

COURSE PROGRAM Information Systems

Academic Year: 2024/25

Identification y characteristics of the course			
Code	401079		ECTS Credits
			6
Name	Information Systems		
Degrees	Máster Degree in Computer Science Engineering		
Center	School of Technology		
Semester	2º	Character	Compulsory
Module	Computer Science Technologies		
Materia	Advanced Computer Science Technologies		
Lecturers			
Name	Office	e-mail	Web page
Pablo García Rodríguez	Calidad EPCC	pablogr@unex.es	https://opendata.unex.es/investiga/investigadores/0229deed14754acb80b2b73dea200330
Subject Area	Languages and Computer Systems		
Department	Computer Systems Engineering and Telematics		
Coordinating Lecturer	Pablo García Rodríguez		
Competencies			
Basic Competencies			
<p>CB6 - Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context.</p> <p>CB9 – Skills to communicate conclusions, and the knowledge and rationale underpinning these, to specialized and non-specialized audiences in a clear and unambiguous manner.</p> <p>CB10 - Learning skills that enable to continue studying in a way that will be largely self-directed or autonomous.</p>			
General Competencies			
<p>CG4 - Capacity for mathematical modeling, calculation and simulation in technological centers and engineering of company, particularly in research, development and innovation tasks in all fields related to Informatics Engineering.</p> <p>CG8 - Ability to apply acquired knowledge and solve problems in new or little-known environments within broader and multi-disciplinary contexts, being able to integrate this knowledge.</p> <p>CG9 - Ability to understand and apply ethical responsibility, legislation and professional deontology of the activity of the Informatics Engineering profession.</p>			
Specific Technical Competencies			
<p>CETI5 - Ability to analyse the information needs that arise in an environment and carry out in all its stages the process of building an information system</p> <p>CETI11 - Ability to conceptualize, design, develop and evaluate the human-computer interaction of computer products, systems, applications and services.</p>			

CETI12 - Ability to create and exploit virtual environments, and for the creation, management and distribution of multimedia content.

Assigned cross-curricular competencies

CT1 - Innovative and entrepreneurial spirit.

CT4 - Skills to communicate conclusions, along with the knowledge and the reasons behind them, to specialized and non-specialized audiences, both orally and in writing, in Spanish and English.

CT12 - Ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts.

Themes and syllabus

Brief description of the syllabus

The goal of the course is to study all the aspects and components of an Information System, including storing, processing and accessing the relevant information, and visualizing the information. We depart from a general introduction to information systems, and we provide with tools and necessary scheduling to build an information systems from scratch, following the theoretical structure currently established. A database with the capability of containing a great quantity of data will be the supported structure. We will study mechanisms of efficient accessing to heterogeneous information stored in the database using high level languages, including consult languages and high level general purpose languages. We also will study the mechanisms of massive data processing (Big Data) and to extract information from the data using different techniques of machine learning and deep learning. Finally, we will apply tools for visualization and presentation of elaborated information to the user.

Course syllabus

Theme 1: Introduction to Information Systems and Data Bases systems.

Contents of the theme 1: General introduction to information systems, including practical contents, applications and tools we are going to use during the course. We Will present general features of the information systems, their problems (as the necessity of storing heterogeneous data) and benefits. We motivate the usage of NoSQL (Not Only SQL) databases to store widespread data, as the central part of Big Data technologies. Advantages and drawbacks of the NoSQL technology are analyzed, and we will study the aspects of inserting, accessing and description of the data in the database.

Theme 2: Massive data processing.

Contents of the theme 2: We present the problems of the complex and heterogeneous information management (storing and accessing). We present tools to access data using general purpose programming languages as Python, as well as describing data and obtaining information from the basic data processing. In this part we introduce tools, technologies and advanced paradigms of massive data processing, and introduce basic parallel and distributed techniques to process data.

Theme 3: Machine Learning

Contents of the theme 3: We introduce the available tools for classification and information retrieval departing from big amounts of data using statistical methods. Modeling of the data using machine learning (supervised and unsupervised) tools and algorithms are introduced.

Theme 4: Deep Learning

Contents of the theme 4: Introduction to the structure and functionality of deep learning applications on massive data. Application to Big Data technologies. Multilayer neural networks. Convolutional neural networks. Classification and pattern recognition on data.

[We Will evaluate the possibility of a seminar in this part covering advanced topics in this field.]

Theme 5: Web information systems.

Contents of the theme 4: In the first part of this topic we study the inclusion of new technologies in web browsers. We analyze the different web programming languages advantages and drawbacks. We study their integration with database systems and content management systems. We cover the deployment of client-server applications through web applications.

