COURSE DATA

Data Subject	
Code	34674
Name	Databases
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	School of Engineering	2	Second term

Subject-matter

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	13 - Information systems and intelligent systems	Obligatory

Coordination

Name	Department
	240 - Computer Science
	240 - Computer Science
	240 - Computer Science

SUMMARY

The course “Databases” is taught during the second semester of the second year. It deals with different subjects: data storage management, storage and retrieval algorithms, and efficient retrieval and update of data.

In this course, databases are presented as the best way to organize factual data in a computer, in front of the use of data files. The main characteristics of databases, theoretical foundations and the data representation models will be described. The architecture of the Database Management Systems will also be introduced.

Particularly, the course will focus on the relational data model, which is the widest used model in commercial implementations of DBMS (Oracle, IBM, Microsoft, …). The students will learn to use the Structured Query Language (SQL) as the basic tool to work with data in a relational database. They will also learn to design and implement a database through a well defined methodology: conceptual design, Entity/Relationship diagrams, logical and physical data models, and normalization.

Finally, the course will deal with the construction of software applications that interact with databases. A major attention will be paid to web applications, and the basic web languages (HTML, XML) and JAVA.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is advisable to have taken the Informática and Programación (first year) and Estructura de Datos y Algoritmos (second year, first semester) courses prior to taking this course.

OUTCOMES

1400 - Degree in Computer Engineering

- G1 - Ability to design, write, organise, plan, develop and sign projects in the field of computer engineering aimed at the design, development or exploitation of computer systems, services and applications.
- G2 - Ability to lead project activities in the field of information technology, in accordance with both the knowledge and the specific skills acquired in the degree.
- G3 - Ability to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of computer systems, services and applications, and of the information that these manage.
- G5 - Ability to design, develop and maintain computer systems, services and applications using software engineering methods as an instrument for quality assurance, in accordance with both the knowledge and the specific skills acquired in the degree.

- R1 - Ability to design, develop, select and evaluate computer applications and systems while ensuring their reliability, safety and quality, according to ethical principles and current legislation and regulations.
- R5 - Knowledge, management and maintenance of computer systems, services and applications.
- R8 - Ability to analyse, design, build and maintain applications in a robust, secure and efficient manner by choosing the most suitable paradigm and programming languages.
- R12 - Knowledge and application of the features, functionalities and structure of databases which enable their proper use, and ability to design, analyse and implement applications based on them.
- R13 - Knowledge and application of the tools needed for the storage of, processing of and access to information systems, including web-based systems.
- TI2 - Ability to select, design, implement, integrate, evaluate, build, manage, exploit and maintain hardware, software and network technologies, within adequate cost and quality thresholds.
- TI5 - Ability to select, implement, integrate and manage information systems that meet the needs of the organisation taking account of cost and quality criteria.
- TI6 - Ability to design systems, applications and services based on network technologies, including the Internet, the web, e-commerce, multimedia, interactive services and mobile computing.
- SI1 - Ability to integrate ICT solutions into business processes in order to meet the information needs of organisations, thus enabling them to achieve their goals effectively and efficiently and providing them with competitive advantage.
- SI2 - Ability to determine the requirements of an organisations information and communication systems, considering safety aspects and compliance with regulations and legislation.
- SI3 - Ability to actively participate in the specification, design, implementation and maintenance of information and communication systems.

LEARNING OUTCOMES

This course will provide students with the following learning results:

1. To know the concepts about storage systems and models and data retrieval, and their importance in organizations.

2. To get the basics for defining, designing and implementing information systems using database management systems.

3. To know the theories and mathematical models which serve as the basis of the relational model.

4. To know about the tools to define, insert, update and manipulate information in a database management system.

5. To apply the relational model principles and technics to develop software applications in the business scope of organizations.

6. To understand the problems related to DBMS design and the needs of each of its components.

7. To deeply know the functional elements of a DBMS, and to critically evaluate and compare the different algorithms implemented in a DBMS.

Complementary skills and social competences that students will acquire are:

- To find, select and assess information to address new problems, using new technologies.
- To make plans for new situations
- To model and solve problems by identifying the essential elements of situations, and making approximations to reduce the problems complexity, including non-standard solutions and providing original ideas.
- To organize, plan and drive individual or group learning process, in a coordinated manner.
- To work individually and in groups.
- Teamwork: collaborate, lead, plan, interact, reach consensus, negotiate, solve conflicts and respect other's opinions.
- Discuss and argue opinions, and get critical attitudes towards problems.
- Analyze texts. Writing and presenting texts with clarity, coherence, organization and comprehension for experts and novices.
- To get a positive attitude towards new problems
- To promote the ethics in the regular professional activity, and to get an ethic compromise.

