Semester – V

Paper Code	Title of the Paper	Course type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
BTCSE 501	Signals & Systems	ES	25	75	100	3-1-0	4
BTCSE 502	Database Management Systems	PC	25	75	100	3-1-0	4
BTCSE 503	Formal Language & Automata Theory	PC	25	75	100	3-1-0	4
BTCSE 504	Object Oriented Programming	PC	25	75	100	3-1-0	4
BTCSE 505	Humanities II (Professional Practice, Law & Ethics)	HS	25	75	100	3-0-0	3
	Departmental Elective –I	DE	25	75	100	3-0-0	3
BTCSE 507	Database Management Systems Lab	PC	25	75	100	0-0-4	2
BTCSE 508	Object Oriented Programming Lab	PC	25	75	100	0-0-4	2
BTCSE 509	Constitution of India	MC	25	75	100	2-0-0	0
					Total	**20-4-8**	**26**

14. Coppola P Damon, 2007. Introduction to International Disaster Management, Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manil

SEMESTER V

BTCSE 501-Signals and System

Course Objective:

1. Knowledge about Basic Signal and System Modeling Concept and Definitions.
2. Knowledge about the Application and use of Mathematical Transforms and State-Variables in order to Solve Electrical Engineering Problems.
3. Knowledge in the use of a Modern Computation Software Tool for the Analysis of Electrical Engineering Problems.

Unit – I: Introduction to Signals and Systems Concepts

Signals and Systems Introduction: Signals and Systems as Seen in Everyday Life and in Various Branches of Engineering and Science, Signals: Energy and Power Signals, Continuous and Discrete Time Signals, Continuous and Discrete Amplitude Signals, System Properties: Linearity, Additivity and Homogeneity, Shift-Invariance, Causality, Stability, Realizability.

Unit – II: Linear Shift-Invariant (LSI) Systems

Linear Shift-Invariant (LSI) systems: Impulse Response and Step Response, Convolution, Input Output Behavior with Aperiodic Convergent Inputs, Types of Shift Invariant Systems: Characterization of Causality and Stability of Linear Shift-Invariant Systems, System Representation through Differential and Difference Equations.

Unit – III: Fourier Series Representation

LSI Inputs and Response: 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: The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT), Parseval's Theorem: The Idea of Signal Space and Orthogonal Bases.

Unit – IV: Laplace and Z-Transform

The Laplace Transform: Notion of Eigen Functions of LSI systems, A Basis of Eigen Functions, Region of Convergence, Poles and Zeros of System, Laplace Domain Analysis:

Solution to Differential Equations and System Behavior, The Z-Transform for discrete time signals and systems: Eigen Functions, Region of Convergence, Z-domain Analysis.

Unit – V: State-Space Analysis

State-Space Analysis and Multi-Input: Multi-Output Representation, State-Transition Matrix and its Role, 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: Relation between Continuous and Discrete Time Systems.

Text 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.

Reference book:

1. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
2. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB",TMH, 2003.
3. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Learning Outcomes:

1. Analyze Different Types of Signals.
2. Represent Continuous and Discrete Systems in Time and Frequency Domain using Different Transforms.
3. Investigate whether the System is Stable.
4. Sampling and Reconstruction of a Signal.

BTCSE 502-Database Management Systems

Course Objective:

1. To understand the different Issues involved in the Design and Implementation of a Database System.
2. To study the Physical and Logical Database Designs, Database Modeling, Relational, Hierarchical, and Network Models.
3. To understand and use Data Manipulation Language to Query, Update, and Manage a Database.
4. To develop an understanding of essential DBMS concepts such as: Database Security, Integrity, Concurrency, Distributed Database, and Intelligent Database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple Database System and demonstrate competence with the fundamental tasks involved with Modeling, Designing, and Implementing a DBMS.

Unit – I: Database System Architecture

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.

Unit – II: Relational Query Languages

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.

Unit – III: Transaction Processing

Transaction Processing: Concurrency Control, ACID Property, Serializability: Serializability of Scheduling, Locking and Timestamp Based Schedulers, Multi-version and Optimistic Concurrency Control schemes, Database Recovery.

Unit – IV: Storage and Security of Database

Storage Strategies: Indices, B-trees, Hashing. Database Security: Authentication, Authorization and Access Control, Security Models: DAC, MAC and RBAC Models, Intrusion detection: SQL injection.

Unit – V: Advanced Topics

Advanced Topics: Object Oriented and Object Relational Databases, Logical Databases, Web databases, Distributed databases, Data warehousing and Data Mining.

Text Books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

Reference Books:

1. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
2. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

Learning Outcomes:

1. For a given query write relational algebra expressions for that query and optimize the developed expressions.
2. For a given specification of the requirement design the databases using E-R Method and Normalization.
3. For a given specification construct the SQL queries for open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms.

5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

BTCSE 503-Formal Language & Automata Theory

Course Objectives:

1. Develop a formal notation for strings, languages and machines.
2. Design finite automata to accept a set of strings of a language.
3. Prove that a given language is regular and apply the closure properties of languages.
4. Design context free grammars to generate strings from a context free language and convert them into normal forms.
5. Prove equivalence of languages accepted by Push down Automata and languages generated by context free grammars.
6. Identify the hierarchy of formal languages, grammars and machines.
7. Distinguish between computability and non-computability and Decidability and un-decidability.

Unit – I: Introduction to Regular Language and Grammar

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.

Unit – II: Context-free Grammar and Languages

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and 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.

Unit – III: Context-Sensitive Languages

Context-Sensitive Languages: Context-Sensitive Grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Unit – IV: Turing Machines

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 Enumerators.

Unit – V: Un-Decidability

Un-Decidability: Church-Turing Thesis, Universal Turing Machine, Universal and Diagonalization Languages, Reduction between Languages and Rice s theorem, Un-decidable Problems about Languages.

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.

Reference Books

1. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
2. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
3. John Martin, Introduction to Languages and the Theory of Computation, Tata McGraw Hill.

Learning Outcomes:

1. Write a formal notation for strings, languages and machines.
2. Design finite automata to accept a set of strings of a language.
3. For a given language determine whether the given language is regular or not.
4. Design context free grammars to generate strings of context free language.
5. Determine equivalence of languages accepted by Push down Automata and languages generated by context free grammars.
6. Write the hierarchy of formal languages, grammars and machines.
7. Distinguish between computability and non-computability and Decidability and un-decidability.

BTCSE 504-Object Oriented Programming

Course Objectives:

1. The course will introduce standard tools and techniques for software development, using object-oriented approach.
2. Use of a version control system, an automated build process, and an appropriate framework for automated unit and integration tests.

Unit – I: Introduction

Introductory Concepts of ADT: Abstract Data Types and their Specifications.

Unit – II: Abstract Data Types

Implement an ADT: Concrete State Space, Concrete Invariant, Abstraction function, Implementing Operations, illustration by the Text examples.

Unit – III: Features of Object-Oriented Programming

Features of Object-Oriented Programming: Encapsulation, Object Identity, Polymorphism – but not inheritance.

Unit – IV: Object Oriented Design

Inheritance in OO design: Design Patterns, Introduction and Classification, The Iterator Pattern: Model-View-Controller Pattern, Commands as Methods and as Objects, Implementing OO Language Features, Memory Management.

Unit – V: Generic Types

Generic types and collections: GUIs, Graphical Programming with Scala and Swing, The Software Development Process.

Reference books

1. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
2. Any book on Core Java.
3. Any book on C++

Learning Outcomes:

1. Specify simple abstract data types and design implementations, using abstraction functions to document them.
2. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
3. Name and apply some common object-oriented design patterns and give examples of their use.
4. Design applications with an event-driven graphical user interface.

BTCSE 505-Humanities II (Professional Practice, Law & Ethics)

UNIT I: History of Legal Profession in India:

Ancient legal texts including Manusmriti, Arthashastra, Quran refers to the law, advocates, judges and courts. Law and lawyers existed and played an important role at all times, even in ancient period. The system underwent certain changes during medieval and the period of British rule. Our present legal system including the judicial is to a large extent based upon the British legal and judicial system. This UNIT contains the study of legal profession in India in ancient, medieval and especially the changes which the profession underwent during British rule and other related aspects essential to understand the history of legal profession in India.

