

CSE 2020 – 2024 Batch 5th Semester Syllabus (Odd Semester, 2022)

Sl. No	Type of Course	Course Code	Course Title	Credits
1	Professional Core Courses	PCC-CS501	Database Management Systems	3
2	Professional Core Courses	PCC-CS591	Database Management Systems Laboratory	2
3	Professional Core Courses	PCC-CS502	Formal Language & Automata Theory	3
4	Professional Core Courses	PCC-CS503	Computer Networks	3
5	Professional Core Courses	PCC-CS593	Computer Networks Laboratory	2
6	Humanities and social sciences including Management Courses	HSMC501	Humanities II (Principles of Management)	3
7	Professional Elective Courses	PEC-CS501	Professional Elective-I (Image Processing)	3
8	Humanities and social sciences including Management Courses	HSMC502 & HSMC582	Universal Human Values – V (ESP – V & SDP – V)	3
9	Mandatory Additional Requirements (MAR)	MC581	Mandatory Additional Requirements (MAR)	0
10	Project	PROJ-CS501	Innovative Project - III	1
11	MOOCs (Mandatory for Honours)	MOOC 5	Massive Open Online Courses (Mandatory for B.Tech(Honours))	2
Total Credit Points of Semester [for B.Tech]				23
Total Credit Points of Semester [for B.Tech (Hons.)]				25

Database Management Systems

Code: PCC-CS501

Credit: 3

Pre-Requisite:- Fundamentals of Mathematics, algebra, calculus etc.

Module-1:

Introduction : Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Module-2:

Entity-Relationship Model

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Module-3:

Relational Model

Structure of relational databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

Module-4:

SQL and Integrity Constraints

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, 1NF, 2NF, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF etc.

Module-5:

Internals of RDBMS

Physical data structures, Query optimization: join algorithm, statistics and cost based optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock based protocols, two phase locking.

File Organization & Index Structures

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Text Books/ Reference Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. ElmasriRamez and NovatheShamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System, McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing: Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.
8. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
9. "Fundamentals of Database Systems", RamezElmasri, ShamkantB.Navathe, Addison Wesley Publishing Edition
10. "Database Management Systems", ArunK.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Database Management Systems Laboratory

Code: PCC-CS591

Credit: 2

Module-1:

Structured Query Language

Creating Database, Creating a Database, Creating a Table, Specifying Relational Data Types, Specifying Constraints, Creating Indexes

Module-2:

Table and Record Handling

INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements

Module-3:

Retrieving Data from a Database

The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions, Combining Tables Using JOINS, Sub-queries

Module-4:

Database Management

Creating Views, Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE, Basics of PL/SQL & its implementations

Formal Language & Automata Theory

Code: PCC-CS502

Credit: 3

Pre-Requisite:- Elementary discrete mathematics includes the notion of set, function, relation, product, partial order, equivalence relation, graph & tree. They should have a thorough understanding of the principle of mathematical induction.

Module-1:

1. Introduction to concepts of alphabet, language, production rules, grammar and automaton, finite state model, concept of DFA and its problems, concept of NFA and its problems.
2. NFA to DFA conversion, Construction of DFA & NFA for any given string and vice versa, Minimization of FA and equivalence of two FA, Mealy & Moore machine and their problems. Limitations of FSM.

Module-2:

1. Introduction to the concept of Chomsky Classification of Grammar, language generation from production rules and vice-versa. Regular language and regular expressions, identity rules.
2. Arden's theorem state and prove, Construction of NFA from regular expression, Conversion of NFA with null moves to without null moves, closure properties, pumping lemma and its applications.

Module-3:

1. Introduction to Context Free Grammar, Derivation trees, sentential forms. Right most and leftmost derivation of strings, concepts of ambiguity. Minimization of CFG, Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages, Enumeration of properties of CFL (proofs omitted).
2. Closure property of CFL, Ogden's lemma & its applications, Push Down Automata: Push down automata, definition and description, Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of CFL and PDA, interconversion, DCFL and DPDA.

Module-4:

1. Turing Machine : Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines (proofs not required), Universal Turing Machine, Halting problem, P, NP.

Module-5:

1. Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram, Design of sequence detector.
2. Finite state machine: Definitions, capability & state equivalent, kth- equivalent concept, Merger graph, Merger table.
3. Compatibility graph, Finite memory definiteness, testing table & testing graph.

Text Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
2. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
3. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
4. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
5. John Martin, Introduction to Languages and the Theory of Computation, TataMcGraw Hill., PEARSON.
6. Dr. R.B.Patel, Theory of Computation, Khanna Publishing House

Computer Networks

Code: PCC-CS603

Credit: 3

Pre-Requisite:- Basic knowledge of python (such as through Intro to Computer Science) is required. Basic search algorithms and a working knowledge of Linux and virtual machines.

Module – 1:

Overview of Data Communication and Networking:

Introduction; Data communications: components, data representation (ASCII, ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical Level:

Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;

Module – 2:

Data link Layer:

Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium Access sub layer:

Point to Point Protocol, LCP, NCP, and Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet (in brief);

Module – 3:

Network layer:

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Procols: ARP, IP, ICMP, IPV6;

Transport layer:

Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Module – 4:

Application Layer

Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

Modern topics:

ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief
Wireless LAN: IEEE 802.11, Introduction to blue-tooth.

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “ – TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
3. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education
4. Zheng& Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas

Computer Networks Laboratory

Code: PCC-CS693

Credit: 2

Pre-Requisite:- Basic knowledge of python (such as through Intro to Computer Science) is required. Basic search algorithms and a working knowledge of Linux and virtual machines.

Topic:-

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
 - Networking cables (CAT5, UTP)
 - Connectors (RJ45, T-connector)
 - Hubs, Switches
- TCP/UDP Socket Programming
- Multicast & Broadcast Sockets

Implementation of a Prototype Multithreaded Server

- Implementation of
 - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
 - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
 - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Humanities – II (Principles of Management)

Code: HSMC501

Credit: 3

Pre-Requisite:- No Pre-requisite or co-requisite is required for this subject.

Module-1:

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives;

Module-2:

1. Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.
2. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.

Module-3:

1. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
2. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-4:

1. Leadership: Concept, Nature, Styles.
2. Decision making: Concept, Nature, Process, Tools & techniques.
3. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial

Module-5:

1. Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.
2. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
3. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Text Books:

1. Management: Principles and Practice by S.K. Mandal, Jaico Publishing House
2. Management Principles and Practices by ParagDiwan
3. Principles and Practices of Management by Partho S. Sengupta, Vikas Publishing House
4. Principles and Practice of Management by L.M. Prasad, Sultan Chand & Sons

Professional Elective – I

Paper Name: Image Processing

Code: PEC-CS501

Credit: 3

Introduction : Background, Digital Image Representation, Fundamental steps in Image Processing, Different types of imaging, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation: A Simple Image Model, types of images, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization, Neighbourhood, Connectivity, Different types of operation on image(arithmetic, logical, set) .

Mathematical Preliminaries : Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement : Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration : Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.

Image Segmentation : Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

An Overview of GIS: Definition of GIS, Features & Functions, GIS as an Information System, GIS & Cartography, GIS data feeds, Historical development of GIS.

Book: Digital Image Processing, Gonzalves,Pearson

Paper Name: Universal Human Values – V

Code: HSMC502 & HSMC582

Credit: 3

ESP – V (HSMC502): Subject wise preparation for GATE EXAMINATION

SDP – V (HSMC582): Quantitative aptitude, verbal, non-verbal practice, logical reasoning etc.
