UIT-RGPV (Autonomous) Bhopal

Subject code-CS-301 **Subject: Discrete Structures**

Semester: III

For credits & marks refer your scheme

Course Objective - This course introduces the applications of discrete mathematics in the field of computer science. It covers sets, logic, proving techniques, combinatorics, functions, relations, Graph theory and algebraic structures. These basic concepts of sets, logic functions and graph theory are applied to Boole an Algebra and logic networks while the advanced concepts of functions and algebraic structures are applied to finite state machines and coding theory.

CO (Course Outcome)

At the end of the course student will be able to:

CO 1	Understand proving techniques and relations on sets
CO 2	Understanding the concept of groups and its standard result
CO 3	Understand the logic of propositional logic and use of finite state machine in discrete structure
CO 4	Use of graphs in discrete structure
CO 5	To create and understand Hasse diagram and use of generating function

COURSE CONTENT:

Unit-I

Set Theory, Relation, Function, Theorem Proving Techniques : Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem Function: Definition, type of functions, one to one, in to and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction..

Unit-II

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Unit-III

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers

Unit-IV

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs.

Unit-V

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimonial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.

References:

1. C.L. Liu, "Elements of Discrete Mathematics" Tata Mc Graw-Hill Edition.
2. Trembley, J. P&Manohar; "Discrete Mathematical Structure with Application CS", Mc Graw Hill.
3. KennethH. Rosen, "Discrete Mathematics and its applications", Mc Graw Hill.
4. Lipschutz; Discrete mathematics (Schaum); TMH
5. Deo, Narsingh, "Graph Theory with application to Engineering and Computer. Science. ", PHI.

UIT-RGPV (Autonomous) Bhopal

Subject code-CS-302 **Subject: Digital Circuit & Design**

Semester: III

For credits & marks refer your scheme

Course Objective- To expose the students to perform binary arithmetic and conversion from one number system to another. To learn different Boolean simplification techniques. To learn the design and analysis of combinational and sequential circuits. To understand the design of registers and counters. To discuss the basic concepts of PLDs .To learn the design and analysis of asynchronous sequential circuits

CO (Course Outcome)

At the end of the course student will be able to:

CO 1	Understand number representation and conversion between different representations in digital circuits
CO 2	Learn different Boolean simplification techniques
CO 3	Understand the design and analysis of Sequential logic circuits
CO 4	Understand the design and analysis of combination all logic circuits.
CO 5	Understand the needs of analog and digital systems and their conversions

COURSE CONTENT:

Unit-I

Number systems& codes, Binary arithmetic, Boolean algebra and switching function. Minimization of switching function, Concept of prime implicant, Karnaugh map method, Quine Mc Cluskey's method, Cases with don't care terms, Multiple output switching function.

Unit-II

Introduction to logic gates, Universal gate, Half adder, Half sub tractor, Full adder, Full sub tractor circuits, Series & parallel addition, BCD adders, Look-ahead carry generator.

Unit-III

Linear wave shaping circuits, Bi-stable, Mono stable & Astable multivibrator, Schmitt Trigger circuits & Schmitt- Nand gates. Logic families: TL, DTL, All types of TTL circuits, ECL, I2L, PMOS, NMOS, & CMOS logic, Gated flip-flops and gated multivibrator, Interfacing between TTL to MOS.

Unit-IV

Decoders, Encoders, Multiplexers, De-multiplexers, Introduction to various semiconductor memories, & designing with ROM and PLA. Introduction to Shift Registers, Counters, Synchronous& Asynchronous counters, Designing of combinational circuits like code converters.

Unit-V

Introduction of Analog to Digital & Digital to Analog converters, sample & hold circuits and V-F converters.

References:

1. M. Mano; " Digital Logic & Computer Design"; PHI
Academic Session 2020-21
2. Malvino Leach; "Digital Principles & Applications";TMH
3. W.H Gothman; "Digital Electronics";PHI
4. Millman & Taub; "Pulse Digital & Switching Waveforms";TMH
5. Jain R.p; "Modern Digital Electronics"; TMH
6. R.J Tocci; " Digital Systems Principles & Applications"

List of Experiments (Expandable):

1. To study and test operation of all logic gates for various IC's)IC#7400, IC#7403, IC#7408, IC#7432, IC#7486)
2. Verification of DeMorgan's Theorem.
3. To construct half adder and full adder.
4. To construct half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Designing and verification of property of full adder.
8. Design a BCD to excess-3 code convertor.
9. Design a Multiplexer/Demultiplexer.

