

| Type | Code | Computer Organization | L-T-P | Credits | Marks |
|------------------------|---|-----------------------|-------|---------|-------|
| | CORE-5 | | 3-1-0 | 4 | 75 |
| Topic Objective | The objective of this course is to study the basic organization of digital computers (CPU, memory, I/O, software) and To have a better understanding and utilization of digital computers. To be familiar with Assembly Language Programming. | | | | |
| Prerequisites | Basic analytical, logical, problem solving skills with basic knowledge and usage of computers is required for this course. Prior experience in Digital logic is beneficial. | | | | |
| Lecture Scheme | Regular lectures (classroom/virtual class with computer/Smartphone) with use of ICT as and when required, lectures are planned to be interactive with focus on problem solving activities. | | | | |

Evaluation Scheme

| Internal Assessment | | | Written Assessment | Total |
|---------------------|-----------|--------------------|--------------------|-------|
| Assignment(s) | Unit Test | Mid-Term (Written) | End-Term | |
| | | 15 | 60 | 75 |

University Syllabus

| Unit No | Topics | Hours |
|---------|---|-------|
| Unit-1 | Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software. Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Overflow of Integer Arithmetic, Floating-Point Numbers & Operations, Characters, Memory Locations and Addresses, Byte Addressability, Word Alignment, Accessing Numbers, Characters, and Character Strings, Memory Operations, Instructions and Instruction Sequencing, Register Transfer Notation, Basic Instruction Types, Instruction Execution and Straight-Line Sequencing, Branching, Condition Codes, Generating Memory Addresses, Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers, Indexing and Arrays, Relative Addressing. | 10 |
| Unit-2 | Basic Processing Unit: Register Transfers, Performance on Arithmetic or Logic Operation, fetching a Word from Memory, Storing a Word in Memory. Execution of a Complete Instruction, Branch Instruction, Multiple Bus Organization Hardwired Control, A Complete Processor. Microprogrammed Control: Microinstructions, Microprogram Sequencing, WideBranch Addressing, Microinstructions with Next-Address Field, Prefetching Microinstructions, Emulation. Cache Memories: Mapping Functions, Replacement Algorithms, Example of Mapping Technique. Performance Considerations: Interleaving, Hit Rate and Miss Penalty, Caches on Processor Chip, Other Enhancements, Virtual Memories: Address Translation. | 10 |
| Unit-3 | Input/ Output Organization: Accessing I/O Devices, Interrupts, Interrupt Hardware, Enabling & Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions. Direct Memory Access, Bus Arbitration, Buses, Synchronous Bus, Asynchronous Bus, Interface Circuits: Parallel Port, Serial Port, Standard I/O Interfaces, Peripheral Component Interconnect (PCI) Bus, SCSI Bus, Universal Serial Bus (USB) | 10 |
| Unit-4 | Pipelining: Role of Cache Memory, Pipeline Performance, Data Hazards: Operand | 10 |

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| | Forwarding, Handling Data Hazards in Software, Side Effects. Instruction Hazards: Unconditional Branches, Conditional Branches and Branch Prediction. Influence on Instruction Sets: Addressing Modes, Condition Codes, Data path and Control Considerations. Superscalar Operation: Out-of-Order Execution, Execution Completion, Dispatch Operation, RISC & CISC Processors. | |
| | Total (Hours) | 40 |

Text Books:

TB1: **Carl Hamacher, Z. Vranesic, S. Zaky, Computer Organization, 5/Ed (TMH)**

Reference Books:

RB1: **William Stallings, Computer Organization and Architecture (Design for Performance), 9/Ed**

RB2: **S. Brown, & Z. Vranesic, Fundamentals of Digital Logic Design with VHDL, 2/Ed, McGraw-Hill.**

Online Resources:

OR1:http://www.cse.iitm.ac.in/~vplab/courses/comp_org.htm

OR2:<https://nptel.ac.in/courses/106/106/106106092/>

OR3:<https://lecturenotes.in/notes/15742-note-for-computer-organistaion-co-by-jntu-heroes?reading=true>

OR4:<https://www.youtube.com/watch?v=lir5Pz3kq0w&list=PLWPirh4EWFpF0FVeBgL75d1RIASn4sGoz>

