	Escuela Técnica Superior de Ingeniería GENERAL SPECIFICATIONS	

COURSE 23/24

Subject Data

Name:
Diseño y Desarrollo de Sistemas de Información

English name:
Information Systems – Design & Development

Code:	Type:
606010212	Compulsory

Hours:			
	Total	**In class**	**Out class**
Time distribution	60	60	

ECTS:

Standard group	Small groups			
	Classroom	**Lab**	**Practices**	**Computer classroom**
	40	20		

Departments:	Knowledge areas:
Tecnologías de la Información	Lenguajes y Sistemas Informáticos

Year:	Semester
3°	1°

TEACHING STAFF

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Others Data (Tutoring, schedule...)

See: https://www.uhu.es/etsi/informacion-academica/informacion-comun-todos-los-titulos/horarios-2/

SPECIFIC INFORMATION OF THE COURSE

1. Contents description:

1.1 In English:

Information Systems – Design & Development studies the Information System, focused on the design and implementation of databases. To do this, the following contents will be developed:

- Architectures, features, components, and types of information systems.
- Conceptual and logical database design.
- Implementation of procedures for an efficient database access.

1.2 In Spanish:

En líneas generales, la asignatura "Diseño y Desarrollo de Sistemas de Información" estudia los Sistemas de Información, haciendo hincapié en el diseño e implementación de bases de datos. Para ello, se desarrollarán los siguientes contenidos:

- Construcción, depuración y ejecución de programas para el acceso y gestión de la información almacenada en una base de datos.
- Restricciones de integridad y lógica de negocio a distintos niveles: conceptual, lógico, físico o de aplicación.
- Persistencia de objetos en bases de datos relacionales.
- Modelos de bases de datos orientados a objeto y objeto-relacionales
- Sistemas de información: arquitecturas, características, componentes y tipos.
- Programación en el ámbito web orientados al desarrollo de sistemas de información.
- Diseño conceptual de sistemas de información basándose en metodologías de análisis conjunto de datos y aplicaciones.
- Desarrollo y despliegue de aplicaciones de sistemas de información

2. Background:

2.1 Situation within the Degree:

"Information Systems - Design & Development" is a 3rd-year, 1st-semester course designed to give students knowledge about database design, data modelling, and implementation in a DBMS. In the 2nd year, 2nd semester, the subject of "Databases" delves deeper into the relational model. This understanding is necessary to see the connection between conceptual data modelling and the logical data model. Additionally, the subject of "Introduction to Software Engineering" covers the basics of software design and development for software projects.

2.2 Recommendations

It is recommended to have discretionary skills in databases and programming or a willingness to learn them. The course includes practical lab sessions where students will design and implement an information system.

3. Objectives (as result of teaching):

The main objectives of Information Systems - Design & Development are to provide students with a general overview of information systems and to equip them with the tools necessary to design and access databases. By studying this subject, students will learn how to:

- Design and develop applications and information systems that interact with databases, ensuring their reliability, safety, and quality.
- Analyze and design the conceptual and logical model of a database.
- Understand the main characteristics and applications of object-relational databases.

4. Skills to be acquired

4.1 Specific Skills:

CC01: Ability to design, develop, select and evaluate applications and computer systems, ensuring their reliability, safety and quality, in accordance with ethical principles and current legislation and regulations.
CC05: Knowledge, administration and maintenance of computer systems, services and applications.
CC12: Knowledge and application of the characteristics, functionalities and structure of the databases, which allow their proper use, and the design and analysis and implementation of applications based on them.
CC13: Knowledge and application of the necessary tools for storage, processing and access to Information Systems, including web-based ones.

4.2 General, Basic or Transversal Skills:

CB1 - Demonstrate to understand and have acquired knowledge about an area of study that starts from basic Secondary Education, and is often at supported by advanced textbooks, but also includes some aspects that involve knowledge related to the forefront of their field of study.
CG0 - Ability to analyze and synthesize: Find, analyze, critique (critical reasoning), relate, structure and synthesize information from various sources, as well as integrate ideas and knowledge.
G03 - Ability to solve problems
G06 - Capacity for autonomous learning as well as initiative and entrepreneurial spirit
G08 - Ability to adapt to technologies and future environments by updating professional skills.
TC2 - Develop a critical attitude, being able to analyse and synthesize.
TC3 - Develop an attitude of inquiry that permanently enables to review and deepen in the knowledge.
TC6 - Promote, respect and safeguard human rights, democratic values, social equality and environmental sustainability, without discrimination on the basis of birth, race, sex, religion, opinion or other personal or social circumstances.

5. Training Activities and Teaching Methods

5.1 Training Activities:

- Evaluation activities and self-evaluation
- Practical sessions in specialized laboratories
- Lecture
- individual work

5.2 Teaching Methods::

- Participatory magisterial class.
- Development of practices in specialized laboratories or computer classrooms in small groups.
- Problem solving and practical exercises.
- Presentation, Implementation, tutoring and presentation of works.
- Evaluations and exams.

5.3 Development and Justification:

During theory sessions, instructors will explain the concepts of each topic interactively, actively encouraging student participation. To facilitate the learning process, problem-solving sessions and practical exercises will be conducted, allowing students to assess their knowledge level and delve deeper into the concepts covered in class. Additionally, throughout the course, various assessment activities will be carried out to track student progress and ensure knowledge acquisition. These activities, referred to as 'Individual Progress Tests,' will be part of the course evaluation system.

Furthermore, whenever possible, complementary activities related to the subject, such as seminars and conferences, will be scheduled. These activities will provide students with an additional opportunity to explore and deepen their understanding of the topics discussed, as well as gain practical and applied insights through interaction with subject matter experts.

The practical component of the course will involve the development of a computer project that will evolve over the duration of the course. During practical sessions, students will progressively implement a secure, reliable, and scalable information system that manages data stored in remote databases.

The course has a webpage on the Moodle platform where students can stay informed and access necessary materials for both theory and practical components. However, we recommend utilizing additional bibliographic resources and knowledge sources

6. Detailed Contents

Topic 1. What is an Information System?

We will begin the course by framing the design and development of a database system as part of an information system. In this topic, we will study the components of an information system and methodologies for its development.
- Information systems
- Databases and Information Systems

Topic 2. Conceptual Data Model and Logical Data Model

To become a proficient database designer, we need to understand the notation of conceptual diagrams and know how to apply it to solve real-world problems. The objective of this topic is to acquire the necessary skills for proper conceptual modeling based on the requirements of an information system. Once the conceptual model is created, it must be transformed into the logical model to enable implementation in a Database Management System. This topic introduces the rules for converting the conceptual model to the relational model."
- Conceptual Data Modeling Elements: Entity-Relationship Model
- The Enhanced Entity Relationship model
- Design Considerations
- Mapping EER model to relations

Topic 3. Non-Relational Databases

The significant volume of information managed by institutions today, along with the need to work with heterogeneous data and more flexible structures, has led to the emergence of new database management systems that support these requirements. In this topic, we will explore the characteristics of these non-relational (NoSQL) systems and learn about the general concepts of MongoDB as a current reference for NoSQL database management.

- What is a non-relational database?
- The benefits of a non-relational database
- Non-relational databases and application development.

Laboratory sessions
The practical sessions for this course will involve the development of a computer project throughout the semester. To implement the project, a general-purpose programming language, graphical libraries for the user interface, design patterns for its architecture, and connections to Oracle and/or MariaDB database management systems will be used

7. Bibliography

7.1 Basic Bibliography:

Database Systems: A Practical Approach to Design, Implementation, and Management, Fouth Edition
Thomas M. Connolly, Carolyn E. Begg
Pearson Educacion, 2014

Sistemas de bases de datos. Un enfoque práctico para diseño, implementación y gestión (4ª edición)
Thomas M. Connolly, Carolyn E. Begg
Pearson Educacion, 2006
http://columbus.uhu.es/record=b1370230~S1*spi

Beginning Java Databases, 2002
Kevin Mukhar,Todd Lauinger, John Carnell , James R. De Carli, Mark Mamoner, Nitin Nanda , Damon Payne , Joel Peach
ISBN-10: 1861004370
ISBN-13: 978-1861004376

