SENG 202 - INTRODUCTION TO DATABASE SYSTEMS

Course Code	Course Name		Semester	
SENG 202	Introduction to Database Systems		Fall ☐ Spring ☒ Summer ☐	
Hours			**Credit**	**ECTS**
Theory	**Practice**	**Lab**	3	6
3	0	0		

Course Details	
Department	Software Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Course Objectives	The aim of this course is to provide students with basic knowledge and skills in information systems and database management systems (DBMS). The course aims to provide students with the opportunity to gain in-depth knowledge in data management, database design, use of SQL language and data analysis. Participants will learn how information systems work in the business world and how to use them effectively, while reinforcing the fundamentals of database management and design. Use relational algebra to express database queries. Use SQL to interact with database management systems. Design appropriate database tables, using functional dependencies and normal forms. Implement a disk-oriented database storage manager with table heaps and indexes. Understand, compare, and implement the fundamental concurrency control algorithms. Implement database recovery algorithms and verify their correctness. Identify trade-offs among database systems techniques and contrast distributed/parallel alternatives for both on-line transaction processing and on-line analytical workloads. Interpret and comparatively criticize database system architectures.

Course Content	The course covers a wide range of topics, starting from the basic concepts of information systems to the history and structure of database management systems and basic commands in SQL language. Weekly lectures will focus on advanced data management techniques such as data modeling, requirements analysis, conceptual modeling, normalization, and data manipulation commands. Modern data management tools such as different types of databases, NoSQL databases, and cloud-based solutions will also be covered. In addition to theoretical knowledge, participants will be able to reinforce what they have learned through practical applications and projects and develop solutions for data management problems they may encounter in the business world.
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☒ Discussion ☒
Prerequisites/ Corequisites	
Work Placement(s)	

Textbook/References/Materials

1. Garcia-Molina, H., Ullman, J. D., & Widom, J. (2014). Database systems: The complete book (2nd ed.). Pearson. ISBN 13: 978-1-292-02447-9
2. Elmasri, R., & Navathe, S. (2015). *Fundamentals of database systems* (7th ed.). Pearson.
3. Kroenke, D. M., & Auer, D. J. (2013). Database processing: Fundamentals, design, and implementation (13th ed.). Pearson Education.
4. Hoffer, J. A., Venkataraman, R., & Topi, H. (2013). Modern database management (11th ed.). Pearson.
5. Connolly, T., & Begg, C. (2015). Database systems: A practical approach to design, implementation, and management (6th ed.). Pearson Education.
6. Mohan, C., & Goyal, D. (2012). Database management systems: Concepts, design, and applications (2nd ed.). McGraw-Hill Education.

Course Category				
Mathematics and Basic Sciences	☐		Education	☐
Engineering	☒		Science	☐
Engineering Design	☒		Health	☐
Social Sciences	☐		Profession	☒

Weekly Schedule

No	Topics	Materials/Notes
1	Relational Model & Algebra: Introduction and Relational Database Basics: What is a database, what is a relational database, terminology	

2	SQL Basics: DDL commands (CREATE, ALTER, DROP, TRUNCATE). DML commands (SELECT; INSERT, DELETE, UPDATE)	
4	Database Design and Requirements Analysis: Database design steps, requirements analysis. ER Diagrams and Relational Model: Basic concepts of ER diagrams, basics of the relational model	
5	Conceptual Design and ER Model: ER diagrams, entities, relationships, integrity constraints	
6	Logical Design and Relational Model: From ER diagram to relational model	
3	SQL Aggregates, SQL Grouping, Joins	
7	Advanced SQL Queries: LIKE operator, set and bag operations, SQL Subqueries	
8	Midterm Exam	
9	Relational Algebra, Query Optimization Basics	
10	Data Anomalies and Solutions: Insertion, deletion and update anomalies, solutions Normalization 1NF, 2NF, 3NF, BCNF, 4NF, 5NF normal forms, normalization processes	
11	Operations and Scheduling:	
12	Concurrency Control Theory: Introduction to Transactions, Concurrent access issues, ACID properties,	
13	More Transactions: Serial schedules, conflict equivalence	
14	Two-Phase Locking Concurrency Control	
15	Overview	
16	Final	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage %**
Attendance		
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework		**20**
Presentation / Seminar		
Project		
Report		
Seminar		
Midterm Exam		**30**
Final Exam		**50**
	Total	**100**
Contribution of Midterm Studies to Success Grade		

Contribution of End of Semester Studies to Success Grade		
	Total	**100**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	14	3	42
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time	14	3	42
Quiz/Studio/Criticize			
Homework	10	20	20
Presentation / Seminar	1	6	6
Project			
Report			
Midterm Exam and Preparation for Midterm	1	20	20
Final Exam and Preparation for Final Exam	1	20	20
Total Workload			**150**
Total Workload / 25			**6**
ECTS Credit			**6**

Course Learning Outcomes	
No	**Outcome**
L1	Describe the basic components and functions of information systems: Students will be able to describe the basic components of information systems (data, software, hardware, people) and their functions.
L2	Compare Different Information System Architectures: Students will be able to compare centralized, distributed and cloud-based information system architectures and discuss the advantages and disadvantages of each.
L3	Write Basic Database Queries with SQL Language: Students will be able to write basic queries, insert, update and delete data in databases using SQL language.
L4	Design a Database Using Data Modeling Techniques (ERD): Students will be able to create a database design using ERD and visualize the connections between entities and relationships correctly.
L5	Develop an appropriate model by analyzing database requirements and normalization: Students will be able to develop an appropriate data model by analyzing database requirements and improve the design by using normalization techniques.

Contribution of Course Learning Outcomes to Program Competencies/Outcomes															
Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant															
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**	**Total**

L1	3	2	2	3	2	3	3	4	2	2	3					29 %53
L2	3	3	3	4	2	3	2	4	2	3	3					32 %58
L3	4	3	2	4	3	4	3	4	2	2	3					34 %62
L4	4	4	3	4	3	3	3	4	2	2	3					35 %64
L5	5	4	3	4	5	4	3	4	3	3	3					41 %75
															Total	171