Week Number	Topics
W10	Advanced Planning Games: Markov Decision Processes – I
W11	Markov Decision Processes – II, Evaluation Functions
W12	Game Theory – I Game Theory – II Hidden Markov Models and Filters: Markov Networks
W13	Gibbs Sampling, Particle Filtering Hidden Markov Models – I Hidden Markov Models – II
W14	**Applications:** Computer Vision – I. Computer Vision – II Robotics – I,
W15	Robotics – II Grammar of English Natural Language Processing – I,
W16	Natural Language Processing – II

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Course Code	**CS222**
Course Title	**Database Concepts**
Cr Hrs	4 (3+1)
Pre-requisite	CS211 (Data Structures & Algorithms)
Recommended Texts	1. Fundamentals of Database Systems, Ramez Elmasri, 2015, 7th Edition, Pearson publishers, ISBN-10: 0133970779, ISBN-13: 978-0133970777 2. Database Systems: Design, Implementation, & Management, Carlos Coronel; Steven Morris, 2018, 13th Edition, Cengage Learning, ISBN-10: 1285196147, ISBN-13: 978-1337627900 3. Database Systems: A Practical Approach to Design, Implementation, and Management, Thomas Connolly, Carolyn Begg, 2014, 6th Edition, ISBN-10: 0132943263, ISBN-13: 978-0132943260 4. Learning SQL: Generate, Manipulate, and Retrieve Data, Alan Beaulieu (Author), O'Reilly Media; 3rd edition (April 7, 2020), ISBN-13 : 978-1492057611
Course Description	Investigates how database management system techniques are used to design, develop, implement and maintain modern database applications in organizations.
Course Objectives	The main objective of this course is to • Introduce students to fundamentals of database technology by studying databases from three viewpoints: those of the database user, the database designer, and the database administrator. • It teaches the use of a database management system (DBMS) by treating it as a black box, focusing only on its functionality and its interfaces.

Course Outline	• Introduction to database systems. • Conceptual database modeling using the entity-relationship • The SQL language, Database application development. • Integrity constraints and database anomalies • Schema quality through the study of functional dependencies and normalization. • Transaction Management, Concurrency and Serializability. • NoSQL

Week Wise Distribution of the Contents

Week Number	**Topic**
W1	Course Introduction: Data and information, Database definitions, The concept of a shared organizational database, Traditional File Processing System, Database Management Systems
W2	Advantages of DBMS, Levels of Data, Database Users, Database Administrator, Data Model and DBMS The three level architecture: External, Conceptual and Internal Levels
W3	Data independence: Logical Data Independence, Physical Data Independence, Functions of DBMS, DBMS Environment Evolution of Data Models, Hierarchical, Network, Relational and Object Oriented
W4	Conceptual, Logical and Physical Designs. Entity-Relationship Data Model, Constructs of E-R Data Model: Entity, Attributes and Relationships, Entity type, Entity Instance, Entity Set, Entity types, their properties and Instances, Naming Entity Types, types of attributes, domain of an attribute, Examples
W5	Key Attributes, Simple or Composite Key, Super Key, Candidate Key, Primary Key, Alternate Key, Relationships, Unary, Binary and Ternary Relationship, Naming Relationships
W6	Cardinality and Modality, Integrity Constraints, Types of Integrity Constraints: Domain, Entity Integrity, Referential and Key Constraints
W7	Introduction to MYSQL WORKBENCH/MS SQL SERVER Intro to SQL, DDL, DML, DCL, TCL,
W8	SQL-DCL: SELECT, with various clauses such as WHERE, IN, LIKE, GROUP BY, DISTINCT, ORDER BY etc. SQL-DML: INSERT, UPDATE, DELETE
MID EXAM / MID OF SEMESTER	
W9	Joins: cross, inner, natural, left outer, right outer, full outer, SQL-DCL: GRANT, REVOKE
W10	SQL-DDL: CREATE, ALTER, DROP, TRUNCATE, COMMENT and RENAME VIEW Management, Indexing
W11	Functions, Stored procedure, Triggers, Backup management, Partitioning
W12	Anomalies and Types: Update, Delete, Insert, Functional Dependency, Inference Rules: Reflexivity, Augmentation, Transitivity, Additivity or Union, Projectivity or Decomposition, Pseudo transitivity
W13	Normalization, 1NF, 2NF, 3NF, Loss of Information in Decomposition, Boyce-Codd Normal Form (BCNF)

W14	4NF, 5NF, Domain Key Normal Form (DKNF), Normalization: Revision with practical Examples
W15	Transaction Management and Concurrency Control, Evaluating Transaction Results, Transaction Properties: Atomicity, Concurrency, Isolation, Durability, Transaction Management with SQL, Scheduler, Deadlocks
W16	Bigdata, Scaling, NOSQL, Types of NOSQL Database, Features of NOSQL databases, Uses of NOSQL, Advantages/Disadvantages, CAP Theorem, NOSQL vs RDBMS

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Course Code	**CS212**
Course Title	**Operating Systems Concepts**
CrHr (TCH + LCH)	3(3+0)
Pre-requisite	CS211 (Data Structures & Algorithms)
Recommended Texts	1. Operating Systems: Internals and Design Principles (8th Edition) ,William Stallings, Pearson; 9 edition 2018, ISBN-13 : 978-0134670959. 2. Operating System Concepts, AviSilberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons, 2008, ISBN-13 : 978-0470128725. 3. Operating System Design: The Xinu Approach, Douglas Comer, 2015, ISBN-13: 978-1498712439
Course Description	This course gives you the overview on operating system in general and how different activities and problems are being handled by it. Different algorithms and techniques are introduced to students for handling different operations within OS
Course Objectives	• Build an understanding of the fundamental concepts of operating system. • Letting students understand the main techniques and algorithms being implemented for handling different issues in operating system
Course Outline	• Introduction, Single-user systems. • Operating system components and services. • Operating system structures, Process concept, Inter-process communication (IPC) and process synchronization,UNIX/Linux IPC tools and associated system calls, Use of FIFOs in a program. • Thread models, Schedulers, Dispatcher. • Algorithm evaluation, Process synchronization. • The Critical Section Problem, The Bakery Algorithm. • Deadlock and Starvation, Deadlock handling, Detections and Recovery. • Memory management, Paging, Memory Management in Intel 80386, Virtual Memory, Demand Paging, , Page Fault, Belady's Anomaly, Stack Replacement Algorithms, Thrashing. • File Concept, Directory Structure, File System, Mounting, File Sharing and Protection, Space Allocation Techniques. • Disk Structure and Scheduling, Free Space Management.