Course Specification

MSc Connected Autonomous Vehicles Engineering
EECT146

Faculty of Engineering, Environment and Computing
School of Mechanical, Aerospace and Automotive Engineering
Academic Year: 2021/22

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.

Coventry University's accreditation with CMI is currently ongoing for the relevant modules and is regularly reviewed and monitored by the CMI through their quality systems. Whilst Coventry University anticipates that these reviews will continue to be successful, if they were to be unsuccessful, the relevant module in this course would no longer be accredited and we would notify applicants and students of this change as soon as possible.

PART A Course Specification

MSc Connected Autonomous Vehicles Engineering

1. Introduction

Do you want to engineer Connected Autonomous Vehicles Engineering (CAVs) of the future? Technological advances across the field of engineering enable significant opportunities for safer and more efficient modes of transport. Revolutionary futuristic visions include fully autonomous "mobile living rooms" eradicating accidents and traffic jams whilst offering high levels of personal comfort. Whilst the "mobile living room" may not become a reality, the continuous development of CAVs is heavily dependent on the skillset and vision of the next generation of engineers. These are a central feature of the Transport Systems Catapult Intelligent Mobility Skills Strategy (Transport Systems Catapult 2016) which states:

"The launch of this Intelligent Mobility Skills Strategy marks a critical milestone and is a call to action for government, academia and industry. The UK is strongly placed to win a significant share of this market through a number of unique strengths such as human machine interaction (HMI) and interaction design, localisation and mapping, analytics and simulation or realtime control." (Transport Systems Catapult 2016:4)

Aligned with the Intelligent Mobility Skills Strategy and the Engineering Councils UK-SPEC (Engineering Council 2019) the CAV MSc course is designed to provide students from mechanical, automotive and similar backgrounds with the necessary technical skillsets to engineer the CAVs of tomorrow. The programme will cover topics such as vehicle dynamics, structural performance, active and functional safety, CAV testing and validation, human centred design and powertrain electrification as well as optimisation of complex systems. The course is also designed to develop and nurture vital "non-technical" skills including global leadership, business and project management as well as a contextual understanding of CAV technology for example in the areas of business and ownership models, insurance, culpability, cyber security, big data and Artificial Intelligence (AI).

Building on Coventry University's excellent track record of automotive engineering teaching, business focused research and internationally recognised Activity-Led Learning (ALL) approach the CAV MSc programme will infuse state-of-the-art technology with practical application and an ability to critically determine advantages and limitations of current and emerging practice. This will enable students to push the boundaries of vehicle engineering, contribute to CAV sustainability and ensuring the current and future safeguarding of society as outlined by the in the UK-SPEC (Engineering Council 2019).

The MSc course sits within the School of Mechanical, Aerospace and Automotive Engineering, which enjoys a global reputation for excellent teaching, outstanding student experience and exciting research.
The School is located in an inspirational £55M state-of-the-art building with modern equipment and student facilities.

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.

As part of this course you will undertake a professional development module which is currently accredited by the Chartered Management Institute (CMI). Upon successful completion of the module, you will gain the CMI Level 7 Certificate in Strategic Management and Leadership Practice at no additional cost.

We are focussed on preparing our students for their first professional position and future careers, with students benefiting significantly from our industrial and strategic partnerships. Our strong tradition of business-focussed research is reflected in the important relationships we have developed with companies such as: Emirates, Jaguar Land Rover, Airbus, Rolls Royce, Unipart and Birmingham International Airport and we are home to the UK's first 'Faculty on the Factory Floor', the Institute for Advanced Manufacturing and Engineering.

2 Available Award(s) and Modes of Study			
Title of Award	Mode of attendance	UCAS Code	FHEQ Level
MSc Connected Autonomous Vehicles Engineering Fall-back awards: PgDip Connected Autonomous Vehicles Engineering PgCert Connected Autonomous Vehicles Engineering	F/T 12 months 2 years with Work Placement P/T 24 months		7

3 Awarding Institution/Body	Coventry University
4 Collaboration	None
5 Teaching Institution and Location of delivery	Coventry University
6 Internal Approval/Review Dates	Date of approval: August 2021 Date for next review: 2026/2027
7 Course Accredited by	
8 Accreditation Date and Duration	N/A
9 QAA Subject Benchmark Statement(s) and/or other external factors	Developed in line with the: **Framework for Higher Education Qualifications** (Quality Assurance Agency 2019) according to the: **Subject Benchmark for Engineering** (Quality Assurance Agency 2019) statements, the **Engineering Council UK-SPEC Fourth Edition** (Engineering Council 2019) and the Professional Body: **Institution of Mechanical Engineers (IMechE)** (Institution of Mechanical Engineers 2019)
10 Date of Course Specification	February 2021
11 Course Director	Georgios Chrysakis

12 Outline and Educational Aims of the Course

This MSc Connected Autonomous Vehicles Engineering (CAV) course aims to provide students with a comprehensive understanding of CAVs and develop knowledge, skills and expertise that can be applied to the broader CAV sector. The educational experience also aims to develop students' intellectual and personal skills, and give them the capability to undertake practical research studies and publish results. This will prepare students to pursue careers and be leaders in the CAV industry.

Specifically, the course aims to:

- Enable students to explore the current and emerging technologies and applications for CAVs.
- Provide qualified engineering and science graduates with the opportunity to advance their engineering proficiency and develop new skills and knowledge within the area of CAVs.
- Prepare students to make significant contributions to their professions, the economy and society.
- Use activity-led learning, underpinned by research inspired teaching, to provide students with a transformative learning experience.
- Create an educational environment that gives access to both academic and industrial experience within the field of CAVs.
- Provide students with the opportunity to deal with complex issues demonstrate self-direction and develop transferable skills.
- Mentor students to be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

These course aims have been developed in line with (Quality Assurance Agency 2019), (Quality Assurance Agency 2019) and (Engineering Council 2019).

13 Course Learning Outcomes

On successful completion of the course, a student will be able to:

1. Select and apply appropriate systematic analysis methods to critically evaluate and solve complex CAV engineering problems.
2. Analyse and critically assess CAV structures and systems using analytical modelling, experimental techniques and numerical simulations.
3. Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging CAV technology.
4. Critically assess the use of CAVs to address and mitigate societal challenges, improving environmental and social welfare.
5. Identify CAV engineering research activities in a way that contributes to sustainable development.
6. Demonstrate the application of legal and ethical requirements associated with CAVs in an industrial and/or societal context.
7. Apply the necessary study and research skills to support the analytical, critical and reflective requirements of written, oral and group assessments.
8. Contribute to a multi-cultural team demonstrating international competency with the necessary planning, reviewing, adaptability, drive and leadership to achieve the required objectives and work schedules.
9. Efficiently communicate research, concepts, solutions and recommendations, and demonstrate a professional approach to written and oral presentations.
10. Critically evaluate the principles of developing and proposing strategy for leading strategic change.

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

The CAV MSc is a 1-year full-time course, which will have September and January intakes. Table 1 lists the individual modules, their level of study, associated credits, learning outcomes covered and a typical delivery pattern. The course is based on the teach-teach-project cycle being used during the entry year. Personalised timetables will be issued to students prior to their course start date. The cascade of awards is listed below.

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.

Credit level	**Module Code**	**Title**	**Credit Value**	**Mandatory/ Optional**	**Course Learning Outcomes**
Subject to securing an appropriate placement opportunity and fulfilling the selection requirements, students will be transferred to the two-year course and the Work Placement modules listed below are to be taken.					
7	7102CEM	Extended Masters Work Placement A	0	Optional	
7	7103CEM	Extended Masters Work Placement B	0	Optional	
7	7104CEM	Extended Masters Work Placement C	0	Optional	

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

Cascade of Awards:

MSc Connected Autonomous Vehicles Engineering – 180 credits (the full curriculum)

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PG Dip Connected Autonomous Vehicles Engineering – 120 credits (any modules, excluding 7166MAA)

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PG Cert Connected Autonomous Vehicles Engineering – 60 credits
(must include at least one of: 7080MAA, 70051CRB or 7085MAA)
(Must not include 7166MAA)

CMI Certificate:

Students who successfully complete the module and meet the CMI learning outcomes will gain a Level 7 Certificate in Strategic Management and Leadership Practice based on the following CMI units: Developing Organisational Strategy (Unit 704); Leading Strategic Change (unit 705).