Actividades formativas*

Student assigned hours		Theory	Practical activities				Monitoring activities	Non-classroom
Theme	Total	GG	PCH	LAB	ORD	SEM	TP	EP
1	8	2		2			0	4
2	17	5		2			0	10
3	44	14		2			0	28
4	44	14		2			0	28
5	17	5		2			0	10
Evaluación **	20	5		5			0	10
TOTAL	150	45		15			0	90

LG: Large Group (100 students).

SL: Seminar/Laboratory (computer laboratory sessions = 15 students).

PT: Programmed Tutorials (educational monitoring, in the form of ECTS tutorials).

PS: Personal Study, individual or group tasks, and reading the literature.

Methodologies

Basically, along the semester classes and developments we will use the *problem-oriented learning* almost exclusively. The paradigm *project-oriented learning* will be used in the development of a final information system. An special emphasis will be placed on *collaborative and cooperative working*, and *master classes* oriented to discussions. A high percentage of the laboratory classes will be devoted to workshops and development activities with the goal of solving problems in multidisciplinary and changing environments.

Regarding the transversal competencies, companies will collaborate in the learning process introducing innovative aspects, in order to students gain a special motivation to the business sector in their education.

Finally, evaluation of the oral and written student Spanish and English skills will be made in the different tasks during the classes, along the semester, putting emphasis in the problem-oriented learning and student cooperative working

Learning results

- Identifying of the fundamentals of information systems, and their scope of application.
- Analysis of the necessities of information management of an organization, and solution proposals based on information systems to satisfy their demands.
- Know the specific characteristics of the multimedia information and their management techniques.
- Formulate the operational phases, together with the techniques and methods involved in a multimedia information system.
- Design a simple multimedia information system.

Evaluation Systems

Students can pass this course according to the continuous evaluation or through a final exam. Students interested in the second method (final exam) will have to formally inform to the lecturers in three weeks from the beginning of the course. Otherwise, it is assumed that student chooses the continuous assessment.

Continuous evaluation consist in both, a final exam including theoretical and practical aspects, and the assessments of the tasks developed by the student during the semester.

Theoretical contents evaluation. It will include a final exam composed of questions (around 20 short questions) related to the theoretical content program of the course. It can be replaced by a final development work containing almost all the contents of the course, consisting in the development of an specific application to be presented at the end of the course.

Practical case studies evaluation. It will consist in the individual defense of a self-made work. It will be carried out on the same day as the theoretical evaluation. To pass this part it is mandatory a rate of attendance to laboratory classes higher than 80%.

Final evaluation of the course. Final evaluation will consist in the weighted mean of the theoretical, practical and tasks assessments. All previous three parts need to be passed individually (a minimum grade of 5 out of 10 is required in each part) in order to calculate the final grade. Final grade weights are 1/2 to the theoretical part and 1/2 to the practical

part.

Students interested in the **final exam evaluation** will be evaluated through a final exam consisting in two parts: theoretical exam (1/2 parts of the final grade) and a final defense of proposed case studies (1/2 parts of the final grade).

Bibliography (basic and complementary)

Basic Bibliography:

- J.A. O'Brien, G.M. Marakas: Management Information Systems, McGraw-Hill, 2006
- R.M. Stair, G.W. Reynolds: [Principles of Information Systems](#), MIS Series, 2009

Complementary Bibliography:

- R. Baeza-Yates, B. Ribeiro-Neto: Modern Information Retrieval, Addison Wesley, 1999
- Python Data Science Handbook. O'Reilly. Jake VanderPlas.
- Learning Python. 5th edition, O'Reilly. Mark Lutz.
- Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. Aurelien Geron. O'Reilly. ISBN: 978-1-491-96229-9.
- Deep Learning: Introducción Práctica con Keras. Jordi Torres. Colección WATCH THIS SPACE – Barcelona, Lulu Press, Inc. ISBN: 978-0-244-07895-9.

Other resources

Main materials are available for downloading from the **Virtual Classroom**:

- Slides of each theme of the course
- Laboratory sheets for each session
- Student scheduling

Other resources in the Virtual Classroom:

- Deliverables and problems
- Participation methods:
 - Communication forum
 - Notices and news boards
- Additional information:
 - Glossary of terms and key words
 - Source code of programs
 - Web references related to programming
 - Self-explanatory videos
- Self-assessment
 - Self-assessment questionnaire.
 - Self-assessment problems.
 - Choice-questions