ADVANCED TOPICS IN DATABASES

COURSE OUTLINE

Responsible: Dimosthenis Akoumianakis

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.8.023.0	**SEMESTER**	2nd
COURSE TITLE	Advanced Topics in DataBases		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	4
Total	**0**	**4**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core
PREREQUISITE COURSES	Sucessful completeion of an Introductory course on Databases
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek and English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE158/

2. LEARNING OUTCOMES

Learning outcomes

The course aims to present current and emerging approaches to the modeling, design and development of database applications. The course builds on the foundations of the introductory third-semester course “Introduction to databases” which is considered a prerequisite. The specific targets of the course cover four thematic areas, namely (a) review of classical data models and database management systems (b) theory of database design (c) advanced data models and (d) databases and the internet. Accordingly, the course outline is formed around these four thematic areas.

General Competences

Successful completion of the course will promote general skills including

- Analysing an information system and record the logical structure of the data used in alternative forms and using alternative tools
- Designing relational schemata to obey to advanced normal forms
- Transforming data across data modeling frameworks
- Understand the basics of alternative approaches to database development with emphasis on object-orientation, graph databases and deductive systems

3. SYLLABUS

The theoretical part will cover:

- Introduction to data modeling and relational database management systems: Overview of classical data models, The relational approach to database development, Overview of SQL and Relational Algebra, Extensions to the basic relational data model, summary of advanced data modeling approaches.
- Relational design theory: Functional dependency theory, Schema decomposition, Desirable properties of well-formed schema, Assessment of decomposition, closure of a set of attributes, Applications of functional dependency theory, Normal forms
- Alternative data models and approaches to database development: Database modelling and the Unified Modelling Language (UML), Transformation of UML models to relational schema and vice versa, Object-oriented concepts and object orientation to databases, (e.g., abstract data types, inheritance, isa- and part-of hierarchies), object-relational databases (SQL3), Graph databases, Deductive databases.
- NoSQL systems and data model mappings (e.g., relations to property graph and vice versa)

In the laboratory students engage in individual exercises and a case study which addresses most of the issues raised in the theory part.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face to face / distance learning
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	e-class and PostgreSQL
TEACHING METHODS The manner and methods of teaching are described in detail.	**Activity** / **Semester workload** Lecturing / 40 Project-based work / case study / 80 **Course total** / **120**
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	The course grade is based on project-based assessments of written (30 %), presentation (30 %) and practical work (40 %).

5. ATTACHED BIBLIOGRAPHY

H. Garcia-Molina, J. Ullman, J. Widom (2020): Database Systems (single volume), Crete University Publishing.

A. Silberschatz, H. F. Korth & S. Sudarshan (2001): Database System Concepts (4th Edition), McGraw-Hill ISBN 0-07-255481-9.

R. Elmasri & S. Navathe (1996): Fundamentals of Database Systems, Μετάφραση στα Ελληνικά από τις εκδόσεις "ΔΙΑΥΛΟΣ".

Instructor's notes and papers