Students who successfully complete this module will be awarded Foundation Chartered Manager status and be able to use the designation 'fCMgr' after their name.

Table 1, module details.

Module		Credit		Course Learning Outcomes										Co/pre-requisite	Indicative delivery semester		
Code	**Title**	**Level**	**Value**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		**1**	**2**	**3**
7080MAA	CAV Contextualisation	7	15	X		X	X	X	X	X	X	X		None	X		
7081MAA	CAV Dynamics	7	15	X	X	X		X		X	X	X		None		X	
7082MAA	CAV Functional Safety	7	15	X	X	X	X	X	X	X	X	X		None		x	
7051CRB	Leading Strategic Change through Creativity and Innovation	7	10					X	X	X	X	X	X	None	x		
7083MAA	Human Factors and CAV Design	7	15	X			X	X	X	X		X		None		x	
7084MAA	Optimisation Techniques	7	15	X	X	X	X	X		X		X		None	X		
7085MAA	Powertrain Electrification and Thermal Management	7	15	X	X	X	X	X	X	X	X	X		None		X	
7086MAA	Simulation, Testing & Validation of CAVs	7	20	X	X	X	X	X	X	X		X		None	x		
7166MAA	Individual Project	7	60	X	X	X	X	X	X	X		X		None			X

15 Criteria for Admission and Selection Procedure

Any applicant to the MSc Connected Autonomous Vehicles Engineering course must:

- Have been awarded an honours degree in mechanical, automotive, motorsport or other relevant engineering discipline (minimum 2:2) or hold an equivalent qualification acceptable to Coventry University.
- Hold IELTS 6.5 or equivalent if English is not the applicant's first language.

Applicants who do not have the above entry requirements will still be considered on their individual merits where alternative and additional evidence of aptitude, such as extensive practical experience is evident via the University's Recognised Prior Learning (RPL) / Recognised Prior Experiential Learning (RPEL) policy. Admissions tutors can offer further advice on this.

16 Academic Regulations and Regulations of Assessment

This Course conforms to the standard University Regulations Mode R

17 Indicators of Quality Enhancement

This Engineering Course has been designed in accordance with the:

- QAA Engineering Subject Benchmark statement (Quality Assurance Agency 2015).
- UK Standards for Professional Engineering Competence (Engineering Council 2013).
- Engineering Council Accreditation of Higher Education Programmes (Engineering Council 2014).

The School of Mechanical, Aerospace and Automotive Engineering

- The MSc Connected Autonomous Vehicles Engineering course sits within the School of Mechanical, Aerospace and Automotive Engineering.
- The School works closely with the Institution of Mechanical Engineers and other professional bodies who inform the curriculum.
- The School engages in a wide variety of research and attracts governmental funding.
- The School engages with industry through advisory boards to inform curriculum design.

The School conducts themed research within a number of Faculty Research Centres (FRC):

- The Centre for Future Transport and Cities.
- The Centre for Flow Measurement and Fluid Mechanics Research.
- The Materials and Manufacturing Faculty Research Centre.
- The Institute of Advanced Manufacturing Engineering.

The report of QAA's Institutional Audit undertaken in 2015 confirmed that

- The maintenance of the threshold academic standards of awards offered on behalf of degree-awarding bodies and/or other awarding organisations meets UK expectations.
- The quality of student learning opportunities at the provider meets UK expectations.
- The quality of the information produced by the provider about its provision meets UK expectations.
- The enhancement of student learning opportunities at the provider meets UK expectations.

