1. Database management System

2. Formal Language and Automata Theory

3. Artificial Intelligence

4. Software Engineering

5. Professional Skill Development

6. Constitution of India-Basic Features and Fundamental Principles

7. MOOCs /SWAYAM/NPTEL etc. Courses-1

8. Summer Internship-II and Seminar

Database Management Systems

Module-1

Database system architecture and Data Model (6 Hrs)

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).
Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Module-2

Relational Query Language (10 Hr)

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server
Relational database design: Domain and data dependency, Armstrong’s axioms, Normal forms, Dependency preservation, Lossless design.
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms

Module-3

Storage Strategy (4 Hr)

Storage strategies: Indices, B-trees, hashing

Module-4

Transaction Processing(8 hrs)

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Module-5

Database Security (6 Lectures)

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Module-6

Advance Topics(4 Hrs)

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

BOOKS

Suggested books

1. “Database System Concepts”, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2. "Fundamentals of Database Systems”, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3. "Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley
4. “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer SciencePress

Formal Language & Automata Theory

Module-1

Introduction and Regular languages and finite automata(10 hrs)

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata
Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Module-2

Context-free languages and pushdown automat (10 hrs)

Context-free grammars (CFG) and Contextfree languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs

Module-3

Context Sensitive Language (2 Hrs)

Context-sensitive languages: Context-sensitive grammars (CSG) and Context-sensitive languages, linear bounded automata and equivalence with CSG

Module-4

Turing Machine(10 Hrs)

Turing machines: The basic model for Turing machines (TM), Turing recognizable (Recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerator.

Module-5

Undecidability

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice’s theorem, undecidable problems about languages

BOOKS

Suggested Books

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

Artificial Intelligence

Module-1

Introduction (10 Hrs)

Overview, Turing test, Intelligent agents. Problem Solving: Solving Problems by Searching: Uninformed search - Depth First Search, Breadth First Search, DFID, Heuristic search - Generate and Test, Best First Search, Beam Search, Hill Climbing, A*, Problem reduction search – AND/OR Graphs, AO*, Constraint satisfaction, Means-ends analysis, Stochastic search methods - Simulated Annealing, Particle Swarm Optimization, Game Playing - Minimax algorithm, Alpha-beta pruning

Module-2

Building Logic(10 Hrs)

Knowledge and Reasoning: Building a knowledge base - Propositional logic, first order logic, Inference in first order logic, Resolution – refutation proofs, Theorem Proving in First Order

Logic: Planning, partial order planning, Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks .

Module-3

Learning (10 Hrs)

Learning: Overview of different forms of learning: unsupervised, supervised, semi-supervised, K-means clustering algorithm, Decision Trees, Neural Networks, Deep Learning.

Module-4

Advance Topics

Advanced topics: Introduction to Computer Vision, Natural Language Processing, Expert Systems, Robotics, Genetic Algorithm.

BOOKS

Suggested Books

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach,” Prentice Hall
2. C. Bishop,“Pattern Recognition and Machine Learning," Springer
3. E. Rich, K. Knight and S. B. Nair, “Artificial Intelligence,” TMH
4. A. C.Staugaard, Jr., “Robotics and AI: An Introduction to Applied Machine Intelligence.

Software Engineering

Module-1

Introduction (8 Hrs)

What is Software Engineering and its history, software crisis, Evolution of a Programming System Product, Characteristics of Software, Brooks’ No Silver Bullet, and Software Myths, Software Development Life Cycles: Software Development Process, The Codeand-Fix model, The Waterfall model, The Evolutionary Model, The Incremental Implementation, Prototyping, The Spiral Model, Software Reuse, Critical Comparisons of SDLC models, An Introduction to Non-Traditional Software Development Process: Rational Unified Process, Rapid Application Development, Agile Development Process.

Module-2

Requirements (8 Hrs)

Importance of Requirement Analysis, User Needs, Software Features and Software Requirements, Classes of User Requirements: Enduring and Volatile, Sub phases of Requirement Analysis, Functional and Nonfunctional requirements, Barriers to Eliciting User requirements, The software requirements document and SRS standards, Requirements Engineering, Case Study of SRS for a Real Time System. Tools for Requirements Gathering: Document Flow Chart, Decision Table, Decision Tree, Introduction to nontraditional Requirements. Module .

Module-3

Software Design(6 hrs)

Goals of good software design, Design strategies and methodologies, Data oriented software design, Coupling, Cohesion, Modular structure, Packaging, Structured Analysis: DFD, Data Dictionary, Structured Design: Structure chart, Object oriented design, Topdown and bottom-up approach, UML, UML Diagrams, Design patterns.

Module-4

Software Project Management (6 Hrs)

Overview of Project Manager Responsibilities & project planning, Software Measurement and Metrics: Line of Code (LOC), Function Point (FP) based measures, Various Size Oriented Measures: Halstead's software science, Project Size estimation Metrics Project Estimation, Techniques, COCOMO, Staffing Level Estimation, Scheduling, Organization & Team Structures Staffing, Risk Management.

Module-5

Software Coding & Testing (5 Hrs)

Development: Selecting a language, Coding guidelines, Writing code, Code documentation. Testing process, Design of test cases, Functional Testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Cyclomatic Complexity Measures: Control flow graphs, Path testing, Data flow and mutation testing, Unit testing, Integration and system testing, Debugging, Alpha & beta testing, testing tools & standards.

Module-6

Software maintenance (4 Hrs)

Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.

Module-7

Software Reliability & Quality Management (3 Hrs)

Introduction to reliability and metrics to reliability measure, Overview of S/W Quality management System ISO 9000, SEI CMM.

BOOKS

Suggested Books

1. Software Engineering: A Practitioner's Approach, R. S. Pressman, McGraw Hill .
2. Zero Defect Software, G. G. Schulmeyer, McGraw-Hill .
3. Fundamental of Software Engg. By Rajib Mall 4th edition PHI .

Professional Skill Development

Module-1

Communicational Skill (10 Hrs)

Public speaking, Group discussion, Gestures and body language & professional presentation skills.

Module-2

Interpersonal Skills (10 Hrs)

Group dynamics, Negotiation skills, Leadership, Emotional intelligence.

Module-3

Employability and Corporate Skills (10 Hrs)

Time management and effective planning, Stress management, People skills, Team work, development of leadership qualities, Decision making and Negotiation skills, Positive attitude, Self-motivation, Professional ethics, Business etiquettes, balancing board room.

Module-4

Business Writing Skill(10 Hrs)

Resume Writing. Interview Skills, Technical Presentation, Guest Lecture, Professional Ethics, Project Management, Entrepreneurship.

BOOKS

Suggested Books

1. “Personality Development and Soft Skills”, Barun Mitra, Oxford University Press.
B. “Managing Soft Skills for Personality Development”, B.N. Ghosh, McGraw Hill.
C. Communication to Win”, Richard Denny, Kogan Page India Pvt. Ltd.

Constitution of India – Basic features and fundamental principle

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world.

Contents

13. Local Self Government – Constitutional Scheme in India 14. Scheme of the Fundamental Right to Equality.
15. Scheme of the Fundamental Right to certain Freedom under Article 19.
16. Scope of the Right to Life and Personal Liberty under Article 21.

MOOCs / SWAYAM / NPTEL etc. Courses -1

Do Online

Online Activity by Swayam, NPTEL, etc.

Summer Internship-2

Contact College or Do In any Company.