

Databases

DSIC. Academic Year 2010-2011

Lecturer

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<http://www.dsic.upv.es/~jorallo/docent/BDA/BDAeng.html>

- Attention hours
 - On demand by email.

Head Lecturer (Course Director): *Laura Mota* (lmota@dsic.upv.es)

Materials

Theory:

Slides in PDF, exams, other material at:

Laboratory:

Slides SQL +
Lab guide lines,
example Databases,
DBMS software at



<http://www.dsic.upv.es/~jorallo/docent/BDA/BDAeng.html>

More exams, more bibliography, other documents, etc.

Official web: **Poliforma-t UPV (only in Spanish)**

Aims

- To study the fundamentals of database technology.
- To study the relational data model.
- To use relational database management systems.

Learning Outcomes: Objectives

- To study the fundamentals of database technology:
Upon completion you will:
 - Know the concept of database and its main features.
 - Know the concept of database management system, its functionalities and components.
 - Know the ANSI/SPARC architecture for database management systems.
 - Know the concept of data independence in databases and the associated mechanisms.
 - Know the mechanisms and strategies for integrity control (quality) and security (privacy) in databases.

Learning Outcomes: Objectives

- To study the relational data model:

Upon completion you will:

- Know the data structures of the relational model: the tuple and the relation, as well as their associated operators.
- Know (at a basic level) how to model the reality using the relational model.
- Be able to query a database in SQL.
- Know the mechanisms of the relational model which are needed to express integrity constraints: domain definition and key definition.
- Define database schemas and constraints in SQL.
- Know additional mechanisms to define constraints and express activity in databases: *triggers*.
- Know (at a basic level) the physical organisation of a relational database.

Learning Outcomes: Objectives

- To use relational database management systems:
Upon completion you will:
 - Be able to apply the theoretical concepts over a relational data system.

Contents

- **UNIT I: INTRODUCTION TO DATABASES.**
- **UNIT II: THE RELATIONAL DATA MODEL.**
- **UNIT III: DATABASE MANAGEMENT SYSTEMS.**

Contents

- **UNIT I:** Introduction to Databases.
- Syllabus:
 - 1.1.- Information Systems.
 - 1.2.- Databases.
 - 1.3.- Database Management Systems.
 - 1.4.- Database techniques: characteristics.
 - 1.5.- DBMS architecture: database schemas.

Bibliography: [CCM03, chapter 1][EN06][Date03][CB10]

Estimated time: 2 hours.

Contents

- **UNIT II:** The relational data model.
- Syllabus:
 - 2.1.- The relational data model (algebraic approach).
 - 2.1.1.- Structures: tuple and relation.
 - 2.1.2.- Relational Schema: representation of reality.
 - 2.1.3.- Operators on relations: relational algebra
 - 2.2.- The relational data model (logical approach).
 - 2.2.1.- Logical interpretation of a relational database.
 - 2.2.2.- Logical expressions.
 - 2.3.- Missing information: null value.

Contents

2.4.- Integrity constraints.

2.4.1.- Constraints over attributes: *domain* and *not null*.

2.4.2.- Uniqueness constraints.

2.4.3.- Notion of primary key. Primary key constraint.

2.4.4.- Referential integrity: Foreign key constraint.

2.4.5.- Referential triggered action: action directives.

2.4.6.- Other mechanisms to represent integrity constraints.

2.5.- SQL – The Relational Database Standard.

2.5.1.- The Data Definition Language (DDL).

2.5.2.- The Data Manipulation Language (DML).

2.6.- Derived information: views

2.6.1.- Notion of view.

2.6.2.- Applications.

2.6.3.- Views in SQL.

Contents

2.7.- Activity mechanisms: triggers.

2.7.1.- Notion of trigger.

2.7.2.- Event-Condition-Action (ECA) rules.

2.7.3.- Applications.

2.7.4.- Triggers in SQL.

2.8.- Evolution of the relational model

Bibliography: [CCM03, chapters 3 and 5][EN06][Date03][CB10]

Estimated time: 18 hours.

Contents

- **UNIT III: Database Management Systems**
- Syllabus:
 - 3.1.- Database Management Systems: components and functionalities.
 - 3.2.- Data independence.
 - 3.3.- Integrity.
 - 3.3.1.- Concept of transaction. Transaction processing.
 - 3.3.2.- Semantic integrity.
 - 3.3.3.- Concurrent accesses
 - 3.3.4.- Database recovery

Contents

3.4.- Security.

3.4.1.- User control

3.4.2.- Authorised access control

3.5.- Implementation of relational databases

Bibliography: [CCM03, chapter 6][EN06][Date03][CB10]

Estimated time: 6 hours.

