17826 - DATA STRUCTURES

Information of the subject

Code - Course title: 17826 - DATA STRUCTURES

Degree: 473 - Graduado/a en Ingeniería Informática
474 - Graduado/a en Ingeniería Informática y Matemáticas
722 - Graduado/a en Ingeniería Informática
734 - Graduado/a en Ingeniería Informática y Matemáticas (2019)

Faculty: 350 - Escuela Politécnica Superior

Academic year: 2020/21

1. Course details

1.1. Content area

Programación y estructuras de datos

1.2. Course nature

Compulsory

1.3. Course level

Grado (EQF/MECU 6)

1.4. Year of study

2

1.5. Semester

First semester

1.6. ECTS Credit allotment

6.0

1.7. Language of instruction

Español, English

1.8. Prerequisites

None

1.9. Recommendations

No prerequisites are needed to attend this course. However, the course includes an important part dedicated to the implementation of databases that requires a good level of programming in C.

1.10. Minimum attendance requirement

There are two options: continuous assessment and non-continuous assessment. Students can decide on one option at the beginning of the course and meet the different requirements for each model.

CONTINUOUS ASSESSMENT METHOD WITH MANDATORY CLASS ATTENDANCE
Attendance to at least 85% of the lectures is mandatory.

NON-CONTINUOUS ASSESSMENT METHOD WITHOUT MANDATORY CLASS ATTENDANCE
Attendance to the lectures is recommended, but not mandatory.

1.11. Subject coordinator/s

Carlos Santa Cruz Fernandez

https://autoservicio.uam.es/paginas-blancas/

1.12. Competences and learning outcomes

1.12.1. Competences

C12: This course examines the data structures and algorithms underlying the databases as well as the implementation of computer applications based on them.

1.12.2. Learning outcomes

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Design, create and manage databases, as well
as understand the internal mechanisms on which they are based.
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1.12.3. Course objectives

GENERAL OBJECTIVES	
G1	Create and manage databases and use them to implement applications
G2	Describe the implementation techniques of data base management systems: data storage, indexes, sorting, etc. Relate the implementation internals with the database performance
G3	Customize databases to suit a particular application. Apply rules to create databases that are structurally correct and optimal.

UNIT BY UNIT SPECIFIC OBJECTIVES	
UNIT 1.- Introduction to databases and databases design	
1.1.	Create databases for the storage of structured information
1.2.	Use a Database Management System as a user or administrator
1.3.	Design the structures of a database
1.4.	Write simple Queries using SQL
UNIT 2.- Relational Model	
2.1.	Formal design of DDBB
2.2.	The relational Model
2.3.	Queries in the relational model framework
UNIT 3.- Relational Algebra	
3.1.	Introduce Relation Algebra operators and expressions.
3.2.	Basis of query evaluation
3.3.	Optimize queries
UNIT 4.- Query Languages	
4.1.	Advance SQL.
4.2.	Non SQL query languages
UNIT 5.- Data Base Implementation	
1.	Examine the data structures and algorithms underlying database implementation in order to optimize the use and access to them
2.	Customize databases to suit a particular application

1.13. Course contents

Synopsis
UNIT 1. Introduction to databases and Database design
UNIT 2. Relational model
UNIT 3. Relational algebra
UNIT 4. Query language
UNIT 5. Data base implementation

Contents

1. **Introduction to databases and Database design**
   1. Concepts and definition
   2. Database management systems
      1. Architecture
      2. Basic user and administrator
      3. SQL primer
   3. Entity relationship model
2. **Relational Model**
   1. Relation database design
   2. Functional dependencies
   3. Normal Forms
   4. Relational calculus
3. **Relational Algebra**
   1. Operator

        2. Logical query plans
        3. Heuristics
        4. Logical query plans optimization
  4. **Query Language**
        1. SQL
  5. **Data Base Implementation**
        1. Storage Structures and basic operations
        2. Indexes
            1. Simple Index
            2. BTree
            3. Hashing

1.14. Course bibliography

The course has no official textbook.

Unidades 1-5:

1. Database Systems: The Complete Book (2nd edition). Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom. Prentice Hall, 2008.
2. Fundamentals of database system (5ª edición). Ramez Elmasri, Shamkant Navathe. Pearson Addison Wesley, 2007. INF/681.31.65/ELM.
3. Database Management Systems (3rd edition). Raghu Ramakrishnan, Johannes Gehrke. McGraw-Hill, 2003. INF/C6160/RAM.
4. **Database** System Concepts (5ª edición). Abraham Silberschatz. McGraw-Hill, 2007. INF/681.31.65/SIL.

Unidad 5:

5. File Structures. Michael J. Folk, Bill Zoellick. Addison-Wesley, 1992. INF/681.3.01/FOL.

2. Teaching-and-learning methodologies and student workload

2.1. Contact hours

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Contact hours (minimum 33%)	74
Independent study time	76

2.2. List of training activities

Activity	# hours
Lectures	42
Seminars	
Practical sessions	
Clinical sessions	
Computer lab	26
Laboratory	
Work placement	
Supervised study	
Tutorials	
Assessment activities	6
Other	

3. Evaluation procedures and weight of components in the final grade

3.1.1. List of evaluation activities

Evaluatory activity	%
Final exam	
Continuous assessment	

3.2.1. List of evaluation activities

Evaluatory activity	%
Final exam	
Continuous assessment	