Course guide
230352 - CV - The Connected Vehicle

Last modified: 11/05/2022

Unit in charge:	Barcelona School of Telecommunications Engineering
Teaching unit:	744 - ENTEL - Department of Network Engineering.

Degree:	MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Optional subject).
	MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).

Academic year: 2022   **ECTS Credits:** 2.5   **Languages:** English

LECTURER

Coordinating lecturer:	Josep Paradells
Others:	Ferran Silva

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.
CE4. Ability to design and dimension transport, broadcast and distribution networks for multimedia signals
CE6. Ability to model, design, implement, manage, operate, administrate and maintain networks, services and contents
CE7. Ability to plan networks and decision-making about services and applications taking into account: quality of service, operational and direct costs, implementation plan, supervision, security processes, scalability and maintenance. Ability to manage and assure the quality during the development process
CE8. Ability to understand and to know how to apply the functioning and organization of the Internet, new generation Internet technologies and protocols, component models, middleware and services
CE9. Ability to deal with the convergence, interoperability and design of heterogeneous networks with local, access and core networks, as well as with service integration (telephony, data, television and interactive services).
CE12. Ability to use programmable logical devices, as well as to design analog and digital advanced electronics systems. Ability to design communication devices, such as routers, switches, hubs, transmitters and receivers in different bands.
CE15. Ability to integrate Telecommunication Engineering technologies and systems, as a generalist, and in broader and multidisciplinary contexts, such as bioengineering, photovoltaic conversion, nanotechnology and telemedicine.

Transversal:
CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

- Lectures
- Laboratory classes
- Laboratory practical work
- Extended answer test (Final Exam)

Classes will be organized in two parts (Part A and Part B) of 1h30min, except the last day where each part will last 1h.

LEARNING OBJECTIVES OF THE SUBJECT

Learning objectives of the subject:

At present, electronics and telematics are taking a relevant role in the car. Communications
are used to connect the different elements in the car, to interact with the smartphone of the
user, to connect to Internet or even to other vehicles. Internet has reached all the places and
it is starting to be present in cars. This seminar focuses on the real possibilities of communications in the car and the technologies
that are available for doing so.
During classes, laboratory activities will be described that can be done at home as a complementary activity. It is mandatory to carry
out two of these so called ?at home lab? per student, delivering a report up to one week after the finishing of the seminar.

Learning results of the subject:

- The seminar introduces the different technologies used in a vehicle, ranging from the internal wired buses, remote keys, NFC to
identify the driver in front of the car, Bluetooth to interact with the audio and the telephone system, to the D for communicating with
the road and other vehicles.

STUDY LOAD

Type	Hours	Percentage
Self study	42,5	68.00
Hours large group	20,0	32.00

Total learning time: 62.5 h

CONTENTS

Day 1

Description:
- Part A: Presentation of the course. Organization. Motivation. Services in a connected car.
- Part B: Automotive Buses.

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 2

Description:
- Part A: Automotive Buses. CAN bus.
- Part B: Automotive Buses. LIN and FlexRay.

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 3

Description:
- Part A: Media Buses. Ethernet.
- Part B: Remote keys. Tire monitoring.

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 4

Description:
- Part A: RFID and applications.
- Part B: NFC.

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 5

Description:
- Part A: Bluetooth
- Part B: Cellular communications. eCall initiative

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 6

Description:
- Part A: Wireless LAN. D.
- Part B: Internet access.

Full-or-part-time: 5h
Theory classes: 3h
Self study : 2h

Day 7

Description:
- Part A: Smartphone car integration. MirrorLink. CarPlay. Automotive Link.
- Part B: Exam.contingut català

Full-or-part-time: 10h
Theory classes: 2h
Self study : 8h

Laboratory at home (home lab): The student has to carry out 2 assignments to choose among the following:

Description:
- CAN bus at home lab proposal
- NFC at home lab proposal.
- Bluetooth at home lab proposal
- WLAN at home lab proposal.
- Mobile IP at home lab proposal.
- Remote terminal at home lab proposal.

Full-or-part-time: 22h 30m
Self study : 22h 30m

GRADING SYSTEM

Final examination: 60%
Participation in class: 15%
Individual assessments (At home lab assignments, at least 2 of the offered): 25%

BIBLIOGRAPHY

Basic:
- Delgrossi, Luca; Zhang, Tao. Vehicle safety communications: protocols, security, and privacy [on line]. Boston: John Wiley and Sons, 2012 [Consultation: 12/01/2016]. Available on: http://onlinelibrary.wiley.com/book/10.1002/9781118452189. ISBN 9781118452189.
- Paret, Dominique; Rebaine, Hassina. Réseaux de communication pour systèmes embarqués. 2nd ed. DUNOD, 2014. ISBN 9782100706068.
- Held, Gilbert. Inter- and Intra- Vehicle Communications [on line]. 2007. Boston: CRC Press, 2008 [Consultation: 10/10/2022]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=321835. ISBN 9781281146663.