Course Schedule

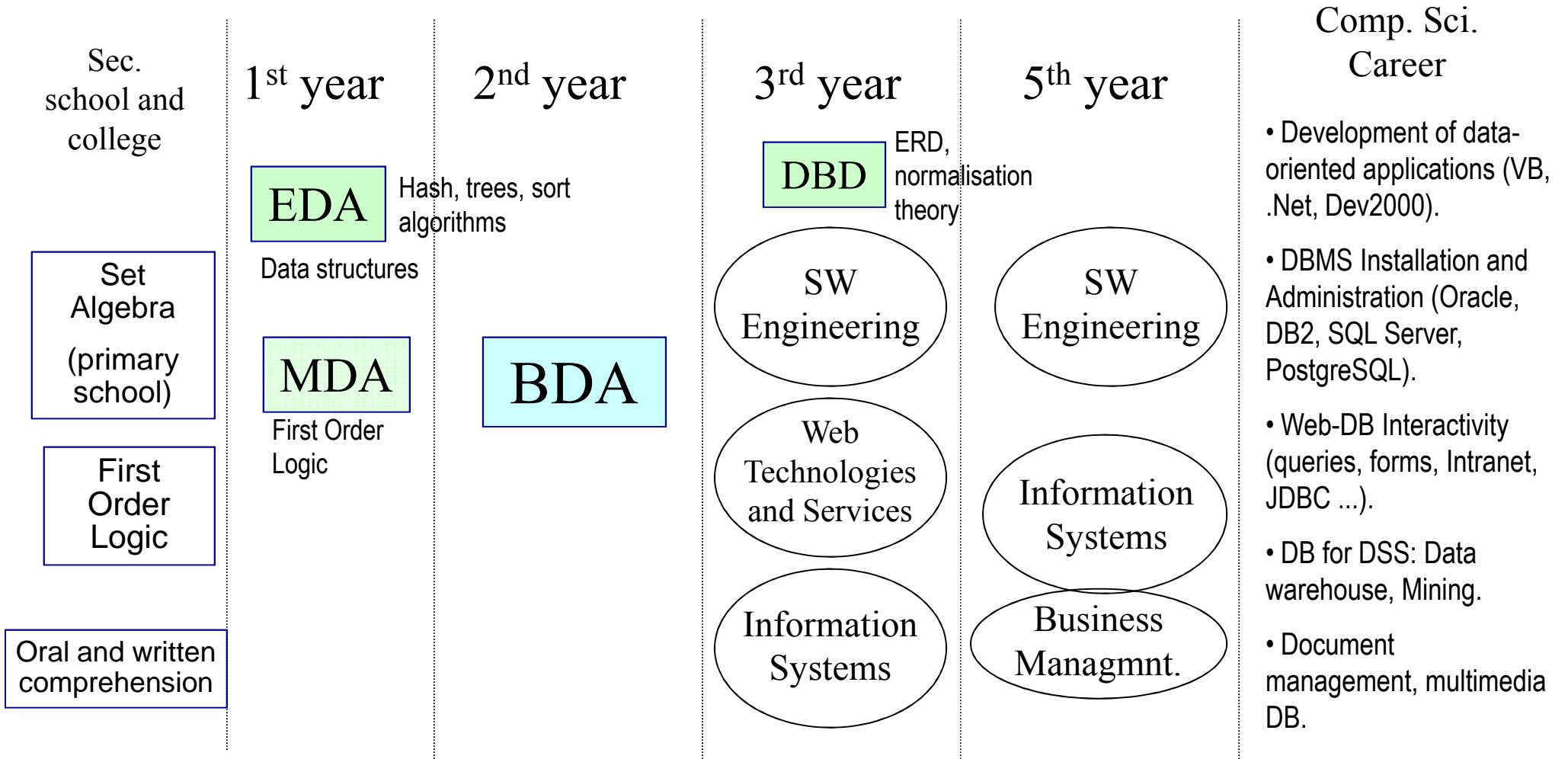
Week	Theory		Laboratory	
1st	Unit 1 Introduction to Databases			
2nd	Unit 2 The relational data model	Structures (2.1.1) R.A (2.1.2)	Queries, modification, database examples.	L1 / L2. Intro RDBMS: Rep. of reality
3rd		R.A (2.1.2) Interpretation (2.2)	SQL: querying	L3 SQL (ORACLE)
4th		Logical interp. (2.3)	SQL: querying	
5th		Exercises	SQL: querying	
6th		I.C. (2.4)	SQL: querying	
7th ^h		I.C. (2.4)	<i>Catch-up Exercises</i>	
8th		Views	<i>Catch-up Exercises</i>	
9th		Triggers	SQL: modification	
10th		Exercises	SQL: data definition	
11th		Unit 3 Database Management Systems	Architecture (3.1) Independence (3.2) Integrity (3.3)	
12th	Security (3.4) RDB Implementation		Transactions. Integrity. Concurrency	
13th				L4 Study of a DBMS: (Oracle)
14th				
15th				

Recommended Readings

- [EN06] Elmasri, R.; Navathe, S.
Fundamentals of database systems, 5th Edition.
Addison-Wesley, 2006
- [Date03] Date, C.J.
Introduction to Database Systems, (8th Edition)
Prentice Hall / Addison Wesley, 2003
- [CB10] Connolly, T.; Begg, C.
Database Systems (5th Edition), Addison-Wesley 2010.
- [CCM03] Celma, M.; Casamayor, J.C.; Mota, L.
Bases de datos relacionales (in Spanish only).
Pearson, Prentice Hall 2003.

Wikipedia: <http://en.wikipedia.org/>

Relationship with Other Subjects



Assessment of the Course

Final Exam (1st seat: June, re-seat: September) :

- What is the exam like?
 - 35% of the final score is a test.
 - 65% of the final score are problems, SQL queries in particular.

From all the objectives, practically 80% of the final grade depends on the following:

- **To know how to interpret a relational schema.**
- **To know how to interpret and use the mechanisms of the relational model in order to express integrity constraints: domain definition, key definition and general constraints.**
- **To know how to query and modify a relational database in SQL.**

Assessment of the Course

Extra point:

- *Up to 1 extra point can be given during the laboratory sessions upon completion of SQL queries that will be delivered during the sessions.*
- *IMPORTANT: This possible extra score will only be added to the final grade if the original grade is greater than or equal to 4.5*