



Course guide

240276 - 240AU133 - Software Architecture and Evaluation

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 747 - ESSI - Department of Service and Information System Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2019). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Franck Gutiérrez, Javier
Martínez Fernández, Silverio Juan

Others:

PRIOR SKILLS

Basic knowledge of programming

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEAU 3. (ENG) Explicar l'arquitectura d'un vehicle d'automoció, el seu comportament, les seves parts i els sistemes que l'integren.
CEAU 1. (ENG) Realitzar models d'enginyeria, aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, per al disseny, simulació, optimització i control de processos i sistemes.
CEAU14. (ENG) Seleccionar i utilitzar les eines adequades per dissenyar elements d'automoció en resposta a les especificacions tècniques donades.

General:

CGAU10. Adapt to changes, being able to apply new and advanced technologies and other relevant processes, initiative and entrepreneurship
CGAU11. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

Transversal:

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.

TEACHING METHODOLOGY

Theory lessons will be based upon the combination of concept exposition by the teacher and active participation by the student. Laboratory classes will consist mainly in the individual solving of exercises by the student with overall analysis in the class

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this course will be to expose the architecture of an intelligent vehicle at the level of hardware, units and software, and acquire the basic abilities for the design and evaluation of such architecture.



CONTENTS

Software engineering

Description:

Preliminaries. Software life cycle. Automotive SPICE

Related competencies :

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.

Full-or-part-time: 6h

Theory classes: 4h

Laboratory classes: 2h

Software Requirements

Description:

Requirements elicitation, documentation, validation and management. Non-functional requirements: sustainability, security/safety.

Related competencies :

CGAU11. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

CGAU10. Adapt to changes, being able to apply new and advanced technologies and other relevant processes, initiative and entrepreneurship

CEAU 3. (ENG) Explicar l'arquitectura d'un vehicle d'automoció, el seu comportament, les seves parts i els sistemes que l'integren.

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.

Full-or-part-time: 12h

Theory classes: 8h

Laboratory classes: 4h

Software architecture

Description:

Architectural levels. Architectural models. Components and connectors. AUTOSAR and MAPE-K reference architectures

Related competencies :

CGAU11. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

CEAU 1. (ENG) Realitzar models d'enginyeria, aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, per al disseny, simulació, optimització i control de processos i sistemes.

CEAU 3. (ENG) Explicar l'arquitectura d'un vehicle d'automoció, el seu comportament, les seves parts i els sistemes que l'integren.

CEAU14. (ENG) Seleccionar i utilitzar les eines adequades per dissenyar elements d'automoció en resposta a les especificacions tècniques donades.

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.

Full-or-part-time: 12h

Theory classes: 8h

Laboratory classes: 4h



Software evaluation

Description:

Verification and validation. Functional tests. System integration tests

Related competencies :

CEAU 1. (ENG) Realitzar models d'enginyeria, aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, per al disseny, simulació, optimització i control de processos i sistemes.

CEAU 3. (ENG) Explicar l'arquitectura d'un vehicle d'automoció, el seu comportament, les seves parts i els sistemes que l'integren.

CEAU14. (ENG) Seleccionar i utilitzar les eines adequades per dissenyar elements d'automoció en resposta a les especificacions tècniques donades.

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.

Full-or-part-time: 6h

Theory classes: 4h

Laboratory classes: 2h

Big Data and Connected Vehicles

Description:

Process through Big Data solutions of the huge amount of data collected by the different sensors, not only of the cars, but also of the context (e.g., smart roads).

Related competencies :

CGAU11. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

CGAU10. Adapt to changes, being able to apply new and advanced technologies and other relevant processes, initiative and entrepreneurship

CEAU 1. (ENG) Realitzar models d'enginyeria, aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, per al disseny, simulació, optimització i control de processos i sistemes.

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.

Full-or-part-time: 8h

Theory classes: 6h

Laboratory classes: 2h

GRADING SYSTEM

The final mark is composed of two parts: theory (50%) and laboratory (50%). The theory part is evaluated by means of two partial exams, each weighting 25%. The first partial exam can be repeated if failed in the same act as the second partial exam. The laboratory part is evaluated continuously along the course, in the fortnightly laboratory sessions. The attendance to laboratory classes must be 100% in order to pass the course, except in cases justified by writing.



BIBLIOGRAPHY

Basic:

- Schaeuffele, Joerg; Zurawka, Thomas. Automotive software engineering : principles, processes, methods, and tools [on line]. Second edition. Warrendale, Pennsylvania: SAE International, 2016 [Consultation: 24/03/2023]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5473549>. ISBN 9780768089502.
- Staron, Miroslaw. Automotive software architectures : an introduction [on line]. 2nd ed. Cham: Springer, 2021 [Consultation: 3 0 / 0 3 / 2 0 2 3]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6510182>. ISBN 9783030659394.

Complementary:

- Bass, Len; Clements, Paul; Kazman, Rick. Software architecture in practice. 3rd ed. Boston [etc.]: Addison-Wesley, cop. 2013. ISBN 0321815734.

RESOURCES

Hyperlink:

- Architecture-centric software and systems engineering. Fraunhofer ACES: Architecture-Centric Engineering Solutions. Architecture-centric software and systems engineering. Fraunhofer ACES: Architecture-Centric Engineering Solutions

Other resources:

<http://publica.fraunhofer.de/documents/N-186361.html>