ISEL
ADEM
Área Departamental de Engenharia Mecânica

Curricular Unit Form (FUC)

Course:	**INDUSTRIAL ENGINEERING MANAGEMENT**					
Curricular Unit (UC)	**Computer Systems Architectures**			Mandatory	**X**	
				Optional		
Scientific Area:	Engineering and industrial management					
Year: **1º**	Semester: **1º**	ECTS: **6,5**		Total Hours: **4,5**		
Contact Hours:	T:	TP:**67,5**	PL:	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
António Luís Freixo Guedes						

T- Theoretical ; TP – Theory and practice ; PL – Laboratory ; S – Seminar ; OT –Tutorial ; TT – Total of contact hours

Entry into Force	Semester: **Winter**	Academic Year: **2016/2017**

Objectives of the curricular unit and competences (max. 1000 characters)

Knowledge of technologies and development processes, from computer system, database manageme nt systems, distributed systems, security, system of computer systems in a framework of vendor independence and execution environments between internal to the organization (on-premises) or in the cloud computing. Formalization of process definition through languages such as (BPMN) and (DMN) and modelling of systems, eg, (OPM) or (UML/SysML), among other mechanisms. Study and evaluation of governance strategies in the establishment of mechanisms of monitoring and maintenance in an integrated coordination of the set of responsibilities of each of the IT systems. The study and discussion of governance models of systems of computer systems and cyberphysical systems is mapped in case studies in a critical evaluation of technological architecture and models of process coordination, whether in the operation of productive systems or of processes and management.

Syllabus (max. 1000 characters)

- Computational models, programming languages and execution environments
- Development of computer systems
- Notions of distributed systems and security
- Life cycle management of computer systems
- Example of a simple system involving a simp lified process in a production system
- Formalization of the modelling of computer systems involving structure and behav iour
- Elements of a computer system
- Definition and modelling of proc esses
- Modelling and execution of rules
- Architectures of the system of co mputer systems
- Study and development of case involving system of computer systems
- Evaluation of functional and non-functional requirements

Curricular Unit Form (FUC)

• Definition of processes and execution frameworks • Design of technological architecture in a multi-ven dor framework • Development of case study with prototype demonstrator

Demonstration of the syllabus coherence with curricular unit's objectives (max. 1000 characters)
Convergence for full integration of computer systems requires that an engineer with a specia lization in Industrial Engineering and Management understand the underlying complexity and be able to assess the potential and risks in their decision making, as well as in coordination with computer engineers. It is considered as a fundamental aspect, approaches oriented process models, data models and domain-specific languages (Domain Specific Languages) in the potential appreciation of the IT systems in process automation. In addition to a set of concepts that allow the Industrial Management engineer to reinforce the scope of its potential, special focus is given to strategies of process automation and association to the technological framework constituted by heterogeneous computer systems. Complexity in the establishment of integrated and open technology frameworks (multi-vendor) is related to the increasing need for interaction / coordination between computer systems and between production infrastructure systems as cyberphysical systems. This complexity affects the decision support systems as they are based on co-operation with real-time systems in a contribution to higher levels of reliability and quality of decision making. Complex interdependencies require the structuring of the coordinated operation with suppliers or with development teams to ensure an integrated and fault tolerant (quality of response to critical processes) framework. Thus, without going into detail aspects of computer engineering, the strategy focuses on the frontier between processes (functional area) and the framework of computer systems (technological area). Model-oriented approaches, in some cases executable, allow for the validation of computer engineering concepts while in charge of systems of computer systems in an integrated and open framework (multi-vendor/non-critical dependencies of specific vendors). The case studies on simplified real scenarios occurs as a tool for consolidating the concepts addressed.

Teaching methodologies (including evaluation) (max. 1000 characters)
The emphasis is on the discussion of computer sys tem, while set of elements developed based on programming techniques, database management, distributed systems, data security in the guarantor of privacy and integrity and monitoring, among other aspects of the construction of computer systems. In the first chapter, the main techniques are synthesized and only then are the system and process modelling tools addressed in a systemic perspective of an organization's computer systems. The case studies and development of validation demonstrator allows the consolidation of the concepts presented and discussed. A set of works, minimum of three, for each of the three chapters (60%) and theoretical component evaluation by test or exam (40%) complement the evaluation framework. The

works are discussed in public presentation and, when necessary, complemented with discussion by group or individual.

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)

While at the border between Engineering and Industrial Management and Computer Engineering, the curricu lum unit of Computer Systems Architectures provides the Industrial Management Engineer with the set of skills that allow him to interact with Computer Engineering in the exercise of management skills. The skills in modelling and design of processes and understanding of techniques and technologies allows him to position himself in the valorisation of the technological framework in the best response to process automation. A further specialization in the knowledge of languages and tools of design and development positions the Industrial Management Engineer in the development of process automation projects based on computer systems, as the technological base of the organization or production system. It is not intended to transform the Industrial Management Engineer into a programmer or with responsibilities in the life cycle management of the computer systems framework. The definition of a computer system, its relationship with a cyberphysical system and fundamental concepts such as computational models, programming languages, distributed systems, execution environments including cloud computing, and other key concepts configure the interface language with Computer Engineering. Established the fundamental basis, the formalization of the modelling of computer systems involving structure and behaviours, including the modelling of systems and processes, establish the basis for a set of competences for the exercise of Industrial Engineering and Management. In this chapter, the degree of concretization is reinforced with the modelling of processes, potentially coordinated with curricular units of the specialty. The concrete cases aim to consolidate knowledge obtained in the achievement of the competencies established as an objective for the curricular unit

Main Bibliography (max. 1000 characters)

1. Volker Stiehl - Process -Driven Applications with BPMN, Springer International Publishing, 2014.
2. Edward A. Lee and Sanjit Seshia - Introduction to Embedded Systems - A Cyber-Physical System s Approach. Lee and Seshia, 2.0 edition, 2015.
3. Dov Dori - Model-Based Sy stems Engineering with OPM and SysML. Springer New York, New York, NY, 2016.
4. Kenneth C. Laudon and Jane P. Laudon - Management Information Systems: Managing the Digital Firm, 2017.
5. Benny Raphael and Ian F. C. Smith - Engineering Informatics: Fundamentals of Computer-aided Engineering, Wiley-
Blackwell; 2nd revised edition, 2013.