ACADEMIC PROGRAM

DATABASES AND DISTRIBUTED SYSTEMS LAB

B.F.A. IN **COMPUTER SCIENCE**

MODALITY: ON CAMPUS

ACADEMIC YEAR: 2022-2023

Name of the course:	Databases and Distributed Systems Lab
Degree :	Computer Science
Location:	Centro Universitario de Tecnología y Arte Digital
Area:	Laboratories
Year:	1º
Teaching period:	2
Type:	OB
ECTS credits:	6
Teaching modality:	On campus
Language:	English
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SUBJECT DESCRIPTION

Area description

This subject belongs to the subject of Laboratories. This subject is dedicated to the eminently practical study of the fundamental concepts associated with networks, operating systems, distributed systems and databases.

Subject description

In this subject, the basic concepts of relational databases are studied, in a practical way, as well as the SQL language for their manipulation. In addition, basic concepts of distributed systems and the practical use of AWS as a Cloud Computing platform will be acquired on which they will work with different types of resources, both software and hardware, as well as deploy simple applications. In higher-level subjects, the theoretical foundations of DBs and Distributed Systems will be studied in detail and in-depth.

COMPETENCIES AND LEARNING OUTCOMES

Competencies

BASIC AND GENERAL SKILLS

BC1: Students should demonstrate knowledge in an area of study that builds upon the foundation of general secondary education and goest beyond at a level that, while supported by advanced textbooks, also encompasses certain aspects derived from the cutting edge of their field of study.

BC2: Students should be able to apply their knowledge to their work or vocation in a professional manner, and they should possess the competencies typically demonstrated through the development and defence of arguments as well as problem-solving within their field of study.

BC3: Students must possess the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that involve reflection on socially, scientifically, or ethically significant issues.

BC4: Students should be capable of conveying information, ideas, problems, and solutions to both specialized and non-specialized audiences.

BC5: Students should have developed the learning skills necessary to pursue further studies with a high degree of autonomy.

GC1 - The ability to comprehend, plan, and solve problems through the development of computer-based solutions.

GC2 - Proficiency in creating computer solutions that are environmentally friendly, socially responsible, and sustainable in their use of natural resources, while also adhering to legal and ethical standards.

GC3 - Knowledge of the scientific principles applicable to solving computer-related problems.

GC4 - The capacity to simplify and optimize computer systems by understanding their complexity.

GC5 - The ability to acquire, adapt, and create new computer technologies.

SPECIFIC SKILLS

SC1 - Familiarity with the architecture of Operating Systems and various mechanisms for managing processes, communication, and synchronization within them.

SC2 - The ability to administer a small-scale computer server or network and automate related tasks.

SC3 - Knowledge of computer communication technologies, including the capability to configure a TCP/IP network and basic services.

SC4 - Understanding of fault tolerance, adaptability, load balancing, and system predictability for the development of distributed applications.

TRASVERSAL SKILLS

CT4 - The ability to constantly update acquired knowledge in the use of digital tools and technologies based on the current state of the industry and the technologies in use.

Learning outcomes

Upon completion of the degree, the graduate will be able to:

- Be able to install Linux and Windows

- To know and apply shell commands in Linux and Windows

- To manage users and access permissions in a system
- To be able to automate tasks using scripting language
- To understand the basics of a computer network
- To configure a simple TCP/IP network
- To know the elements of a relational database
- To build simple queries in SQL
- To be able to write elementary database applications

