Universidad de Alcalá

TEACHING GUIDE

Databases

Degree in
Information System Engineering (GISI)
Computer Engineering (GIC)
Computer Science Engineering (GII)

Universidad de Alcalá

Academic Year 2021/2022

2nd Year - 1st Semester (GISI+GIC+GII)

Approved by the School Board on July 6, 2021

TEACHING GUIDE

Course Name:	**Databases**
Code:	**780016 (GISI+GIC+GII)**
Degree in:	**Information System Engineering (GISI)** **Computer Engineering (GIC)** **Computer Science Engineering (GII)**
Department and area:	**Ciencias de la Computación** **Computer Science**
Type:	**Compulsory (GISI+GIC+GII)**
ECTS Credits:	**6.0**
Year and semester:	**2nd Year - 1st Semester (GISI+GIC+GII)**
Teachers:	Por definir
Tutoring schedule:	Consultar al comienzo de la asignatura
Language:	English

1. COURSE SUMMARY

This modules aims to introduce students to databases and their design and implementation. Students will learn:

• To design databases using the Entity-Relational model, relational model and normalization theory.

• The Structured Query Language (SQL).

Prerrequisites and recommendations:

Data structures and programming modules are recommended modules that should have been taken before this module.

2. SKILLS

Basic, Generic and Cross Curricular Skills.

This course contributes to acquire the following basic, generic and cross curricular skills:

en_CG1 - Ability to conceive, write, organize, plan, develop and sign projects in the field of computer engineering that are intended, in accordance with the knowledge acquired as established in section 5, annex 2, of resolution BOE-A -2009-12977, the conception, development or exploitation of computer systems, services and applications.

en_CG3 - Ability to design, develop, evaluate and ensure accessibility, ergonomics, usability and security of computer systems, services and applications, as well as the information they manage.

en_CG4 - Ability to define, evaluate and select hardware and software platforms for the development and execution of computer systems, services and applications, in accordance with the knowledge acquired as set out in section 5, annex 2, of resolution BOE-A-2009 -12977.

en_CG5 - Ability to conceive, develop and maintain computer systems, services and applications using software engineering methods as an instrument for quality assurance, in accordance with the knowledge acquired as established in section 5, annex 2, of the resolution BOE-A-2009-12977.

en_CG6 - Ability to conceive and develop centralized or distributed computer systems or architectures integrating hardware, software and networks in accordance with the knowledge acquired as set out in section 5, annex 2, of resolution BOEA-2009-12977.

en_CB1 - That students have demonstrated to possess and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

en_CB2 - That the students know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

en_CB3 - That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

en_CB4 - That students can transmit information, ideas, problems and solutions to both a specialized and non-specialized public.

en_CB5 - That the students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

en_TRU1 - Capacity of analysis and synthesis.

en_TRU2 - Oral and written competencies.

en_TRU3 - Ability to manage information.

en_TRU4 - Autonomous learning skills.

en_TRU5 - Team work.

Specific Skills

This course contributes to acquire the following professional skills:

en_CI1 - 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.

en_CI7 - Knowledge, design and efficient use of the types and structures of data most appropriate to the resolution of a problem.

en_CI8 - Ability to analyze, design, build and maintain applications in a robust, safe and efficient way, choosing the most appropriate programming paradigm and languages.

en_CI12 - 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.

en_CI13 - Knowledge and application of the necessary tools for storage, processing and access to Information Systems, including web-based ones.

Learning Outcomes

After succeeding in this subject the students will be able to:

RA1: Identify the problems that have led to the emergence of the concept of Database. Schematize the architecture and functionality of a database management system. Associate the mathematical foundations that allowed the development of the relational model with the characteristics of the SQL language

RA2: Identify the concepts of organizational data warehouses and their use for decision making applications

RA3: Know how to install a basic DBMS, as well as other tools to support the design and implementation of databases and put them into operation

RA4: Know how to use database management systems, including creation, maintenance and retrieval of information as well as access control, security and user permissions.

RA5: Knowing how to connect a database with a programming environment

RA6: Know how to capture the specifications of a part of the real world in a conceptual model, locating its semantic restrictions. Evolve this model through the different phases of data design: logical and physical model to create a database application that solves the specified problem

RA7: Ability to build test cases that validate the set down processes.

