Course Specification

MSc Electrical Automotive Engineering

ECT007

School of Computing, Electronics and Mathematics
Faculty of Engineering, Environment and Computing
Academic Year: 2019

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 Electrical Automotive Engineering

1. Introduction

Electric and Hybrid Electric Vehicles constitutes a modern and timely area in engineering and one expected to expand very quickly in the next few years. Climate change and the consequent need to reduce CO2 emissions has progressively led to major advances in many modern developments of power engineering such as in photovoltaics, wind turbines, biofuels etc. The next step, which strongly affects our daily lives is transportation. Electric vehicles minimise pollution whilst increasing power efficiency. Moreover, areas such as autonomous vehicles and smart transportation grids are beginning to become reality. As a result, expertise in this demanding engineering field is in high demand in the transport industry.

Coventry has a long history in the automotive and transport industries, and Coventry University plays a significant role in shaping the future of modern transportation. Coventry University has been a valuable partner in various projects and collaborations with industry and academia in the area of transportation, with significant experience and technical know-how. Furthermore, the Future Transport and Cities Research Centre has been established in Coventry University to organise and promote state of the art research activities in the technological field of clean transportation.

Our postgraduate course on Electrical Automotive Engineering aims to provide the expertise required to meet the modern transportation market demands. Carefully planned, it consists of a balanced mix between electric power, electronics and communications. Our vision is to create experienced and specialised engineers who will be highly sought after by the electrical automotive engineering market.

As the area of Electrical Automotive Engineering is under continuous development by manufacturers, industry and academia, it is necessary to enhance this MSc course with strong research elements and deliver a research-oriented teaching and culture. For this purpose, academics and professionals from overseas and other UK institutions are invited to deliver seminars and lectures on timely research topics and advancements in the area of Electrical Automotive Engineering. Furthermore, the students will benefit from research-oriented individual projects and will be encouraged to participate in National and International Conferences and Workshops to present their works.

The delivery of this course will consist of a balance between theory, simulations and laboratory testing creating an ideal teaching and learning environment. The aim is to cultivate not only a strong foundation in electrical automotive engineering but also critical and original thinking. For this purpose, our students will benefit from our high level teaching environment and infrastructure, practical hands on laboratory equipment and specialised modern simulation tools adopted by industry nowadays. The teaching activities are partially industry and research focused to motivate and promote engineering development and originality among our students.

For students in today’s competitive employment markets having work experience can significantly enhance employment prospects. For this reason, the course offers students the opportunity to undertake a work placement, extending the main provision to a two-year course. The work placement could be International or UK with a focus which may be industry or research. Following a selection process within the first semester and subject to securing an approved placement opportunity, students would move onto the two-year course. International students who are interested in a work placement will be supported in completing an application for extending their Tier 4 visa by international student support services. Upon completion of their placement, students will return to complete the course and the final project for the full award.

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 Electrical Automotive Engineering</td>
<td>FT – 1 year</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2 years with Work Placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PT – 2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Description</td>
<td>Duration</td>
<td>Course Code</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>PgDip in Electrical Automotive Engineering</td>
<td>FT – 1 year</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PT – 2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PgCert Electrical Automotive Engineering</td>
<td>FT – 1 year</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PT – 2 years</td>
<td></td>
<td></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: January 2018 |
|                                                        | Date for next review: 2026 |
| 7 Course Accredited by                                | Not currently accredited |
| 8 Accreditation Date and Duration                      |                   |
| 9 QAA Subject Benchmark Statement(s) and/or other external factors | Designed is accordance with The Framework for Higher Education Qualifications [Link](http://www.qaa.ac.uk/en/Publications/Documents/qualifications-frameworks.pdf) The course content has also been developed to follow the overall requirements for the Accreditation of Higher Education Programmes (AHEP) in engineering as set by the UK Engineering Council that is the UK regulatory body for the engineering profession. |
| 10 Date of Course Specification                        | June 2019        |
| 11 Course Director                                     | Dr. Konstantinos (Kostas) Gyftakis |
12 Outline and Educational Aims of the Course

