WM997-15 Smart, Connected and Autonomous Vehicle Fundamentals

21/22

Department
    WMG
Level
    Taught Postgraduate Level
Module leader
    Valentina Donzella
Credit value
    15
Module duration
    2 weeks
Assessment
    Multiple
Study location
    University of Warwick main campus, Coventry

Description

Introductory description

Autonomous/Automated vehicles (AVs) aim to enhance and improve the safety and efficiency of future mobility, therefore this module introduces and explores the key subjects related to future AV development.
The key topics are: understanding the complexity of autonomous vehicle systems; human factors affecting the design of future AVs; analysing the key perception sensors; understanding how machine learning is used; understanding how networks and communications can support AVs.
Key topics are introduced from both the theoretical and practical viewpoints to encourage independent critical evaluation of the subject matter.

Module aims

Smart, Connected and Autonomous Vehicle Fundamentals aims to introduce the students to the key challenges associated to smart, connected and autonomous vehicles: SAE levels of autonomy and their implications on safety; robustness of embedded systems; environmental perception and data science; connectivity and communication infrastructures; test techniques for SCAVs; new mobility models and human factors. Learning is enhanced through tutorials and the understanding of unique experimental facilities such as 3xD (Drive-in Driver-in-the-loop Driving) simulator facility.

This module aims to provide the students with the critical knowledge associated with current and future technical challenges of smart, connected and autonomous vehicles and their importance for electrification.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

This module covers the topics are related to: system complexity in Automated Vehicles (AVs) Levels of Autonomy • AV testing • Supply chain and business models of mobility as service; Safety standards and analysis techniques; • trust, AV stakeholders, wellbeing and sensing the human • Perception Sensors • Wired(CAN, Lin,...) and wireless (LTE, 5G, DSRC)communication for AVs • Data science basis for machine intelligence and neural network

Learning outcomes

By the end of the module, students should be able to:

- At the end of the module, the students will demonstrate an in-depth knowledge of key principles underpinning human interaction and apply it to compare/criticise the design.
- The student will be able to evaluate and compare the performance of different automotive perception sensors
- The student will demonstrate a critical high-level understanding of challenges associated with data science and machine learning techniques, in the context of safe Automated Vehicles
- The student will be able to demonstrate an applied knowledge of automotive system complexity and their testing.
- The student will be able to critically evaluate wired and wireless communication technologies in the SCAV context.
- The students will be able to apply acquired knowledge to criticise and implement technical choices in the design of AVs.

Indicative reading list

Handbook of automotive human factors / editor Motoyuki Akamatsu (Automotive Human Factors Research Center, AIST, Tsukuba, Japan, for Society of Automotive Engineers of Japan, Inc.).

H. Winner, S. Hakuli, F. Lotz and C. Singer, Handbook of driver assistance systems: Basic Information, Components and Systems for Active Safety and Comfort, Springer International Publishing, 2016.

A variety of up-to-date sources including: - Latest government / UK Automotive Council roadmaps for autonomous vehicles - Latest automotive legislation and standards - Current academic research in the field of smart connected and autonomous vehicles

Subject specific skills

The student will gain many skills relates to autonomous vehicles. They will gain the knowledge on system complexity in AVs and their requirements, get experience and understanding of test techniques for AVS; apply that t understanding to create testing scenarios, also using dedicated simulation software; understand the importance of human factors and how they inform design; knowledge of supply chain in the automotive industry and business model of mobility as services; understand and evaluate different perception sensors; understand AV wireless and wired communications; understanding of data science basis for machine intelligence and the concept of neural network.

Transferable skills

Team work - work effectively in a group or team to achieve goals
Personal motivation, organisation and time management skills
Research and analytical skills
Project and program management skills,
The ability to gather and interpret information
Industry knowledge by guest lecturer

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Tutorials	4 sessions of 2 hours (5%)
Supervised practical classes	4 sessions of 1 hour (3%)
Other activity	41 hours (27%)
Assessment	77 hours (51%)
Total	150 hours

Private study description

No private study requirements defined for this module.

Other activity description

Guest Lectures or Group Activities , visit to 3XD Simulator;

33 Hours of student self-guided study to prepare for the IMAs. Guidance on topics to be studied is provided during lectures (with some extra contents on moodle) and IMA instructions.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Post Module assignment: Smart, Connected and Autonomous Vehicle Fundamentals	70%	77 hours	Yes (extension)
Post Module assignment based on the intended learning outcomes of the module - around 4000 words			
In Module assessments	30%		Yes (extension)
Based on self-study hours (33 hours), specified in section 5. The marks will be spit between some small written assignments and/or oral presentations.			

Assessment group R

	Weighting	Study time	Eligible for self-certification
Post Module assignment: Smart, Connected and Autonomous Vehicle Fundamentals	100%		Yes (extension)
Post Module assignment based on the intended learning outcomes of the module -- around 5000 words			

Feedback on assessment

IMAs : Feedback will be provided promptly- comments on submission with graded mark.

PMA : The written feedback will be provided based on WMG feedback template and it will address each of the questions submitted, including feedback comments on presentation, structure and grammar.

Availability

There is currently no information about the courses for which this module is core or optional.