DESCRIPTION OF CONTENTS

1. Introduction

Lecture 1. Introduction
- Information systems
- File systems vs database management systems
- Databases as part as information systems
- Basic conceptos of databases
- DBMS architecture. The ANSI-SPARC model

2. The Entity/Relationship model

Lecture 2. The Entity/Relationship model
- A brief history
- Entities and atributes
- Relationships
- Restrictions
- Aggregation
- The extended E/R model

3. The relational model

Lecture 3. The relational model
- The relacional model
- Relational algebra
- Relational calculus

4. Query and data definition languages

Lecture 4. Query and data definition languages
- Introduction to SQL
- Data definition language (DDL)
- Data manipulation language (DML)
- Introduction toPL/SQL.

Laboratory sessions

1,2 and 3 - View and manipulate a database (using the SQL language and as a data manipulation language).

4 and 5 - Procedural languages in the database (using the PL/SQL language)

5. Databases design

Lecture 5. Database design
- Design methodologies
- Conceptual design
- Logical design. Normalization.
- Physical design

Laboratory sessions
6 and 7 - Creating databases (using the SQL language as a data definition language).

6. Accessing databases from software applications

Lecture 6. Accesing databases from software applications
- Multilayer applications architecture
- HTML and XML documents
- Embeded and dynamic SQL
- ODBC and JDBC

Laboratory sessions
8 - Creating an application for extracting data from a database.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	5,00	0
Development of individual work	20,00	0
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	25,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The learning process will be based on a combination of lectures, problem resolution sessions and practical activities (computer based laboratories). It will be complimented with the student personal work.

- Lectures will have a duration of 90 minutes, and different subjects will be taught, trying to promote the students participation.

- Practical activities will be based on problems resolution in the classroom. The duration of the sessions will be 90 minutes. Some of the planned activities are:

o Problems resolution sessions

o Seminars in regular classrooms and computer facilities

o Debates, problems resolution and exercises previously worked by students

o Individual tutorials

- Laboratory sesions will focus on the resolution of problems introduced in the regular lectures, with a duration of 150 minutes.

- Individual personal work for promoting the autonomous learning process, based on these aspects:

- Preparation of lectures and reading of recommended texts
- Problems resolution
- Homework to be evaluated by the lecturer
- Laboratory sessions preparation with anticipation

- Teamwork. Development of activities in small groups, inside and outside the classroom.

The virtual learning platform of the UVEG (Aula Virtual) will be used as a support to the teaching process and the student-lecturer communication. All the course material will be made available in this platform.

EVALUATION

Students will do 2 types of work:

1. Autonomous auto-learning work
2. Supervised work

1. Autonomous work for auto-learning will consist of activities done outside the regular schedule. The lecturer will guide this type of activities (readings, problems resolution, researching, etc.), but they will not be marked, although students could ask the lecturer for their revision in the individual tutorials.
2. Supervised work will consist of activities proposed by the lecturer, and they will be marked in order to evaluate the student evolution (N_Activities). The types of work are:
    1. Individual activities
    2. Group activites
    3. Practical work with computers

The main characteristics of these activities are:

- They will be evaluated by the lecturer
- They will have a deadline or will be made in-person
- They are mandatory
- They are not recoverable in the second call

The student will have to pass several exams during the semester (N_exams). The final mark will be calculated using this formula:

Final Mark = 50% N_Exams + 50% N_Activities

It will be necessary to get, at least, 5 out of 10 at N_Exams for the formula to be applied. The qualification of N_Activities will be kept for the second call.

In any case, the evaluation of this subject will be done in compliance with the University Regulations in this regard, approved by the Governing Council on 30th May 2017 (ACGUV 108/2017)

This assessment starts from the premise that teaching at the University of Valencia is, by definition, on-campus lecture delivery method. In this sense, the student should be aware that attendance at both the theoretical and practical lectures is essential for proper monitoring of the contents of the course. The student must also consider the possibility to enroll part time (except in the case of students who register for the first time), when it is unable to attend all courses (60 credits). However, there is an exception for those students that justify it and request it. They have the possibility of being assessed without attending to all or part of the lectures. For these cases, students should proceed as follows:

- At the beginning of the course, student should inform to lecturer responsible for the course, the incidence that makes her/him unable to attend the class. This must be adequately justified in documentary form.
- The lectures in charge, in the light of this information, will decide the possibility of evaluation without full or partial assistance to the lectures.

Students who are in this situation must submit for evaluation all work required by the lecturer (not necessarily the same to those required for the course) and may also be called to defend them orally to the lecturer, and conduct a knowledge test. The weight of the final grade work will be 50% and the test the remaining 50% knowledge.

REFERENCES

Basic

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Additional

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