The MSc Electrical Automotive Engineering seeks to provide a post-graduate education covering the main theoretical and practical aspects of the field. The overall aim of the MSc Electrical Automotive Engineering is to provide:

- Deep and comprehensive understanding of the current electric/hybrid electric vehicles technology, concepts and challenges;
- Develop academic and practical skills in electric power related areas such as electrical machines and drives, power electronics and batteries covering all aspects of the vehicle's powertrain.
- Develop a solid background on vehicle electronics, signal processing and communications needs and challenges.

This course aims to educate graduates from a mechanical/automotive background in the modern area of electrical automotive engineering and provide a valuable qualification for this growing and expanding market. Moreover, graduates from Electrical and Electronic Engineering, Electronic Engineering and Computer and Hardware Engineering will have the opportunity to specialise and focus their know-how in the automotive technology.

13 Course Learning Outcomes

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

1. To develop learn and apply new theories, concepts and methods.
2. To critically evaluate, model and test the operation of electrical systems and components for automotive applications.
3. Demonstrate a thorough understanding of electrical power conversion and power flow.
4. To analyse the degradation mechanisms and ageing process of the automotive electrical and electronics systems.
5. Awareness of current standard and specifications of the on board electronics and networking system. To design and assess systems and components.
6. To develop extensive knowledge and understanding of a wide range of computer modelling and simulation software.
7. Conduct rigorous and ethical research / formal enquiry into related issues that require familiarity with a range of research sources and appropriate methodologies.
8. To demonstrate awareness and ability to critically evaluate risks, including health and safety when conducting design and tests.

14 Course Structure and Requirements, Levels, Modules, Credits and Awards

Modules within the course, their status (whether mandatory or options), the levels at which they are studied, their credit value and pre/co requisites are identified in the table below.

Modules will be delivered as a combination of lectures, practical hands on lab testing, computer laboratory sessions, simulations laboratory sessions, online learning, seminars discussions and tutorials. The course adopts a combination of lab-rotation model and flipped-classroom of teaching and learning, with a combination of online/in-class lectures, online/in-class tutorials as well as in-class discussions and presentations. These are designed and set by the module leaders reflecting the specific topics with the aim of maximising attainment and learning.

The course structure reflects its main aims and has been designed to match the research interests and expertise of the electrical and electronics academics as well as the latest issues and technologies in electric/hybrid electric mobility. It also meets the overall requirements for the Accreditation of Higher Education Programmes (AHEP) in engineering as set by the UK Engineering Council. The modules provide the critical understanding, comprehensive knowledge and technical skills of the core electrical automotive engineering areas covered by the course. The Individual project will require the students to perform research into and analysis of the current electrical automotive engineering issues and undertake a substantial work in addressing those issues. Finally, students looking to continue in Doctoral studies can choose to specialise within either of the above modules.

The table below shows the list of module and indicative delivery pattern over two semesters.
During semester 1, students who have expressed an interest in undertaking a work placement should begin the application process for placement opportunities. Students have the responsibility for securing a placement, but they will be supported throughout the application process by a specialist employer engagement team. The university will work with employers to identify opportunities. Subject to securing a placement, the International Student Support team will work with international students to obtain UK study visa extensions. Visas required to work in other countries will be the responsibility of the student.

The course is structured so that students complete two semesters of taught modules and then spend three semesters on placement. During this time students would be enrolled onto modules 7102CEM Extended Masters Work Placement A, 7103CEM Extended Masters Work Placement B and 7104CEM Extended Masters Work Placement C. The modules are zero credit and do not contribute to the classification or name of the award but must be passed to complete the placement. Upon completion of the work placement, students are expected to return to Coventry to complete the final semester during which time they undertake their project module. Successful completion of the Work Placement is reflected in the final student transcript.