OR5:https://www.youtube.com/watch?v=ktQDGH9_PjQ

Course Outcomes: *At the end of this course, the students will be able to:*

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| C01 | Understand the architecture of modern computer, and also understanding of how the computer performs arithmetic operations on positive and negative numbers. |
| C02 | Apply knowledge of basic processing unit to control microinstructions and to different memory concepts. |
| C03 | Understand I/O organization to manage interrupt and use of interface circuits in computer systems. |
| C04 | Analyze the pipelining performance and design a pipeline for consistent execution of instructions with minimum hazards |

Program Outcomes Relevant to the Course:

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| P01 | Computing Knowledge: Apply the knowledge of mathematics, science, logic, computing fundamentals to address complex problems. |
| P02 | Problem Analysis: Ability in identifying, formulating and analyzing problems to derive substantiated conclusions through the applications of complex solutions. |
| P03 | Design and Development: Create solutions and system processes tailored to address complex IT challenges, leveraging both background knowledge and relevant tools. |
| P04 | Investigation Techniques: Employ computing knowledge and methodologies, such as experimental design, data analysis, interpretation and information synthesis to draw valid conclusions. |
| P05 | Utilization of Modern Technology/Tools: Skillfully create, select and apply appropriate techniques, resources and computing tools while understanding their limitations. |
| P06 | Individual and Team Work: Proficient in both independent and collaborative work across diverse environments, including leadership roles. |

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| P07 | Technocrat and Society: Utilize contextual knowledge to assess societal, legal and security issues relevant to professional practices. |
| P08 | Effective Communication: Proficient in conveying complex ideas, writing reports, creating presentations and delivering messages to diverse audience. |
| P09 | Ethics: Adhere to ethical principles and professional norms for conducting oneself in a professional context. |
| P010 | Skill and Competency: Demonstrate the ability to analyze and apply the local and global impacts of project management, while consistently upgrading skill sets and navigating design various trade-offs. |
| P011 | Lifelong Learning: Recognize the necessity and possess the readiness and capability to engage in independent and continuous learning within the evolving landscape of technology. |

Mapping of COs to POs: (1: Low, 2: Medium, 3: High)

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| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 |
| CO1 | 3 | 2 | 3 | | 2 | | | | | | 2 |
| CO2 | 3 | 3 | 3 | | 3 | | | | | | 3 |
| CO3 | 3 | 3 | 3 | | 3 | | | | | | 3 |
| CO4 | 3 | 3 | 2 | | 3 | | | | | | 3 |

| Type | Code | LESSON PLAN Computer Organization | L-T-P | Credits | Marks |
|------------|---------|---|-------|---------|-------|
| Lecture No | Unit No | | 3-1-0 | 4 | 75 |
| Lecture 1 | 1 | Topic: Introduction to design and basic structure of computer and its types. Details about its functional units. Ref: TB1 (1.1, 1.2); RB1 (1.1, 1.2);OR1 | | | |
| Lecture 2 | 1 | Topic: Connection between processor and memory, basic operational concept, Bus structures, concept of system software. Ref: TB1 (1.3, 1.4,1.5); RB1 (3.2, 3.4);OR1 | | | |
| Lecture 3 | 1 | Topic: Introduction to machine instruction, concept about number representation, Addition of Positive Numbers, Addition of Signed Numbers. Ref: TB1 (2.1, 2.1.1,2.1.2); RB1 (9.1-9.3,10.1);OR1 | | | |
| Lecture 4 | 1 | Topic: Subtraction of signed numbers and overflow of integer arithmetic. Floating-point numbers & operations, characters. Ref: TB1 (2,1.3, 2.1.4,2.1.5); RB1 (10.1,10.4,10.5); OR2, OR3 | | | |
| Lecture 5 | 1 | Topic: Storing of data in memory locations and addresses, byte addressability, word alignment, accessing numbers, characters, and character strings. Ref: TB1 (2.2); RB1 (8.3); OR3, OR1 | | | |
| Lecture 6 | 1 | Topic: Memory Operations, Instructions and Sequencing of Instructions, Register Transfer Notation, Basic Instruction Types. Ref: TB1 (2.3,2.4.1,2.4.3);RB1 (12.1); OR4 | | | |
| Lecture 7 | 1 | Topic: Instruction execution and straight-line sequencing, concepts of branching. Ref: TB1 (2.4.4,2.4.5); RB1 (12.2,12.4);OR5 | | | |