18 Additional Information

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

Faculty Student handbook

Course Handbook

Module Guides

Module Information Directory

Student Portal

EEC student Portal

Induction

Students engage in a series of induction events, 'Student Essentials' over the first six weeks of their programme. The Student Essentials encompass a number of academic, administrative and social events including a welcome and introduction to the university, the facilities and the faculty. As part of the Student Essentials induction events, all students are directed to an online student handbook and a course handbook that provides key information. Additionally, students will have a 'meet and greet' with the Course Director and will be allocated their personal tutor for the year as part of the Academic Personal Tutor (APT) scheme.

Buildings and Equipment

The faculty is mainly based within two buildings, the Engineering and Computing building (ECB) and the Sir John Laing building, both of which are equipped with specialist equipment to support students. This includes a high performance engineering centre which houses a full size harrier Jump Jet, three further simulators, a wind and smoke tunnel, civil engineering specialist testing equipment, a range of CNC machinery, a laser workshop and a 3D Geoscience Information Laboratory. Of particular interest and relevance to CAV MSc students are the virtual driving simulator, the ECB lower ground laboratories and the High Performance Computing (HPC) facilities. Where pertinent, the MSc will also make use of state-of-the-art research facilities located within the Centre for Future Transport and Cities; e.g. the 6-meter interactive power wall, which can be used to explore detailed design and engineering concepts using virtual reality.

Student Support

A comprehensive support and guidance system exists for all postgraduate students within the Faculty of Engineering, Environment and Computing. Support is available via Course Directors, who are available to advise students on academic and pastoral issues. Times and locations where Course Directors are available to meet with students will be shown on course Aula webs. Module Leaders and the associated module team are available to offer support at module level. Again, Module Leaders advertise their contact times on module Aula webs and their location. Outside of office hours, you can also email any member of academic staff.

Prior to the commencement of the Masters project, individual supervisors with appropriate expertise or research experience are assigned to each student. The process will start with a list of projects being issued to students by potential supervisors. The projects may be industry, research or academically based. Students will then get a chance to meet and discuss details with individual supervisors before selecting a specific project.

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

The Faculty Registry have offices located close to the main Student Information Points/Receptions. Students can drop by the Registry support desk which is next to reception in the ECB; Monday – Friday from 1000 – 1600. Or Students can contact Registry staff via the Reception desks in the EC building or the John Laing building; Monday – Friday from 0830 – 1700. This team can also be emailed 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 and Learning Support Tutors 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 Support Centre called SIGMA based in the Library. 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 Student's Union also provide recreational facilities, 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.

Talent Team is a team of dedicated employability and career development professionals, responsible for supporting and developing Engineering, Environment and Computing students with such matters as, graduate employment, career advice, CV guidance, covering letters, application forms, interview preparation etc.

Library – There is also additional support for all students learning within the Lanchester Library. The library hosts both physical books, administers central access to electronic resources (e-books and electronic journals) as well as document supply (obtaining books or journal articles from other universities).

References

Engineering Council (2019) *UK-SPEC UK standard for Professional Engineering Competence 4th edition* [online] available from <https://www.engc.org.uk/media/3417/uk-spec-fourth-edition.pdf> [23 February 2021]

Engineering Council (2014) *The Accreditation of Higher Education Programmes* [online] available from <https://www.engc.org.uk/EngCDocuments/Internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20(1).pdf> [12 February 2019]

Institution of Mechanical Engineers (2019) *UK-SPEC UK standard for Professional Engineering Competence 3rd edition* [online] available from <https://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC%20third%20edition%20(1).pdf> [12 February 2019]

Quality Assurance Agency (2019) *UK Quality Code for Higher Education Part A: Setting and Maintaining Academic Standards* [online] available from <https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf> [23 February 2021]

Quality Assurance Agency (2019) Subject Benchmark Statement - Engineering [online] available from <https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-engineering.pdf?sfvrsn=1f2c881_16> [23 February 2021]

Transport Systems Catapult (2016) *IMechE homepage* [online] available from <https://www.imeche.org/> [12 February 2019]