CONTENTS

Introduction to database managers

Introduction to structured data

Introduction to relations

Introduction to queries

Introduction to reporting

Basic DB programming: macros, stored procedures and triggers

SUBJECT SYLLABUS

1. Topic 1. Introduction to DBMS and DBMSs

1.1. History and beginnings of DBs

1.2. Advantages of its use

1.3. General introduction to BBDD and SGBDs

2. Topic 2. General Concepts: E/R Model and DB Scheme

2.1. Design of a BD

2.2. Entity/Relationship Model and its representation

23. Cardinality of relationships

2.4. How to go from Conceptual Design to Logical Design of a DB

2.5. Types of keys, normalization and concepts about physical implementation of a DB

2.6. Tools to work with the E/R Model

3. Topic 3. Database Management Systems (MySQL) and Management Tools

3.1. Definition and components of a DBMS

3.2. Architecture of a SGDB and its properties

3.3. Most used database managers and storage engines

3.4. Introduction to MySQL and Management and Reporting Tools

4. Topic 4. Basic knowledge of the SQL language

4.1. History and basic functions of the SQL language

4.2. Database manipulation language and its commands

4.3. Type of data

4.4. Ways to interact with databases

4.5. Views of a DB

4.6. JOIN command

5. Topic 5. Distributed Systems and Cloud Computing

6. Topic 6. Introduction to Amazon Web Services (Cloud Services)

7. Topic 7. EC2 Service (Virtual Machines in AWS)

8. Topic 8. RDS Service (DB Service in AWS)

9. Topic 9. VPC Service and Security Groups (Connectivity in AWS)

10. Topic 10. Lambda Function (Serverless Computing Services on AWS)

TRAINING ACTIVITIES AND TEACHING METHODOLOGIES

TRAINING ACTIVITIES

LEARNING ACTIVITIES	Total hours	Hours of presence
Theoretical / Expository classes	22,50	22,50
Practical classes	28,50	28,50
Tutorials	4,00	0,00
Independent study and autonomous work of the student	50,00	0,00
Elaboration of work (group or individual)	40,00	0,00
Evaluation Activities	5,00	5,00
TOTAL	150	56

Teaching methodologies

Expository method or master lesson

Case learning

Learning based on problem solving

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

Just in time Teaching (JITT) or classroom on time

Expository method or master lesson

Case method

Learning based on problem solving

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

TEMPORAL DEVELOPMENT

DIDACTIC UNITS/TOPICS TIME PERIOD

Topic 1: Introduction to DBs and DBMSs Week 1

Topic 2: General Concepts: E/R Model and DB Scheme Week 2, 3 and 4

Topic 3: Database Management Systems (MySQL/MariaDB) and Management Tools Week 5 and 6

Topic 4: Basic knowledge of the SQL language and practical activities Week 7, 8 and 9

Topics 5, 6: Distributed Systems and Introduction to Amazon Web Service services. Practice on the use of the resources learned (EC2 and RDS + SQL) Weeks 10

Topic 7, 8, 9 and 10: Distributed Systems and Introduction to Amazon Web Service services. Use of resources (EC2, VPC and RDS) Week 10 and 11

Practical AWS Scenarios (EC2, RDS and VPC) Weeks 13, 14 and 15

EVALUATION SYSTEM

ASSESSMENT SYSTEM	MINIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)	MAXIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)
Assessment of participation in class, exercises or projects of the course	10	30
Assessment of assignments, projects, reports, memos	30	60
Objective test	30	60

GRADING CRITERIA

ASSESSMENT SYSTEM	ORDINARY EVALUATION	EXTRAORDINARY EVALUATION
Assessment of participation in class, exercises or projects of the course	10	10
Assessment of assignments, projects, reports, memos	40	40
Objective test	50	50

General comments on the evaluations/assessments

Final Note Ordinary Call = 10%*AE1 + 40%*AE2 + 50%*AE3

General considerations about the evaluation:

1. The final grade for the subject in the ordinary session will be calculated with the grades of the three activities described in the previous table, applying the corresponding weights. Therefore, the rule to apply to calculate the final grade will be:

Ordinary_Final_Grade = 10%*AE1 + 40%*AE2 + 50%*AE3

2. AE1: The evaluation of participation and class work: will be carried out based on attendance, class work and the delivery of the activities and exercises proposed during classes. This aspect will represent 10% of the final grade for the subject in the ordinary call.

3. AE2: Throughout the course, practical activities or mandatory work will be proposed that must be delivered on the indicated date through the virtual platform. Some of the proposed tasks can be evaluated through a partial exam. These activities (mandatory and partial practices) will account for 40% of the final grade for the subject in the ordinary call.