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| Lecture 8 | 1 | Topic: Condition codes, generating memory addresses, addressing modes. Ref: TB1 (2.4.6,2.4.7); RB1 (13.1); OR2 |
| Lecture 9 | 1 | Topic: Implementation of variables and constants, indirection and pointers Ref: TB1 (2.5.1,2.5.2); RB1 (13.2);OR1 |
| Lecture 10 | 1 | Topic: Concept of indexing and arrays, relative addressing.. Ref: TB1 (2.5.3,2.5.4); RB1 (13.1); OR2 |
| Lecture 11 | 2 | Topic: Introduction to Basic Processing Unit, Concept of Register Transfers, Performance on Arithmetic or Logic Operation. Ref: TB1 (7.1,7.1.1,7.1.2); RB1 (17.7); OR2 |
| Lecture 12 | 2 | Topic: Process of fetching a word from memory and storing a word in memory. Basic idea about execution of a complete instruction, Branch instruction. Ref: TB1 (7.1.3,7.1.4,7.2);RB1 (12.4);OR1 |
| Lecture 13 | 2 | Topic: Multiple bus organization hardwired control, A complete processor. Ref: TB1 (7.3,7.4); RB1 (19.3); OR1 |
| Lecture 14 | 2 | Topic: Basic organization of Microprogrammed control unit, Microinstructions. Ref: TB1 (7.5,7.5.1); RB1 (20.1, 20.2) OR1 |
| Lecture 15 | 2 | Topic: Sequential execution ofMicroprogram, WideBranch addressing. Ref: TB1 (7.5.2,7.5.3); RB1 (20.3); OR3, OR2 |
| Lecture 16 | 2 | Topic: Microinstructions with next-address field, Prefetching microinstructions, Emulation. Ref: TB1 (7.5.4,7.5.5,7.5.6); RB1 (20.4); OR4 |
| Lecture 17 | 2 | Topic: Introduction to Cache memories, Mapping functions, replacement algorithms Ref: TB1 (5.5.1,5.5.2); RB1 (4.2); OR2 |
| Lecture 18 | 2 | Topic: Example of Mapping Technique. Performance Considerations, Interleaving. Ref: TB1 (5.5.3,5.5.4,5.6.1); RB1 (17.2); OR5 |
| Lecture 19 | 2 | Topic: Hit Rate and Miss Penalty, Caches on Processor Chip. Ref: TB1 (5.6.2,5.6.3); RB1 (4.4); OR5 |
| Lecture 20 | 2 | Topic: Other Enhancements, Virtual Memories: Address Translation. Ref: TB1 (5.6.4,5.7); RB1 (8.5); OR1 |
| Lecture 21 | 3 | Topic: Introduction to Input/ Output Organization, Accessing I/O Devices. Ref: TB1 (4.1); RB1 (7.3); OR2 |
| Lecture 22 | 3 | Topic: The idea of Interrupts and the hardware & software needed to support them, Enabling & Disabling Interrupts. Ref: TB1 (4.2,4.2.1,4.2.2); RB1 (3.2); OR3, OR2 |
| Lecture 23 | 3 | Topic: Handling Multiple Devices, Controlling Device Requests. Ref: TB1 (4.2.3,4.2.4); RB1 (3.3); OR3, OR5 |
| Lecture 24 | 3 | Topic: Exceptions. Direct Memory Access as an I/O mechanism for high speed devices. Ref: TB1 (4.2.5,4.4); RB1 (7.5); OR1 |
| Lecture 25 | 3 | Topic: Bus Arbitration, Buses. Ref: TB1 (4.4.1,4.5); RB1 (3.4); OR5, OR2 |
| Lecture 26 | 3 | Topic: Data transfer over Synchronous &Asynchronous Bus. Ref: TB1 (4.5.1,,4.5.2); RB1 (3.4,3.5); OR4 |
| Lecture 27 | 3 | Topic: The design of I/O Interface Circuits, Parallel Port. Ref: TB1 (4.6,4.6.1); RB1 (3.5); OR1 |
| Lecture 28 | 3 | Topic: Serial Port, Standard I/O Interfaces. |

