ECSE206L: Information Management Systems

Course Type:	Core

L	T	P	Credits
3	1	2	5

Pre-requisites: NA

Course Learning Outcomes:

CLO1: Show the understanding of the fundamentals relational database systems.

CLO2: Construct databases using DBMS products such as MySQL/Oracle/My SQL Server.

CLO3: Design database systems and understand new developments and trends in databases.

Module 1 (Contact hours: 12)

Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels. Mappings, Database, users and DBA Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus. Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, Irreducible set of FD, Normalization – 1NF, 2NF, 3NF.

Module 2 (Contact hours: 12)

Decomposition using FD- dependency preservation, BCNF, Multivalued dependency, 4NF, Join dependency and 5NF. Overview, measures of query cost, selection operation, sorting, join. Evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views. Transaction concepts, properties of transactions, serializability of transactions, testing for serializability.

Module 3 (Contact hours: 9)

System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems. Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Isolation, Intent locking; Introduction, Discretionary access control, Mandatory Access Control, Data Encryption.

Module 4 (Contact hours: 9)

Introduction to Distributed Database Systems (DDS), pro and cons of DDS, transactions, commit, and transparency in DDS. Data warehousing, Big data technologies, including big data storage, big data processing and big data analytics; Introduction to NoSQL database systems, including column stores, RDF stores, Hbase;Hadoop MapReduce Algorithms for expensive queries over big data.

Lab Experiments

Entity-Relationship model:- Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.
SQL Concepts: - Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator
Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types. Transaction control commands – Commit, Rollback, Savepoint. PL/SQL Concepts: - Cursors, Stored Procedures, Stored Function, Database Triggers.

Suggested Textbooks:

1) *Ramakrishnan, Raghu and Johannes Gehrke, Database management systems (3rd Edition), McGraw Hill, 2000. ISBN- 978-0072465358.*
2) *Elmasri, Ramez and Shamkant B. Navathe, Fundamentals of database systems, (7th Edition) Pearson, 2015. ISBN- 978-0133970777.*
3) *Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill , 2010, ISBN:0-07-352332-1*
4) *Date C.J, "An Introduction to Database", 8thEdition, 2003, Addison-Wesley Pub Co, ISBN: 978-0321197849*
5) *Jeffrey A. Hoffer, Heikki Topi, V Ramesh – MODERN DATABASE MANAGEMENT, 10 Edition, PEARSON, 2012*

References:

1) *Supplementary Resource:-http://ovid.cs.depaul.edu/Classes/CSC355-S14/CSC355-links.htm*
2) *ONLINE COURSES VIA EDX*
3) *Database Systems Concepts and Design*
   A course on the fundamentals of Relational Database systems
   https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x
4) *Developing SQL Databases:- Learn the technologies and features needed to create and design SQL databases, including how to implement SQL views, indexes and tables.*
   https://www.edx.org/course/developing-sql-databases-microsoft-dat215-1x-1

Evaluation Components:

Components of Course Evaluation	Percentage
Mid Term Examination	15
Quiz 1	05
Lab Mid Term Examination	10
Continuous Lab Evaluation	15
Quiz 2	05
End Term Examination	30
End Term Lab Exam (Project)	20

During the Lab sessions students will gain practical experience by the followings.

1. Cover core relational database topics including logical and physical design and modelling
2. Develop database applications using front-end tools and back-end DBMS.
3. Design, Create and maintain data warehouses and Learn recent advances in NOSQL, Big Data and related tools.