COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	8.005	SEMESTER	8th
COURSE TITLE	Reliability Engineering		
COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS Credits**
	Theory (Lectures)	2	2
	Tutorial/Exercises	2	2
	TOTAL	**5**	**4**
COURSE UNIT TYPE	Specialized knowledge/Consolidation		
PREREQUISITES	Introduction to Databases		
LANGUAGE OF INSTRUCTION/EXAMS	Greek and English		
COURSE DELIVERED TO ERASMUS STUDENTS	yes		
WEB PAGE (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 Skills

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 METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	▪ Use of ICTs in lecturing ▪ Use of ICTs for the communication with students via the e-class platform
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	39
Project (journal/paper reading and theoretical study)	26
Tutorials	32
Non-guided personal study	30
Total Contact Hours	**120**

ASSESSMENT METHODS	The course grade is based on written examination (50 %) and laboratory work (50%). The written exam is structured as follows: 1. Part A (50 %) includes five (5) questions aiming to assess the students' understanding of key theoretical concepts and constructs. The response to each question is typically short but may require critical thinking. 2. Part B (50 %) presents three (3) design challenges of comparable complexity. Students are required to select and solve two (out of the three challenges). Each challenge may be split into sub-challenges, thus covering a range of topics. The laboratory entails assessment of individual exercises and a group project which presented in class.

(5) RECOMMENDED BIBLIOGRAPHY

-Recommended 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".*
- *M. Liu, G. Dobbie, T. W. Ling (2002): A Logical Foundation for Deductive Object-Oriented Databases, ACM Transactions on Database Systems, Vol. 27, No. 1, Pages 117–151.*
- *J. Grant and J. Minker (1992): The impact of Logic Programming on Databases, Communications of the ACM, Vol.35, No.3, March.*

Relevant Scientific Journals:

- *ACM Transactions on Database Systems*