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| | | Ref: TB1 (4.6.2,4.7); RB1 (3.5); OR1 |
| Lecture 29 | 3 | Topic: Commercial bus standards, Peripheral Component Interconnect (PCI) Bus,. Ref: TB1 (4.7.1); RB1 (3.6); OR1 |
| Lecture 30 | 3 | Topic: SCSI Bus, Universal Serial Bus (USB). Ref: TB1 (4.7.2,4.7.3); RB1 (14.4); OR1 |
| Lecture 31 | 4 | Topic: Basic concept of Pipelining, Role of Cache Memory. Ref: TB1 (8.1,8.1.1); RB1 (17.1, 17.3) OR4 |
| Lecture 32 | 4 | Topic: Pipeline Performance, Various Data Hazards that cause performance degradation. Ref: TB1 (8.1.2,8.2); RB1 (18.1); OR3 |
| Lecture 33 | 4 | Topic: Operand Forwarding, Handling Data Hazards in Software. Ref: TB1 (8.2.1,8.2.2); RB1 (18.2); OR5 |
| Lecture 34 | 4 | Topic: Side Effects. Instruction Hazards,Unconditional Branches. Ref: TB1 (8.2.3,8.3,8.3.1); RB1 (14.4);OR2 |
| Lecture 35 | 4 | Topic: Conditional Branches and Branch Prediction. Ref: TB1 (8.3.2); RB1 (14.5); OR2 |
| Lecture 36 | 4 | Topic: Influence of pipelining on Instruction Sets, Addressing Modes. Ref: TB1 (8.4,8.4.1); RB1 (13.1); OR3 |
| Lecture 37 | 4 | Topic: Condition Codes, Data path and Control Considerations. Ref: TB1 (8.4.2,8.5); RB1 (12.5); OR4 |
| Lecture 38 | 4 | Topic: Superscalar Operation, Out-of-Order Execution. Ref: TB1 (8.6.1);RB1 (16.2); OR2 |
| Lecture 39 | 4 | Topic: Execution Completion, Dispatch Operation. Ref: TB1 (8.6.2,8.6.3); RB1 (16.3); OR5 |
| Lecture 40 | 4 | Topic: Basic concept of RISC & CISC Processors and its implementation. Ref: TB1 (1.6.5,11.1); RB1 (16.4,16.5)page no:545,568; OR1 |

BCA-3rd Sem (2023)

| SN | Code | Paper | Credit | No. of Classes | L-T-P | Marks MT-ET-PRTL-(T) | Faculty | Deadline |
|----|------|------------------|--------|----------------|-------|-------------------------|--------------|----------|
| 1 | CC-6 | Java programming | 4+2 | 40+20 | 3-1-2 | 15-60-25-(100) | Mr. C. Sethi | |
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| Type | Code | Java programming | L-T-P | Credits | Marks |
|------------------------|---|------------------|-------|---------|-------|
| | Core -6 | | 3-1-2 | 4 + 2 | 100 |
| Topic Objective | The objective of this course is to introduce fundamentals of Object Oriented Programming in Java environment and develop a small application using java. | | | | |
| Prerequisites | Basic concepts of OOP concepts. | | | | |
| Lecture Scheme | Regular lectures (classroom/virtual class with computer/Smartphone) with use of ICT as and when required, lectures are planned to be interactive with focus on application. | | | | |

Evaluation Scheme

| Mid-Term (Written) | End-Term | Practical | Total |
|--------------------|----------|-----------|-------|
| 15 | 60 | 25 | 100 |

University Syllabus

| Unit No | Topics | Hours |
|---------------|--|-----------|
| Unit-1 | Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface) , Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, Buffered Reader class. | 10 |
| Unit-2 | Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Class Variables & Methods, Objects, Object Reference, Objects as parameters, final classes, Garbage Collection. Constructor- types of constructor, this keyword, super keyword. Method overloads and Constructor overloading. Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing, Enumerations, Polymorphism, Method Overriding and restrictions. Package: Pre-defined packages and Custom packages. | 10 |
| Unit-3 | Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From | 10 |

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| | Methods, String Buffer Classes and StringBuilder Classes. IOpackage: Understanding Streams File class and its methods, Creating, Reading, Writing using classes: Byte and Character streams, File Output Stream, File Input Stream, File Writer, File Reader, Input Stream Reader, Print Stream, Print Writer. Compressing and Uncompressing File. | |
| Unit-4 | Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multithreading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads.Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and Manipulating databases using JDBC. | 10 |
| | Total (Hours) | 40 |

Text Books:

 TB1: **E. Balagurusamy**, "Programming with Java", TMH, 4/Ed,

Reference Books:

 RB1: **Herbert Schildt**, "The Complete Reference to Java", TMH, 10/Ed.

Online Resources:

 OR1: <https://www.geeksforgeeks.org/java-programming-basics/>

 OR2: <https://www.tutorialspoint.com/java/index.htm>

 OR3: <https://www.javatpoint.com/java-io>

 OR4: <https://beginnersbook.com/2013/04/java-exception-handling/>

 OR5: <https://www.marcobehler.com/guides/jdbc>

| Type | Code | LESSON PLAN | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | Java programming | 3-1-2 | 4 | 70 |
| Lecture 1 | 1 | What is language? What is program? Software, programming languages, type of programming. Java is what type of programming? Ref: TB1(1.2-1.3, pg1-3); OR1 | | | |
| Lecture 2 | 1 | Basic concept of oops, History of java programming. Ref: TB1(2.1, pg10-11); OR1 | | | |
| Lecture 3 | 1 | Java Architecture and Features Ref: TB1(2.2, pg11-14); OR1 | | | |
| Lecture 4 | 1 | Understanding the semantic and syntax differences between C++ and Java, Ref: TB1(2.3, pg14-15); OR1 | | | |
| Lecture 5 | 1 | Compiling and Executing a Java Program Ref: TB1(3.1, pg23-24); OR1 | | | |
| Lecture 6 | 1 | Variables, Constants, Keywords Data Types Ref: TB1(4.1-4.4, pg46-49); OR1 | | | |
| Lecture 7 | 1 | Operators (Arithmetic, Logical and Bitwise) and Expressions Ref: TB1(5.1-5.8, pg62-69); OR1 | | | |
| Lecture 8 | 1 | Comments, Doing Basic Program Output. Ref: TB1(5.9, pg70); OR1 | | | |
| Lecture 9 | 1 | Decision Making Constructs (conditional statements and loops) and Nesting Ref: TB1(6.1-6.5, pg81-85); OR1 | | | |
| Lecture 10 | 1 | Java Methods (Defining, Scope, Passing and Returning Arguments, the Scanner class, Buffered Reader class. Ref: TB1(8.4,8.10, pg128,138); OR1 | | | |

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| Lecture 11 | 2 | Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes. Ref: TB1(1.3-1.4, pg3-7); OR1 |
| Lecture 12 | 2 | Class Variables & Methods, Objects, Object reference, Objects as parameters, Ref: TB1(8.5-8.7, pg128-133); OR1 |
| Lecture 13 | 2 | final classes, Garbage Collection Ref: TB1(8.14, pg144-145); OR2 |
| Lecture 14 | 2 | Constructor- types of constructor, this keyword, super keyword Ref: TB1(8.7, pg133); OR2 |
| Lecture 15 | 2 | Method overloading and Constructor overloading Ref: TB1(8.8, pg136); OR2 |
| Lecture 16 | 2 | Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance Ref: TB1(10.1-10.2, pg180-183); OR2 |
| Lecture 17 | 2 | Interface, Up-Casting, Down-Casting, Auto-Boxing Ref: TB1(10.3-10.5, pg183-186); OR2 |
| Lecture 18 | 2 | Enumerations, Polymorphism, Ref: TB1(9.8, pg171-172); OR2 |
| Lecture 19 | 2 | Method Overriding and restrictions. Package: Pre-defined Ref: TB1(11.1-11.4, pg190-192); OR2 |
| Lecture 20 | 2 | packages and Custom packages Ref: TB1(11.5-11.9, pg193-199); OR2 |
| Lecture 21 | 3 | Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Ref: TB1(9.1-9.4, pg153-158); OR2 |
| Lecture 22 | 3 | Java Strings: The Java String class, Creating & Using String Objects, Ref: TB1(9.5, pg161-162); OR2 |
| Lecture 23 | 3 | Manipulating Strings, String Immutability& Equality, Passing Strings To & From Methods Ref: TB1(9.5, pg163-164); OR2 |
| Lecture 24 | 3 | String Buffer Classes and StringBuilder Classes Ref: TB1(9.7, pg166); OR2 |
| Lecture 25 | 3 | Understanding Streams File class and its methods, Ref: TB1(16.1-16.3, pg294-297); OR3 |
| Lecture 26 | 3 | Creating, Reading, Writing using classes: Byte and Character streams Ref: TB1(16.4-16.6, pg297-300); OR3 |
| Lecture 27 | 3 | File Output Stream, File Input Stream, File Writer, File Reader Ref: TB1(16.7-16.10, pg301-304); OR3 |
| Lecture 28 | 3 | Input Stream Reader, Print Stream, Print Writer Ref: TB1(16.11-16.13, pg306-312); OR3 |
| Lecture 29 | 3 | Compressing and Uncompressing File. Ref: TB1(16.13-16.14, pg313-315); OR3 |
| Lecture 30 | 3 | Program copy the contents from one file to other files. Ref: TB1(16.15-16.16, pg317-320); OR3 |
| Lecture 31 | 4 | Error and exception,Exception Handling mechanisim Ref: TB1(13.1-13.1, pg234-236); OR4 |
| Lecture 32 | 4 | The Thread class and Runnable interface. Ref: TB1(12.2,12.10, pg205,225); OR4 |
| Lecture 33 | 4 | Exception Handling, Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions Ref: TB1(13.4-13.5, pg237-241); OR4 |