<table>
<thead>
<tr>
<th>Credit level</th>
<th>Module Code</th>
<th>Title</th>
<th>Credit Value</th>
<th>Mandatory/Optional</th>
<th>Course Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7102CEM</td>
<td>Extended Masters Work Placement A</td>
<td>0</td>
<td>Optional</td>
<td></td>
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<tr>
<td>7</td>
<td>7103CEM</td>
<td>Extended Masters Work Placement B</td>
<td>0</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7104CEM</td>
<td>Extended Masters Work Placement C</td>
<td>0</td>
<td>Optional</td>
<td></td>
</tr>
</tbody>
</table>

The work placement is to be taken over three semesters and prior to the final semester of the course.

Cascade of Awards:
MSc Electrical Automotive Engineering: The full curriculum (180 credits).
PgDip in Electrical Automotive Engineering: any 120 credits from the programme of study excluding 7005CRB.
PgCert Electrical Automotive Engineering: any 60 credits from the programme of study excluding 7011CEM.
<table>
<thead>
<tr>
<th>Module credit level</th>
<th>Module Code</th>
<th>Title</th>
<th>Credit Value</th>
<th>Mandatory/Optional</th>
<th>Course Learning Outcomes</th>
<th>Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7007CEM</td>
<td>Electrical Machines</td>
<td>15</td>
<td>M</td>
<td>1, 3, 4, 6, 7, 8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7004CEM</td>
<td>Power semiconductors and converters</td>
<td>20</td>
<td>M</td>
<td>1, 2, 3, 4, 6, 7, 8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7005CEM</td>
<td>Automotive Networking and Signal Processing</td>
<td>15</td>
<td>M</td>
<td>1, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7009CEM</td>
<td>Sensor and Measurement Technology</td>
<td>15</td>
<td>M</td>
<td>1, 5, 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7012CEM</td>
<td>Automotive electronics and embedded systems</td>
<td>15</td>
<td>M</td>
<td>1, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7006CEM</td>
<td>Energy Storage and High Voltage Systems</td>
<td>15</td>
<td>M</td>
<td>1, 2, 3, 6, 7, 8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7010CEM</td>
<td>Automotive cybersecurity</td>
<td>15</td>
<td>M</td>
<td>1, 5, 7</td>
<td></td>
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<tr>
<td>7</td>
<td>7005CRB</td>
<td>Global Professional Development – Entrepreneurship</td>
<td>10</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7011CEM</td>
<td>PG Individual Project</td>
<td>60</td>
<td>M</td>
<td>1, 7</td>
<td>The PG Individual Project is to be allocated after taking ALL the PG Modules</td>
</tr>
</tbody>
</table>
15 Criteria for Admission and Selection Procedure

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

• A minimum of a second class honours degree in an engineering or science related subject as follows. Engineering related subjects are the following: mechanical, automotive, aerospace, electrical, electronic, computer hardware, computing and industrial (or equivalent). Science related subjects are: physics and mathematics (or equivalent).
• A relevant professional qualification of an equivalent level
• 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 (automotive manufacturing plants), 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 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 programme is subject to the general University admission procedures and access policies. A wide range of academic backgrounds is deemed suitable for entry to the programme. 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.
• If it is deemed appropriate, applicants may be offered an opportunity to undertake a preliminary programme of study prior to enrolling on the programme.
• 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
17 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 courses. 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 Examiner at module level is to ensure that academic standards are in line with national norms for the subject. External Examiners report annually on the programme 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 programme 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 programme.

There is a diverse and active range of research activities influencing programmes in most areas of the Faculty. All staff teaching on the MSc Electrical Automotive 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. This is achieved in many ways, for example there are several long-standing advisory boards, 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 Programme 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 Course Directors, who are available to advise students on academic and pastoral issues. Times that Course Directors are 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 support 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 have 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 and the John Laing 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 Computer Programming Support and Academic 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.