RA8: Ability to search information of any of the contexts in which Databases are exploited today, and implement it by choosing the most convenient tools for this

RA9: Understand the role that standards have in Engineering in general and Databases in particular and the convenience of adherence to standards and their professional practice.

RA10: Become aware of the need for an exhaustive search for quality in maintenance and responsibility in the use of the data they use in the exercise of their profession.

RA11: Value the benefits of teamwork and get used to making a public recognition of the contributions of colleagues

3. CONTENTS

Contents Blocks	Total number of hours
1. Introduction to databases.	4 hours
2. Database models a. Entity-Relationship model and database design	18 hours
3. Relational databases a. Relational model b. Tools: relational design tools and DBMS c. Relational algebra and calculus d. Structured Query Language (SQL) 3. Good practices:	20 hours
3. Good practices: a. Restrictions, referential integrity and triggers. b. Normalisation theory	14 hours

4. TEACHING - LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credits Distribution

Number of on-site hours:	58 hours (56 hours on-site +2 exams hours)
Number of hours of student work:	92
Total hours	150

4.2. Methodological strategies, teaching materials and resources

Databases I is is part of the second year and second semester and composed of 6 ECTS (150 hours).

Learning activities include:

- Theory classes.
- Practical classes: problem solving.
- Laboratory classes
- Tuitions : individual or collective

In addition, it is possible to carry out the following works:

- Practical classes: problem solving.
- Laboratory classes
- Individual or team assignments.
- Demonstrations of assignments
- Seminars.
- On-line activities using a learning management systems such as Blackboard

5. ASSESSMENT: procedures, evaluation and grading criteria

Preferably, students will be offered a continuous assessment model that has characteristics of formative assessment in a way that serves as feedback in the teaching-learning process.

5.1. PROCEDURES

The evaluation must be inspired by the criteria of continuous evaluation (Learning Assesment Guidelines, LAG, art 3). However, in compliance with the regulations of the University of Alcalá, an alternative process of final evaluation is made available to the student in accordance with the Learning Assesment Guidelines as indicated in Article 10, students will have a period of fifteen days from the start of the course to request in writing to the Director of the Polytechnic School their intention to take the non-continuous evaluation model adducing the reasons that they deem convenient. The evaluation of the learning process of all students who do not apply for it or are denied it will be done, by default, according to the continuous assessment model. The student has two calls to pass the subject, one ordinary and one extraordinary.

Ordinary Call

Continous Assessment:

The main assessment tools will be:

1. Problems (EP). Solving practical problems individually or in small groups. Solving practical problems individually or in small groups.
2. Laboratory Exercises (EL). Performance of laboratory practices and delivery of the corresponding reports. The evaluation will consider systematic observation, where the teacher will record the main difficulties and skills observed in each student, and the realization of a single memory by practice, by each of the groups of students who have done it.

3. **Assessment** Tests (PE). evaluation composed of three tests that will be carried out during the term focused on both practical and theoretical aspects of the subject.

The students, as a group, will deliver the reports of the laboratory practices following the established schedule. These practices will be evaluated by the professor responsible for the laboratory group, to assess if the objectives indicated in the script of the same have been met.

Assessment through final exam:

In the case of evaluation by means of a final exam, the evaluation will be an single final exam and assignment

Extraordinary Call

The procedure will be the same as that described for the assessment by means of a final exam in the ordinary call.

5.2. EVALUATION

EVALUATION CRITERIA

The assessment criteria measure the level in which the competences have been acquired by the student. For that purpose, the following are defined::

CE1. The student is able to extract the semantics of the data, their interrelations and their restrictions, from specifications of a real-world plot

CE2. The student is able to express the constraints and relationships between the data, modeling the problem plot, at a conceptual, logical and physical level, and justifying the design criteria used.

CE3. The student knows how to implement the design in a DBMS and is able to maintain and consult the information in it.

CE4. The student knows how to find solutions to the problems raised, in the manuals, to integrate the database in other computerized contexts.

CE5. The student expresses himself both orally and in writing using appropriate terminology and always assessing the contributions of other members of the class.