Fundamentos de bases de datos con Java
Kevin Mukhar
Anaya Multimedia, 2002

7.2 Additional Bibliography:

Fundamentals of Databases Systems (Sixth Edition)
Ramez A. Elmasri, Shamkant B. Navathe
Addison Wesley, 2011

Fundamentos de Sistemas de Bases de Datos (3ª edición)
Ramez A. Elmasri, Shamkant B. Navathe
Addison Wesley, 2002
http://columbus.uhu.es/record=b1341702~S1*spi

8. Systems and Assessment Criteria

8.1 System for Assessment:

- Examination of theory / problems
- Defense of practice
- Individual monitoring (partial tests and activities)

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

The final grade through **continuous assessment** will be calculated using the following formula:

Final mark = 0.35 * Theory Exam grade + 0.5 * Practice Project Defense grade + 0.15 * Individual Progress Tests

To pass the course through continuous assessment, a minimum of 3 out of 10 points must be obtained in the theory exam grade, as well as a minimum of 3 out of 10 points in the practice defense grade. The theory exam will focus on problem solving and theoretical/practical questions related to the theory syllabus. Students are only allowed to use material that the teacher has indicated and nothing else. This exam will assess the specific skills CC01, CC05, CC12, and CC13 in their most theoretical aspects, as well as the basic and general skills CB1, CG0, and CG03.

The assessment for the practical project defense will be based on two components:

- Documentation and Project Functionality (40%): Evaluation of the project documentation and its functionality developed during the course.
- Individual Problem Solving (60%): Assessment of individual exercises related to the project

The skills being assessed in the practice exam are CC01, CC05, CC12, and CC13 in their practical aspects. Additionally, the general skills CG0, CG03, and CG08 will be evaluated.

The individual student progress will be assessed through 'Individual Progress Tests'. These tests will be conducted during the semester when the course is taught, and their scores will contribute to the final grade for continuous assessment in both the First and Second Examination Periods (Call/Convocatory I and II). The competencies being evaluated through this type of activity are general competences CG03 and CG06, and the transversal ones CT2, CT3, and CT6.

If the theory exam or the practical project defense receives a grade equal to or higher than 5 out of 10, it will be considered approved. In such cases, the approved portion can be transferred from the First Examination Period (Call/Convocatory I) to the Second Examination Period (Call/Convocatory II). To request this transfer for either of these two grades, students should follow the mechanisms proposed by the faculty. If no indication is provided, it will be assumed that the student does not wish to proceed with the transfer. Individual Progress Test scores will automatically carry over from Convocatoy I to Convocatory II.

The course is considered passed when the final grade is equal to or greater than 5 out of 10.

Honors
The distinction of 'Honors' (MH) may be awarded to students who have obtained a final grade equal to or higher than 9.0. When the number of students eligible for 'Honors' exceeds the available spots, the following requirements will be considered in the indicated order: highest final grade, highest practical grade, highest theory grade, and highest grade in academically guided activities (AAD)

8.2.2 Examinations Convocatory II

Same as Convocatory I

8.2.3 Examinations Convocatory III

Same as Final Single Assessment

8.2.4 Extraordinary Convocatory

Final Single Assessment

8.3 Single Final Evaluation:

Students who want to benefit from the **final single evaluation** must communicate it in the first two weeks of the subject, or in the two weeks following enrolment if it has occurred after the beginning of the subject. To do this, a link will be enabled on the web of the subject. For these cases, the following formula will be applied for its evaluation:

 Final grade = 0.5 * Theory exam + 0.5 * Practice Project Defense

The theory exam and the practical project defense will take place on the official date set by the institution. The theory exam will involve solving problems, theoretical/practical questions, or multiple-choice questions related to the theory syllabus. No additional materials, except those specified by the faculty, can be used during this exam.

For the practical project defense, the student must complete the project proposed during the course and have it operational on the official date set by the institution. On the same day, the student will need to solve one or more exercises related to the project in the lab. The grading for this part of the course will be based on evaluating both the project's documentation and functionality (40%) and the assessment of the proposed exercises (60%).

In the final single evaluation, to pass the subject the student must obtain, at least, 5 points out of 10 in the theory exam and 5 points out of 10 in the practice exam.