Legal Education in India: The system of legal education, as existed in India during various periods, the changes it underwent during British rule, the introduction of three and five year courses making the system more qualitative, the impact of globalization upon the legal system, particularly upon the legal education, etc will be the issues covered under this UNIT. The role played by Bar Council, UGC and other bodies in regulating legal education in India, the suggestions made by Law Commission of India in its 184th Report will also be discussed.

UNIT II: Professional Ethics and Duties of Lawyers:

"Ethics is basis of a civilized and organized society. Ethics is a system, a philosophy of conduct of principles practiced by a person or group of persons. Every profession has its code of conduct, pertaining to right and wrong in conduct based on the principles of morality." The need and necessity of ethics in the legal profession, relevant theories explaining its value and relevance in legal profession will be the core issue of discussion under this UNIT. In addition, duties of lawyers towards his clients, court, public, his fellow attorneys, self, society, etc., will also be undertaken for discussion. Indian code of ethics will be discussed in comparison with

that of American Code and other countries will be taken up for discussion. An advocate should practice law for the purpose of administering justice and making a living afterwards. The UNIT will also include role played by a lawyer in the administration of justice. The discussion will also cover issues like an advocate's duty towards legal reform, duty to provide legal aid, etc.

UNIT III: Rights & Interests and Limitations of Such Rights:

The rights to practice, right to argue his case, right over his professional fees, etc will be the core contents of this UNIT. Decisions of courts on, Advocate's right to strike" will be subject of deliberation. Conflicts of interests [lawyer –v- client's interests] and limitations of the rights of lawyers including restrictions on advertising, bar from carrying on other professions, etc will also be taken up for discussion.

UNIT IV: Regulation of Legal Profession:

"Nobody has a more sacred obligation to obey the law than those who make the law". A lawyer, being one involved with the process of law-making and interpretation is also bound by law. This UNIT will cover issues relating to regulation of legal profession in India, focusing more on topics like - the nature, composition, constitution, power, responsibilities and other related topics relating to the Bar Councils, etc. The enrolment of advocates, disciplining of advocates, etc will also be covered.

UNIT V: Liability for Deficiency in Service and other Wrongs Committed By Lawyers:

This UNIT includes the analysis of case laws and relevant laws like Consumer Protection Act, Contempt of Court proceedings, etc which imposes liability upon an advocate for the wrongs he commits in the course of his professional service.

Other Important Issues: The following topics of importance will be taken up for class discussion during the course: - Impact of Globalization on legal profession - Legal outsourcing in India. - Role of advocate in providing legal aid services. – Advocate's role in outside court / informal settlement of disputes. - Age bar and entry into practice

Suggested Readings:

1. Raju Ramachandran, Professional Ethics: Changing Profession and Changing Ethics (Lexis Nexis, Butterworths).

2. Dr. P. B. Mukharji, Professional Ethics of The Advocate(University of Burdwan)

3. P. RamanathaAiyer,Legal & Professional Ethics – Legal Ethics, Duties & Privileges of a Lawyer(Wadhwa Publications, Nagpur).

4. Justice V. R. Krishna Iyer,Law, Lawyers and Justice(b. R. Publishing Corpn, Delhi).

5. Stephen Gillers, Regulation of Lawyers: Problems of Law & Ethics(Little, Brown & Com Boston Toronto, London).

6. Ross Grauston (ed.), Legal Ethics & Professional Responsibility(Clarendon Press, Oxford).

7. Gary Bellow & Bea Moultan,The Lawyering Process: Ethics and Professional Responsibility, (The Foundation Press, Inc.).

8. D.V. SubbaRao, Sanjiva Row's The Advocates Act, 1961(LexisNexis, Butterworths).

9. Nicolson and Webb, Professional Legal Ethics(OUP).

10.S. C. Sarkar, Modern Advocacy and Professional Ethics…

BTCSE 507-Database Management Systems Laboratory

Lab based on Database Management Systems

BTCSE 508-Object Oriented Programming Laboratory

Lab based on Object Oriented Programming

BTCSE509 - Constitution of India

Course Objectives: Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik

Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I: History of Making of the Indian Constitution:

History, Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT II: Contours of Constitutional Rights & Duties:

Fundamental Rights: Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III: Organs of Governance:

Parliament: Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT IV: Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: 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

UNIT V: Election Commission:

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4. Discuss the passage of the Hindu Code Bill of 1956.

SEMESTER VI

BTCSE 601 Project–I