GRADING TOOLS

The work of the student is graded in terms of the assessment criteria above, through the following tools:

1. Ordinary call
    a. Continuous assessment, with three assessment exams (PEI1,PEI2,PEP3).
    b. deliverables of laboratory work, possibly fractionable, especially the last one. (PL1, PL2, PL3)
    c. Final assessment (PEF)

    There are two possible evaluation paths:
    - Students choosing continuous evaluation, there will be three tests (Continuous Assessment Tests –CATs-) which is the 60% of the final mark. Another three practical assignments (Continuous Assessment Laboratory –CALs-) will cover the remaining 40%. Students may have to demonstrate their practical assignment to the module convenor.
    - Students opting for a single evaluation, a final exam is the 60% of the final mark and the remaining 40% will be evaluated though an assignment.
    - Students that do not pass the continuous evaluation or final exam will have a resit with both parts (theory and practice) and the distribution of the marks is as the continuous evaluations (60 and 40% respectively).

2. Extraordinary call. Final assessment (PEF)

GRADING CRITERIA

In the ordinary call-continuous assessment the relationship between the competences, learning outcomes, criteria and evaluation instruments is as follows.

Skill	Learning Outcomes	Evaluation criteria	Grading Tool	Contribution to the final mark
TRU1-TRU3, TRU5,CI1,CI7, CI12,CI13	RA1,RA6	CE1-CEI5	PEI1	15%
CG1,CG4,CG5,TRU1-TRU3, TRU5,CI1,CI8, CI12, CI13	RA1,RA2,RA6	CE1-CEI5	E1, F	12%
TRU1-TRU3, TRU5,CI1,CI7, CI12, CI13	RA6,RA8,RA9	CE1-CEI5	PEI2	25%
CG1,CG4,CG5,TRU1-TRU3, TRU5, CI1,CI8, CI12, CI13	RA1 ,RA3,RA6, RA10,RA11	CE1-CEI5	E2, F	12%
TRU1-TRU3, TRU5, CI1, CI12, CI13	RA1,RA2,RA3,RA4 RA6,RA7,RA11	CE1-CEI5	PEI3	20%
CG1,CG3,CG4,CG5,CG6,TRU1-TRU3, TRU5, CI1, CI8, CI12, CI13	RA4,RA5,RA6, RA7,RA8,RA9, RA10,RA11	CE1-CEI5	E3, F, D	16%

In the ordinary call-final evaluation, the relationship between the competences, learning outcomes, criteria and evaluation instruments is as follows.

Skill	Learning Outcomes	Evaluation criteria	Grading Tool	Contribution to the final mark
TRU1-TRU3, TRU5;CI1,CI12,CI13,CI17	RA1,RA2,RA3,RA6 RA8,RA9	CE1- CE5	PEFT	60%
CG1,CG3,CG4,CG5,CG6,TRU1-TRU3, TRU5,CI1,CI8,CI112,CI13	RA1,RA2,RA3,RA4 RA5,RA6,RA7,RA8 RA9,RA10,RA11	CE1-CE5	PEFL	40%

Extraordinary call

In the case of the extraordinary call, the same percentages that have been established in the case of the evaluation by means of a final exam will be maintained, giving the option of making the PL or maintaining the mark obtained in the EL (continuous evaluation) or in the PEF (final evaluation), according to the student's decision. In any case, the PL will be made by those students who have not done it in the final exam option in the ordinary call.

6. BIBLIOGRAPHY

6.1. Basic Bibliography

- SILBERSCHATZ A. Fundamentos de Diseño de Bases de Datos, McGraw-Hill (2007)
- CONNOLLY, T.M. Sistemas de Bases de Datos, Addison Wesley (2005)

6.2. Additional Bibliography

- DATE, C.J. Introducción a los Sistemas de Bases de Datos, Prentice Hall (2002)
- ELMASRI R., NAVATHE S.B.. Fundamentos de Sistemas de Bases de Datos, Pearson (2007)

Disclosure Note

The University of Alcalá guarantees to its students that, if due to health requirements the competent authorities do not allow the total or partial attendance of the teaching activities, the teaching plans will achieve their objectives through a teaching-learning and evaluation methodology in online format, which will return to the face-to-face mode as soon as these impediments cease.