course is subject to the general University admission procedures and access policies. A wide range of academic backgrounds is deemed suitable for entry to the course. However, careful monitoring of applications to ensure that applicants are suited to the programme takes place. Where necessary and possible, applicants are interviewed, especially those who do not appear to meet standard admissions criteria.

Accreditation for Prior Learning (APL) is in accordance with University regulations.

The Accreditation for Prior Experiential learning (APEL) will only be awarded for achievements equivalent to masters’ level.

16 Academic Regulations and Regulations of Assessment

This Course conforms to the standard University Regulations Mode R.
Indicators of Quality Enhancement

The QAA’s Higher Education Review undertaken in February 2015 confirmed that Coventry University meets the UK expectations regarding the:

- setting and maintenance of the academic standards of awards;
- quality of student learning opportunities;
- quality of the information about learning opportunities;
- enhancement of student learning opportunities

The assurance of the quality of modules is the responsibility of the Boards of Study which contribute modules to the course. The Programme Assessment Board (PAB) for the Faculty of Engineering, Environment and Computing is responsible for considering the progress of all students and making awards in accordance with both the university and course-specific regulations.

Students are represented on the Student Forum, Boards of Study and Faculty Board, all of which normally meet two or three times per year. Student views are also sought through module and course evaluation questionnaires.

External Examiners are appointed for all named University awards. The role of the External Examiners at module level is to ensure that academic standards are in line with national norms for the subject. External Examiners report annually on the course and their views are considered as part of the Course Quality Enhancement Monitoring report (CQEM). Details of the CQEM process can be found on the Registry’s web site.

Lecturers, guest speakers, case studies and web materials are used when appropriate to ensure that the content of the MSc course remains valid and contemporaneous, drawing on relevant expertise from within the course team. Research activity and interests, relevant scholarly and consultancy activities will be used to inform the module content within the MSc course.

There is a diverse and active range of research activities influencing courses in most areas of the Faculty. Staff teaching on the MSc Embedded Systems Engineering course is actively engaged in research directly related to the content of the module in which they are engaged.

In all areas of the Faculty there is a strong and regular industry input to the subject-base. The Industry Advisory Board (IAB) for the School of Computing, Electronics and Computing is made of various external industry advisers and provides feedback and advice at both the course and module levels to ensure that the course is current and valid, and prepares students to work in an industry and global context. Industry input is also achieved in many other ways, for example, through industry-focused collaborative research initiatives and use of guest speakers from industry. Alumni from the course as well as related undergraduate course will be invited to provide feedback, possible student projects as well as engage in guest lectures.
18 Additional Information

Enrolled students have access to additional, key sources of information about the course and student support including:

- Student Handbook
- Course Handbook
- Module Information Directory
- CU Online / Moodle
- Module Webs
- Postgraduate Course Webs
- EEC Faculty Postgraduate Web
- EEC Student Portal (https://share.coventry.ac.uk/students/EC/Pages/Home.aspx)
- Coventry University Student Portal https://share.coventry.ac.uk/students/Pages/Index.aspx
- Study Support information is accessible from Student Services (and also from Faculty Registry)
- Generic Faculty information is available on the EEC Faculty Web

Support is also available via the Course Director, who is available to advise students on academic and pastoral issues. Times that the Course Director is available to meet with students will be shown on course Moodle webs and also their location. Module Leaders and the associated module team are available to offer support at module level. Again module leaders advertise their contact times on module Moodle webs and also their location. Outside of office hours, students can also email any member of academic staff.

The Faculty Registry team supports students through their studies, providing information and guidance on the rules and procedures that affect academic progress. Faculty Registry can help students deal with problems they may be having with academic life and help them understand the University’s academic processes and regulations. They have a detailed understanding of the curriculum structures and other specialist support that is available within the University.

The Faculty Registry has offices located close to the main Receptions. Students can drop by the Registry support desk which is next to reception in the Engineering and Computing building; Monday – Friday from 1000 – 1600. Or they can contact Registry staff via the Reception desks in the main Engineering and Computing building, the John Laing building or the George Eliot building; Monday – Friday from 0830 – 1700. This team can also be emailed at FacultyRegistry.eec@coventry.ac.uk at any time and this will be passed to each student’s dedicated course support team to respond to.

The Faculty Learning Support Co-ordinators work closely with the Disabilities Office in the Hub and Course Teams within the Faculty. Reasonable adjustments will be made for students with disabilities who have registered with the University as requiring additional support with their studies.

The University has an excellent record on widening access and welcomes students from all backgrounds and neighbourhoods with low participation in higher education.

Students have access to a Maths and Stats Support Centre called SIGMA based in the Library as well as the drop-in support (Theta session) at the Engineering and Computing Building. The Centre for Academic Writing (CAW) can also provide support on topics ranging from how to organise an academic argument to improving grammar and sentence structure. The university provides support for students’ health and wellbeing, which includes a Medical Centre, Spirituality and Faith Centre, Counselling and Mental Health Service, Sports and Recreational Centre and a Nursery.

The Students’ Union also provides recreational facilities and support and advice for students. International Students may obtain further help from the student welfare team in the International Student Centre.

There is a careers service where qualified consultants are available to help students think about the issues they face as they move through University studies and prepare for employment.