UIT-RGPV (Autonomous) Bhopal

Subject code: CS-310 **Subject: INTRODUCTION TO AI, MACHINE LEARNING & ROBOTICS**

Semester: III

For credits & marks refer your scheme

Course Out comes: At the end of the course student will be able to:

CO 1	Understand the concept of Artificial Intelligence.
CO 2	Analyze different problem solving methods that are used in Artificial Intelligence.
CO 3	Understand the concept of Machine Learning.
CO 4	Analyze different models of Machine Learning
CO 5	Interpret different mechanisms involved in a robotic system.

COURSE CONTENT:

Unit-I Introduction to Artificial Intelligence Fundamentals of Artificial Intelligence: Definitions, Introduction, key concepts, Evolution, Terminology, Approaches and Goals. Relation between Artificial Intelligence, Machine Learning and Deep Learning. Logic-Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution

Unit-II Problem Solving State space search; production systems, search space control, Uninformed and Informed Search: depth first search, breadth-first search. Heuristic Search: Best First Search, Hill Climbing. Optimal Decisions in Games, Alpha–Beta Pruning.

Unit-III Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Design and Analysis of Machine Learning Experiments: Guidelines for machine learning experiments, Factors, Response, and Strategy of experimentation, Regression Vs Classification

Unit-IV. **Models Based on Decision Trees:** Introduction to Decision Tree, Decision Tree for Classification, Impurity Measures for Decision Tree Construction, Properties of Decision Tree Classifier (DTC).**Bayesian Learning:** Fundamentals of Bayes Theorem, Classification Using Bayes Model. **Clustering:** Introduction to Clustering, Clustering of Patterns.

Unit-V Basics of Robotics Overview: Types of Robots, evolution, and Applications; Interplay between artificial intelligence and Robotics; Introduction to Robot Kinematics: Forward and Inverse Kinematics; Sensors in Robotics: Types (Proximity, Vision, LIDAR); Actuators: Motors and Controllers; Basics of Robot Control: Path Planning and Navigation; Introduction to Robot Operating System (ROS).

Reference Books:

1. Artificial Intelligence: A Modern Approach, S. Russell and P. Norvig, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, 2010, Tata McGraw-Hill Education Pvt. Ltd.
3. Introduction to Robotics by S. K. Saga of Tata McGraw-Hill Publishing Company Ltd
4. Machine Learning: Theory and Practice by M N Murty and Ananthanarayana V S, Universities Press (India)Pvt. Limited, 2024.
5. Introduction to Machine Learning using Python: Sarah Guido
6. Artificial Intelligence and Machine Learning by Pradeep Singh, Gandhi, Raman Mc Graw Hill

List of Lab Experiments:

1.Write a program to implement Hill Climbing algorithm.

2.Write a Program to Implement Breadth First Search using Python.

3.Write a Program to Implement Depth First Search using Python.

4.Write a Program to Implement Alpha-Beta Pruning.

5.Implement Naive Baye's theorem to classify the English text

6. Write a Python program to implement Simple Linear Regression and plot the graph.

7. Extraction the data from database using Python

8. Write a program to demonstrate the working of the decision tree based ID3 algorithm by considering a dataset.

9. Demonstration of Forward and Inverse Kinematics in Robots

10. Study of Robot Operating System (ROS).

UIT-RGPV (Autonomous) Bhopal

Subject code-CS-304 **Subject: Computer System Organization**

Semester: III

For credits & marks refer your scheme

Course Objective- Students to be familiarize the basic principles of computer architecture, Design and Multi Processing, Types of data transfer, Concept of semi conductor memories which is useful for research work in field Computer System

Course Out comes: At the end of the course student will be able to:

CO 1	Understand Von Newman model, various sub systems, CPU, Memory, I/O, System Bus, CPU and Memory registers
CO 2	Understand Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Microprogram sequencer, Microprogramming ,ALU unit
CO 3	Understand Modes of data transfer and applications
CO 4	Memory Maps, Memory Hierarchy, Cache Memory-Organization and mappings. Associative memory, Virtual memory, Memory Management Hardware.
CO 5	Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

COURSE CONTENT:

Unit I

Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer. 8085 microprocessor organization

Unit-II

Control Unit Organization: Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Micro programming, Arithmetic and Logic Unit: Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic units, design of arithmetic unit.

Unit-III

Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor, 8085 I/O structure, 8085 instruction set and basic programming. Data transfer – Serial / parallel, synchronous /asynchronous, simplex/half duplex and full duplex.

Unit-IV

Memory organization: Memory Maps, Memory Hierarchy, Cache Memory-Organization and mappings. Associative memory, Virtual memory, Memory Management Hardware.

Unit-V

Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

References:

1. Morris Mano: Computer System Architecture, PHI.
2. Tanenbaum: Structured Computer Organization, Pearson Education
3. J P Hayes, Computer Architecture and Organizations, Mc- Graw Hills, New Delhi
4. Gaonkar: Microprocessor Architecture, Programming, Applications with 8085; Penram Int.
5. William Stallings: Computer Organization and Architecture, PHI
6. Carter; Computer Architecture (Schaum); TMH
7. Carl Hamacher: Computer Organization, TMH

UIT-RGPV (Autonomous) Bhopal

Subject code-CS-305 **Subject: Electronic Device & Circuits**
Semester: III

For credits & marks refer your scheme

Course Objective- Student will be familiarize with basic concepts of diode, transistors, amplifiers, oscillators etc. Students will be able to learn the basic ideas about power supplies, SMPS, UPS and electronic devices.

Course Out comes: At the end of the course student will be able to:

CO 1	Explain semiconductor theory, different kinds of diode and transistors and amplifiers and difference between them.
CO 2	Explain the study of Oscillators and Power amplifiers
CO 3	Explain the study of switching characteristics of diode and transistors. Also study of different multi vibrators, amplifiers.
CO 4	Explain study of Inverting and non-inverting amplifiers, comparators, triggers and filters
CO 5	Study of IC Voltage regulators, SMPS, UPS

COURSE CONTENT:

Unit- I

Semiconductor device, theory of P-N junction, temperature dependence and break down characteristics, junction capacitances. Zener diode, Varactor diode, PIN diode, LED, Photo diode, Transistors BJT, FET, MOSFET, types, working principal, characteristics, and region of operation, load line biasing method. Transistors an amplifier, gain, bandwidth, frequency response,h-parameters equivalent, type of amplifier.

UnitI- II

Feedback amplifier, negative feedback, voltage-series, voltage shunt, current series and current shunt feedback, Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, classA, class B, class AB, C amplifiers, their efficiency and power Dissipation.

Unit- III

Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time, transistor as switch, Multivibrators, Bistable, Monostable, Astable multivibarators. Clippers and clampers, Differential amplifier, calculation of differential, common mode gain and CMRR using h parameters, Darlington pair, Boot strapping technique. Cascade and cascade amplifier.

Unit- IV

Operational amplifier characteristics, slew rate, full power bandwidth, offset voltage, bias current, application, inverting, non inverting amplifier, summer, average, differentiator, integrator, differential amplifier, instrumentation amplifier , log and antilog amplifier , voltage to current and current to voltage converters , comparators Schmitt trigger, active filters, 555 timer and its application.

Unit- V

Regulated power supplies. Series and shunt regulators, current limiting circuits, Introduction to IC voltage regulators, fixed and adjustable switching regulators, SMPS, UPS

References:

1. Milliman Hallkias - Integrated Electronics; TMH Pub.
2. Gayakwad; OP-amp and linear Integrated Circuits; Pearson Education
3. Salivahanan; Electronic devices and circuits; TMH
4. Salivahanan; Linear Integrated Circuits; TMH-
5. Miliman Grabel; Micro electronics , TMH
6. Robert Boylestad & Nashetsky; Electronics Devices and circuit Theory; Pearson Ed.

List of Experiments (Expandable):

1. Diode and Transistor characteristics
2. Transistor Applications (Amplifier and switching)
3. OP-Amp and its Applications
4. 555 timer and its Applications

UIT-RGPV (Autonomous) Bhopal

Subject code-CS-306 **Subject: Programming Lab–I (Java Technologies)**
Semester: III

For credits & marks refer your scheme

Course Objective-To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the ability general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program.

Course Out comes: At the end of the course student will be able to:

CO	Course outcomes
C01	Understand OOP concepts to apply basic Java constructs.
C02	Analyze different data structures, usage of Generic classes and java packages.
C03	Understand the different kinds of file 1/0, Multithreading in complex Java programs.
C04	Contrast different GUI layouts and design GUI applications and Applet with database connectivity.
C05	Construct a full-fledged Java advance applications.

COURSE CONTENT:

UNIT-I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant& Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, maxand min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, My SQL, Oracle

UNIT–IV

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, animating a Series of Images, Loading and playing Audio clips

UNIT–V

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. E. Balaguruswamy, “Programming In Java”; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
4. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall
5. Cay Horstmann, Big JAVA, Wiley India.

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List of Programs(Expandable):

1. Installation of J2SDK
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONTRUCTOR
10. Write a program to show Interfacing between two classes
11. Write a program to add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.

UIT-RGPV (Autonomous) Bhopal

Subject code-CS-309 **Subject: Computer Engineering Workshop**
Semester: III

For credits & marks refer your scheme

Course Objective- Student will be familiarize with basic concepts of diode, Resistors, transistors, Transformers etc. Students will be able to learn the basic ideas about PCB, Personal Computer Assembling etc.

Course Out comes: At the end of the course student will be able to:

CO	Course outcomes
C01	To understand the basic components of register, AC, DC , capacitor, diodes and Transistors
C02	Understanding the concept of function generator, voltage regulator and battery. Fundamental working of relay and its types
C03	Uses of various Testing and measurement tools
C04	Implementation and design of PCB Component assembly and soldering
C05	Assembling various computer equipments.

COURSE CONTENT:

UNIT-I
Basic components:- Type of component, Active and Passive, A.C. and D.C. Resistors: Types of resistors, color code. Capacitors: Type of capacitors, color code. Inductor: inductance and its type, concept of a coil. Diode: Introduction working and types. Transistors: Introduction and its type**.**

UNIT-II
Transformer: Introduction, working and its type. Function Generator: Introduction and its type. SMPS: Introduction, working and its type. LED: Introduction, working and its type. Voltage Regulator: Introduction, working and its type. Battery: Introduction, working and its type. IFT: Introduction, working and its type. Relay: Introduction, working and its type.

UNIT–III
Testing & Measurement Tools: Introduction, Working and uses of Multimeter, Voltmeter, Ammeters, Wattmeter and CRO.

UNIT–IV
Printed Circuit Board: Introduction, Manufacturing Process, PCB Type, Designing, Etching Component Assembly, Soldering.

UNIT–V

Personal Computer Assembling: Assemble All Computer parts like Motherboard, RAM, Hard Disk, SMPS, Cable, Buses, Keyboard, Mouse**.**

References:

1. Electronic Device and Circuit, Jacob Millman, Christos C. Halkias, McGraw-Hill
2. Hardware bible By : Winn L Rosch, Techmedia publications.
3. Modern All about printers By: Manohar Lotia, Pradeep Nair, Bijal Lotia BPB publications.
4. The complete PC Upgrade and maintenance guide, Mark Minasi BPB Publication

List of Experiments (Expandable):

1. Testing of NPN and PNP Transistor using Multimetre
2. Testing of Ceramic and Electrolytic Capacitor using Multimetre
3. Testing of Inductor using Mustimeter.
4. Testing of Values Voltages at different points on PCB using Multimetre.
5. Testing of Current at different points on PCB using Multimetre.
6. Testing of SMPS using Multimeter. Testing of Step Up and Step down Transformers using Multimetre.
7. Testing of IFT(Intermediate Frequency Transformer) using Multimetre
8. Testing of Resistance using Multimetre and Reading of Resistance using Colour Coding Table.
9. Assemble Mono Stable, Astable, and Bistable multivibrator (Clocked and Unclocked) using PCB..