University of Engineering & Management, Kolkata
Department of Computer Science
B.Tech (CSE(IOT, CYS, BCT)) 2021 - 2025 Batch
5th Semester Structured Syllabus

Sl. No.	Paper Code	Paper Name	Credit Point
1	ESC-CSE501	Signals & Systems	**3**
2	PCC-CSE501	Database Management Systems	**3**
3	PCC-CSE591	Database Management Systems Laboratory	**2**
4	PCC-CSE502	Formal Language & Automata Theory	**3**
5	PCC-CSE503	Software Engineering	**3**
6	PCC-CSE593	Software Engineering Laboratory	**2**
7	HSMC-CSE501	Principles of Management	**3**
8	PEC-CSE501B	Professional Elective - I: Digital Forensics	**3**
9	HSMC-CSE502	Essential Studies for Professionals - V	**0.5**
10	HSMC-CSE582	Skill Development for Professionals - V	**0.5**
11	MC-CSE501	Constitution of India	**0**
12	MC-CSE581	Mandatory Additional Requirements (MAR)	**0**
13	PROJ-CSE501	Innovative Project - III	**1**
14	MOOC 5	Massive Open Online Courses (Mandatory for B.Tech(Honours))	**2**
Total Credit Points of Semester [for B.Tech]			**24**
Total Credit Points of Semester [for B.Tech(Hons.)]			**26**

Paper Name: Signals & Systems
Paper Code: ESC-CSE501
Credit: 3

Topic: -
Module-1:
1. Signals and systems as seen in everyday life, and in various branches of engineering and science.
2. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals.
3. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

Module -2:
1. Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with a periodic convergent inputs.
2. Characterization of causality and stability of linear shift invariant systems. System representation through differential equations.

Module -3:
1. Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality.
2. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT).
3. Parseval's Theorem. The idea of signal space and orthogonal bases.

Module-4:
1. Evolution of Transforms: Fourier Transform, Laplace Transform, Z-transform (single sided and Double sided).
2. The Laplace Transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, , solution to differential equations and system behavior using Laplace Transformation.
3. The z-Transform for discrete time signals and systems- Eigen functions, region of convergence, z-domain analysis.

Module-5:
1. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects.
2. Relation between continuous and discrete time systems.

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.

3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980

Paper Name: Database Management Systems
Paper Code: PCC-CSE501
Credit: 3

Topic: -
Module-1:
1. Introduction
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Module-2:
1. Entity-Relationship Model
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Module-3:
1. Relational Model
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

Module-4:
1. 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.

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

Module-5:
1. Internals of RDBMS
Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.

2. 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. Elmasri Ramez and Novathe Shamkant, “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”, Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
10. “Database Management Systems”, Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Paper Name: Database Management Systems Laboratory
Paper Code: PCC-CSE591
Credit: 2

Topic: -
Module-1:
1. Structured Query Language
Creating Database, Creating a Database, Creating a Table, Specifying Relational Data Types, Specifying Constraints, Creating Indexes

Module-2:
1. Table and Record Handling
INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements

Module-3:
1. 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:
1. Database Management
Creating Views, Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE, Basics of PL/SQL & its implementations

Text Books/ Reference Books:
1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, “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
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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", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
10. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Paper Name: Formal Language & Automata Theory
Paper Code: PCC-CSE502
Credit: 3

Topic: -
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

Paper Name: Software Engineering
Paper Code: PCC-CSE503
Credit: 3

Module-1:
1. Software Engineering –Objectives, Definitions, Software Process models – Waterfall Model, Prototype model, RAD, Evolutionary Models, Incremental, Spiral etc. new age technologies.

Model-2:
Software Project Planning- Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model etc, risk management.

Module-3:
Structured Analysis – SA / SD, SRS, Context diagram and DFD, Physical and Logical DFDs, Data Modelling, ER diagrams, Software Requirements Specification

Module-4:
Design Aspects: Top-Down And Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis Functional vs. Object- Oriented approach.

Module-5:
Unified Modelling Language, Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram etc.

Module-6:
Coding & Documentation – Structured Programming, Modular Programming, Module Relationship- Coupling, Cohesion, OO Programming, Information Hiding, Reuse, System Documentation.

Testing – Levels of Testing, Integration Testing, System Testing.

Module – 7:
Software Quality, Quality Assurance, Software Maintenance, Software Configuration Management, Software Architecture, maintenance, software reuse.

Text / Reference Books:
1. Software Engineering: A practitioner's approach– Pressman (TMH)
2. Software Engineering- Pankaj Jalote (Wiley-India)
3. Software Engineering- Rajib Mall (PHI)
4. Software Engineering –Agarwal and Agarwal (PHI)

Paper Name: Software Engineering Laboratory
Paper Code: PCC-CSE593
Credit: 2

Topic: -

Part-A: Development of requirements specification, function-oriented design using SA/SD, object-oriented design using UML, test case design, implementation of CRUD based project using C++ (along with file management system or database management system) and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.

Part-B: Development of simple software with proper front end & Backend using Java, JSP, JDBC.

Text / Reference Books:

1. Core and Advanced Java, Black Book, by Dreamtech Press (Author).
2. J2EE: The complete Reference **by** Jim Keogh (Author)

Paper Name: Principles of Management

Paper Code: HSMC-CSE501

Credit: 3

Module I:

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.

2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by Objectives;

Module II:

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 III:

1. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.

2. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module IV:

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 V:

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 / Reference Books:

1. Management: Principles and Practice by S.K. Mandal, Jaico Publishing House

2. Management Principles and Practices by Parag Diwan

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

5. Principles & Practices of Management (B.Tech) by Rajul Dutt, Krishan Prakashan

Professional Elective – I

Paper Name: Digital Forensics

Paper Code: PEC-CS501B

Credit: 3

Module 1:
Introduction:
Understanding of forensic science, digital forensic, The digital forensic process, Lockard's exchange principle, Scientific models.

Module 2:
Understanding of the technical concepts:
Basic computer organization, File system, Memory organization concept, Data storage concepts

Module 3:
Digital Forensics Process Model:
Introduction to cybercrime scene, Documenting the scene and evidence, maintaining the chain of custody, forensic cloning of evidence, Live and dead system forensic, Hashing concepts to maintain the integrity of evidence, Report drafting.

Module 4:
Computer Operating System Artifacts:
Finding deleted data, hibernating files, examining window registry, recycle bin operation, understanding of metadata, Restore points and shadow copies.

Module 5:
Legal aspects of digital forensics:
Understanding of legal aspects and their impact on digital forensics, Electronics discovery

Module 6:
Understanding of digital Forensic tools
Quality assurance, Tool validation, Tool selection, Hardware and Software tools.

Module 7
Case Study:
Understanding of Internet resources, Web browser, Email header forensic, social networking sites.

Text / Reference Books:

1. The basics of digital Forensics (Latest Edition) – The primer for getting started in digital forensics by John Sammons – Elsevier Syngress Imprint
2. Cybersecurity – Understanding of cybercrimes, computer forensics and Legal perspectives by Nina Godbole and Sunit Belapure – Wiley India Publication
3. Practical Digital Forensics – Richard Boddington [PACKT] Publication, Open source community

List of e-Learning Resources:
1. https://nptel.ac.in/
2. https://www.coursera.org/
3. Ministry of Electronics and Information Technology (MeitY) – Govt of India – Information Security Project - https://www.infosecawareness.in/

Paper Name: Constitution of India
Paper Code: MC-CSE501
Credit: 0
Topic:
Module 1

Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Module 2
Union government and its administration: Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. State government and its administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

Module 3
Supreme court: Organization of supreme court, procedure of the court, independence of the court, jurisdiction and power of supreme court. High court: Organization of high court, procedure of the court, independence of the court, jurisdiction and power of supreme court. Subordinate courts: constitutional provision, structure and jurisdiction. National legal services authority, Lok adalats, family courts, gram nyayalays. Public interest litigation (PIL): meaning of PIL, features of PIL, scope of PIL, principle of PIL, guidelines for admitting PIL.

Module 4
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayatiraj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Text / Reference Books:
1. Indian polity, M, Laxmikanth, MC Graw Hill education, 5th Edition.
2. DD Basu, "Introduction to the constitution of India", 21st Edition, Lexis Nexis Books Publication ltd, India3.
3. Magbook: Indian Polity and Governance- Arihant Publication

Paper Name: Essential Studies for Professionals - V

Paper Code: HSMC-CSE502

Credit: 0.5

****GATE Syllabus**

Paper Name: Skill Development for Professionals - V

Paper Code: HSMC-CS582

Credit: 0.5

**** Quantitative aptitude.**