School of Information Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

B Tech Computer Science and Business Systems

III Sem Syllabus

SOIT

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	FORMAL LANGUAGES AND AUTOMATA THEORY	CB301	3	1	-	MAX. MARKS – 70 MIN MARKS – 28 DURATION: 3 HRS.

OBJECTIVES

To define mathematical methods of computing devices, called abstract machines, namely Finite Automata, Pushdown Automata, and Turning Machines.

To study the capabilities of these abstract machines.

To classify machines by their power to recognize languages.

Employ finite state machines to solve problems in computing

Explain deterministic and non- deterministic machines.

Identify different formal language classes and their relationships

Design grammars and recognizers for different formal languages

Determine the decidability and intractability of computational problems

Comprehend the hierarchy of problems arising in the computer sciences

UNIT I: Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with Î transitions - Significance, acceptance of languages. Conversions & Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

UNIT II: Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets.

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and left most derivation of strings.

UNIT III: Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL.

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

UNIT IV: Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required). , linear bounded automata and context sensitive language

UNIT V: Computability Theory: Chomsky hierarchy of languages, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXT BOOKS :

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.

2. Introduction to Theory of Computation –Sipser 2nd edition Thomson.

REFERENCES :

1. Introduction to Formal Languages, Automata Theory and Computation Kamala Krithivasan, Rama 2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

3. Theory of Computation : A Problem – Solving Approach- Kavi Mahesh, Wiley India Pvt. Ltd.

4. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.

5. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI.

6. Introduction to languages and the Theory of Computation, John C Martin, TMH.

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	COMPUTER ORGANIZATION AND ARCHITECTURE	CB302	3	1	-	MAX. MARKS – 70 MIN MARKS – 28 DURATION: 3 HRS.

OBJECTIVES:

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.

It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.

Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

UNIT – I- Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT – II Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT – III Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – IV Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT – V Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOK:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

REFERENCES:

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.

2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.

3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	OBJECT ORIENTED PROGRAMMING + LAB	CB303	3		4	MAX. MARKS – 70 MIN MARKS – 28 DURATION: 3 HRS.

OBJECTIVES:

Introduces Object Oriented Programming concepts using the C++ language.

Introduces the principles of data abstraction, inheritance and polymorphism;

Introduces the principles of virtual functions and polymorphism

Introduces handling formatted I/O and unformatted I/O

Introduces exception handling

UNIT – I Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and de-allocation operators-new and delete, Preprocessor directives.

UNIT – II C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT – III Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT – IV C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

UNIT – V Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

TEXT BOOKS:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.

2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

REFERENCES:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.

2. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press.

3. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd.

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	COMPUTATIONAL STATISTICS + LAB	CB304	3	1	2	MAX. MARKS – 70 MIN MARKS – 28 DURATION: 3 HRS.

OBJECTIVES

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

Clustering: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters

LABORATORY

Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing

Data Wrangling: Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions

Data Aggregation, Group Operations, Time series: GoupBy Mechanics, Data Aggregation, Groupwise Operations and Transformations, Pivot Tables and Cross Tabulations, Time Series Basics, Data Ranges, Frequencies and Shifting

Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches

TEXT BOOKS:

1.   An Introduction to Multivariate Statistical Analysis, T.W. Anderson.

2.   Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson.

3.   Statistical Tests for Multivariate Analysis, H. Kris.

4.   Programming Python, Mark Lutz.

5.   Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.

6   Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005.

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	DATATBASE MANGEMENT SYSTEMS + LAB	CB305	3	1	2	MAX. MARKS – 70 MIN MARKS – 28 DURATION: 3 HRS.

OBJECTIVES:

To teach and acquaint students the significance of Database design and ER Modelling.

To acquaint the students with concepts of good database design and normalization of relational schemas.

To teach students the different concurrency control and recovery techniques for transactions.

UNIT I: Introduction: Introduction to Database. Hierarchical, Network and Relational Models. 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 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, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.

UNIT III: Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. **Storage strategies**: Indices, B-trees, Hashing.

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

UNIT V: Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.**Advanced topics**: Object oriented and object relational databases, Logical databases, Webdatabases, Distributed databases, Data warehousing and data mining.

LABORATORY

1. C implementation of a Database Editor.
2. Download standard data of reasonable size (Unit level data of various rounds of NSS surveys) form internet and implement various SQL commands.

TEXT BOOKS:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

REFERENCE BOOKS:

1. *Principles of Database and Knowledge – Base Systems*, Vol 1 by J. D. Ullman.
2. *Fundamentals of Database Systems*. R. Elmasri and S. Navathe.

Foundations of Databases. Serge Abiteboul, Richard Hull, Victor Vianu.

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS			THEORY PAPERS
			L	T	P	
CSBS	INDIAN CONSTITUTION (NON CREDIT)	CB306	-	-	-	MAX. MARKS – MIN MARKS – DURATION:

OBJECTIVES

To enable the student to understand the importance of constitution

To understand the structure of executive, legislature and judiciary

To understand philosophy of fundamental rights and duties

To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

To understand the central and state relation, financial and administrative

UNIT-I - Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II- 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, The Supreme Court and High Court: Powers and Functions;

UNIT-III- State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT-IV - A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: 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 of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

2. Subash Kashyap, Indian Constitution, National Book Trust

3. J.A. Siwach, Dynamics of Indian Government & Politics

4. D.C. Gupta, Indian Government and Politics

5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6. J.C. Johari, Indian Government and Politics Hans

7. J. Raj Indian Government and Politics

8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8

2. nptel.ac.in/courses/109104045/

3. nptel.ac.in/courses/101104065/

4. www.hss.iitb.ac.in/en/lecture-details

5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution