Course Title	Databases and Information Management Systems				
Course Code	CSC635				
Course Type	Compulsory				
Level	Master (2nd Cycle)				
Year / Semester	1st Year / 2nd Semester				
Teacher's Name	TBA				
ECTS	10	Lectures / week	3 Hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	To provide information on database management systems. Various database models will be introduced, such as Hierarchical, Relational, and Network models as well as emerging models such as Object Oriented Data models and Object Relational models. An emphasis to the Relational database systems is given and students learn all the steps involved with database analysis, design and development. Database administration including reliability, security and integrity are also discussed. Emphasis is also given to the internals mechanisms of a database.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Distinguish between the various Database Management Systems models • Describe and analyze various steps that are implemented in designing Relational Database Systems • Create, organize and manipulate databases using correct procedures such as Entity-Relationship diagrams, functional dependencies, and table normalization • Build queries using the Structured Query Language, relational algebra and relational calculus • Utilize database techniques such as security, system recovery, transaction processing and concurrency control				
Prerequisites	CSC615	Co-requisites	None		
Course Content	To provide information on database management systems. Various database models will be introduced, such as Hierarchical, Relational, and Network models as well as emerging models such as Object Oriented Data models and Object Relational models. An emphasis to the Relational database systems is given and students learn all the steps involved with database development. Database administration including reliability, security and integrity are also discussed. Description: Relational Data model; A more in-depth analysis of the relational data structure including definition of the modeling concepts and notation of the				

	relational model, identification of integrity constraints, update operations and their effects on integrity constraints. Structured Query Language (SQL); Introduction to a comprehensive database language. Statements for data definition, query, and update. Relational algebra; An introduction to the relational algebra using the traditional set operations, attribute names for derived relations and special relational operations. Tuple Relational Calculus and Domain Relational Calculus. Query By Example (QBE); Overview of another relational language. Functional Dependencies and Normalization for Relational Databases; Designing guidelines for Relation Schemes, Functional dependencies, General Definitions of First, Second and Third Normal Forms, Boyce-Codd Normal Form (BCNF). Storage and Indexing in Database Management Systems: Comparison of File Organizations (System and Cost Model, Assumptions), I/O cost analysis (Heap Files, Sorted Files and Clustered B+Tree Index File), Indexes and Performance Tuning (Understanding the Workload, Index Specification in SQL, Index-Only Plans,Index Selection Guidelines) Storing Data: Disks and Files: Disks (Components, Accessing a Block, Arranging Pages), RAID (Basic Concepts, Levels: 0 to 5 and 0+1), Disk Space Manager, Buffer Manager: Definitions (Pin/Unpin, Dirty-bit), Replacement Policies (LRU, MRU, clock), Sequential Flooding, Buffer in OS, File, Page and Record Formats: File Structure (Linked-List/Directory-based), Page Structure with Fixed/Variable-length records, Record Structure (Fixed-length/Variable-length), System Catalog. Tree-based Indexing: B+Trees, Hash-based Indexing Overview of Query Evaluation: Revision of the Relational Model and Relational Operators, Overview of Query Evaluation, Introduction to Query Optimization, Alternative Plans: Motivation with Examples External Sorting Evaluating Relational Operators Typical Relational Query Optimizer Transaction Management & Concurrency Control: Introduction to Transactions, The ACID (Atomicity-Consistency-Isolation-Durability) Properties, Transactions and Schedules, Concurrent Executions of Transactions and Problems, Transaction Support in SQL Transactions and Schedules (Serial, Complete Schedules), Serializability (Conflicting Actions, Conflict Equivalence, Conflict Serializability, Testing for Serializability using Precedence Graphs, View Equivalence and View Serializability, Concurrent Execution of Transaction, Recoverability (Recoverable Schedule, Cascadeless schedule, Strict Schedules

<table>
<tr><td></td><td>Concurrency Control with Locking
Concurrency Control with Timestamps

Crash Recovery

Introduction to Distributed Databases, Types of Distributed Databases, Homogeneous, Heterogeneous (Federated, MultiDBs), Distributed Databases Architectures (Client Server, Collaboration Server, Middleware), Data Fragmentation & Replication (Horizontal, Vertical and Mixed Fragmentation. Synchronous vs. Asynchronous Replication), Distributed Catalog Management. Distributed Query Processing (Centralized, Ship-to-one-site, Semi-join, Bloom-join)

Introduction to Semi-Structured (XML) and Unstructured Data with emphasis on Big Data management techniques</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Raghu Ramakrishnan and Johannes Gehrke: DATABASE MANAGEMENT SYSTEMS, McGraw-Hill Publishers, Latest Edition

Elmarsi & Navathe ,FUNDAMENTALS OF DATABASE SYSTEMS, Benjamin/Cummings, Addison-Wesley, Latest Edition

Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer D. Widom, DATABASE SYSTEMS: THE COMPLETE BOOK, Prentice Hall, Latest Edition.

Silberschatz, Korth et al, DATABASE SYSTEMS CONCEPTS, McGraw-Hill, Latest Edition.</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Mid – Term Examination</td><td>25%</td></tr><tr><td>Final Examination</td><td>40%</td></tr><tr><td>Assignments/Lab</td><td>25%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>English</td></tr>
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