Practices out of date and form will not be admitted without justified cause and all of them are mandatory to take the ordinary exam, that is, to pass the subject in the ordinary call all mandatory practices must be presented. If any of these mandatory practices are delivered after the deadline without justification, it will have a 50% grade penalty (that is, if the grade obtained was an 8, the actual grade will be 4). Absence from the partial will be evaluated with a 0 in said grade.

4. AE3: At the end of the semester, an ordinary final exam will be taken, which will have a total weight of 50% on the grade of the ordinary call. To pass the subject in the ordinary session it will be necessary for the student to have at least a 5 in this final exam. Only students who have all the practices delivered will be able to take the exam.

Summarizing:

 To pass the subject in the ordinary session, it is essential that the final average grade (including the practical + partial activities, the final exam and class work) is at least 5.0 (out of 10). In addition to this requirement, it is necessary that the final exam grade be at least 5.0 (out of 10). If any of these requirements are not met, the subject will be automatically considered failed regardless of the rest of the grades.

 If the student does not pass the ordinary call, the student may take the extraordinary call with the following criteria:

o If the student has failed the subject in the ordinary session due to not having achieved 5 in the final exam, but has all his practices delivered and with a passing average, then he will have to take the extraordinary exam exclusively and his grades from the exam will be kept. course. Her extraordinary exam maintains the weight of 50% of the grade and must have a minimum grade of 5 (out of 10).

o If the student has the subject failed in ordinary due to pending and/or failed practices, but has passed the exam (>=5), said exam is saved, and he will have to present the pending or failed practices in an extraordinary session.

o In the rest of the cases: pending and/or failed practices and exam <5, a final exam will be carried out that will represent 60% of the grade, and in which all the content of the subject will enter. The 30% will be calculated from the evaluation of the practical(s) indicated by the teacher at that time (they may be defined at that time or those requested during the course that have not been delivered or are suspended). The remaining 10% will be the grade for attendance and class work obtained during the course.

o The final average grade must be at least 5.0 (out of 10) and the final exam grade must be at least 4 (out of 10).

• All code and work submitted by students must be ORIGINAL, meaning that they must have been developed by the student throughout the course, without external help.

• Copies between works: A working copy will be understood as those projects that contain equal or very similar parts, that do not comply with the rules established in the previous paragraphs. Copies of work will lead to complete suspension of the subject, with no possibility of recovery in the current call. Copied and original works will be penalized equally. It will be the teacher who decides the seriousness of the copy, and the final decision may be consulted and reviewed by the rest of the teaching team if a second opinion is needed.

• No grades of any kind will be kept between different academic years, nor between different calls.

LIST OF REFERENCES (BOOKS, PUBLICATIONS, WEBSITES):

BASIC:

• DuBois, Paul. MySQL Cookbook: Solutions for Database Developers and Administrators. "O'Reilly Media, Inc.", 2014.

RECOMMENDED

• Elmasri, Ramez, and Shamkant B. Navathe. Database fundamentals. Person, Addison Wesley, 2011.

• Elmasri, Ramez. Fundamentals of Database Systems. Addison-Wesley, 1998.

• Ramakrishnan, Raghu, and Johannes Gehrke. Database management systems. McGraw Hill, 2000.

• Beaulieu, A. (2009). Learn SQL (Vol. Second Edition). Spain: ANAYA Multimedia Impressions.

• DuBois, Paul. MySQL Cookbook: Solutions for Database Developers and Administrators. "O'Reilly Media, Inc.", 2014.

• Burns, Brendan. Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services. "O'Reilly Media, Inc.", 2018.

• Wittig, Michael, Andreas Wittig, and Ben Whaley. Amazon web services in action. Manning, 2016.

• Golden, Bernard. Amazon web services for dummies. John Wiley & Sons, 2013.

• MySQL Manuals https://dev.mysql.com/doc/

REQUIRED MATERIALS, SOFTWARE AND TOOLS

Type of classroom
Theory classroom

Board and projection system

Materials:
Computer with Windows, OSX or Linux

Software:
VirtualBox y VirtualBox Extension Pack

Ubuntu 22.04.

MySQL/MariaDB client/server

Dbeaver CE (Community Edition)

Acceso a cuenta AWS Academy