University of Tehran
School of Electrical and Computer Engineering

Course:	**8101459–Database Design**
Course type:	<table><tr><td></td><td colspan="6">EE*</td><td colspan="3">CE*</td><td rowspan="2">Credit: 3</td></tr><tr><td></td><td>Com</td><td>E</td><td>P</td><td>B</td><td>Con</td><td>D</td><td>SW</td><td>HW</td><td>IT</td></tr><tr><td>Required</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☒</td><td>☐</td><td>☒</td></tr><tr><td>Elective</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr></table>
Level:	Undergraduate ■ Graduate ☐
Co-requisite(s):	None.
Prerequisite(s):	Operating Systems I(8101443)
Prerequisite by topic:	Basic understanding of data structures and algorithms Basic understanding of operating systems: scheduling, concurrency and synchronization, memory management, storage management
Textbook(s):	[1] R. Ramakrishnan and J. Gehrke, *Database Management Systems,* McGraw-Hill 3rd Edition, 2003.
Coordinator:	Azadeh Shakery, Assistant Professor, School of ECE
Goals:	This course introduces relational database systems. In this course the students will learn how to design and create relational databases and how to use them. They will also learn about the internals of database management systems: how such systems store data, optimize and execute queries and process transactions.
Outcome:	Upon successful completion of the course, students will be able 1. to understand the basics of a database system and its architecture 2. to design a database for an application: draw an Entity-Relationship (ER) diagram from a problem specification, convert the ER diagram to relations, and normalize the relations 3. to write database queries in SQL 4. to write relational algebra and relational calculus expressions for queries 5. to understand how the relations and indexes are stored in a database system 6. to identify useful indexes for a specific database and workload 7. to understand how the queries are optimized and executed in a DBMS 8. to understand concurrency control and recovery in database systems
Topics:	❖ Foundations ▪ The relational model ▪ Relational Algebra and Relational Calculus ▪ SQL: Queries, Constraints, Triggers

	▪ Schema Refinement and Normal Forms ❖ Storage and Indexing ▪ Storing Data: Disks and Files ▪ Tree-Structured Indexing ▪ Hash-Based Indexing ❖ Query Evaluation ▪ External Sorting ▪ Evaluating Relational Operators ▪ A Typical Relational Query Optimizer ❖ Transaction Management ▪ Overview of Transaction Management
Computer usage:	An open-source Database management system
Assignments:	10 homework assignments 1 computer assignment
Projects:	None
Grading:	Assignments: 20 % Quizzes: 10 % Midterm exams: 35 % Final exam: 35 %
Further readings:	[1] H. Garcia-Molina, et al., *Database Systems: The Complete Book,* Pearson Prentice Hall 2nd Edition, 2009. [2] J.D. Ullman and J. Widom, *A First Course In Database Systems*, Pearson Prentice Hall 3rd Edition, 2008.
Prepared by:	Azadeh Shakery
Date:	September, 10, 2017

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		