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| Lecture 34 | 4 | Threading, creating single and multiple threads Ref: TB1(12.3-12.5, pg206-212); OR4 |
| Lecture 35 | 4 | Multi-threading: The Thread class and Runnable interface, Thread prioritization. Ref: TB1(12.6-12.8, pg214-218); OR4 |
| Lecture 36 | 4 | Thread prioritization, synchronization and communication. Ref: TB1(12.9, pg221); OR4 |
| Lecture 37 | 4 | suspending/resuming threads Ref: TB1(12.11, pg226); OR4 |
| Lecture 38 | 4 | Using java.net package. Ref: TB1(14.3-14.5, pg251-255); OR4 |
| Lecture 39 | 4 | Overview of TCP/IP and Datagram programming. Ref: TB1(14.6-14.10, pg255-260); OR4 |
| Lecture 40 | 4 | Accessing and manipulating databases using JDBC Ref: TB1(15.2-15.4, pg272-276); OR5 |

Lesson Plan

| Type | Code | | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | Discrete Mathematical Structure | 3-1-0 | 4 | 75 |
| Lecture 1 | 1 | Topic: introduction to Logic Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 2 | 1 | Topic: The foundations: Logic and proofs Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 3 | 1 | Topic: Basic of propositional logic and propositional equivalences Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 4 | 1 | Topic: Predicates and quantifiers ,Nested quantifiers. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 5 | 1 | Topic: Rules inference, Mathematical Induction. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 6 | 1 | Topic : Basic of sets, Definition ,Types and operation of sets. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 7 | 1 | Topic : Relations and functions, types and definitions. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 8 | 1 | Topic Closures of Equivalence Relations Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 9 | 1 | Topic : Partial ordering well ordering definition with examples. Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 10 | 1 | Topic: ordering, Lattice, Sum of products and product of sums principle of Inclusions and Exclusions. Ref: TB1 ; TB2; OR1;OR2:OR3 | | | |
| Lecture 11 | 2 | Topic: The basic of counting, Fundamental principle of counting(FPC) Ref: TB1 ; TB2; OR2 | | | |
| Lecture 12 | 2 | Topic: Permutation: Definition ,Examples and numericals regarding permutations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 13 | 2 | Topic: Combinations: Definition formula and numerical regarding combinations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 14 | 2 | Topic: The Pigeonhole principle Ref: TB1 ; TB2; OR1;OR2. | | | |
| Lecture 15 | 2 | Topic: Some basic numericals about Pigeonhole principle. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 16 | 2 | Topic: Recurrence Relation: Definition and types of recurrence relations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 17 | 2 | Topic: properties of recurrence relations Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 18 | 2 | Topic: Solving Recurrence relations Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 19 | 2 | Topic: generating functions. Solving Recurrence using generating functions. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 20 | 2 | Topic: addition problems regarding recurrence relation. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 21 | 3 | Topic: Introduction to graphs, graphs terminologies Ref: TB1 ; TB2; OR1;OR2:OR3 | | | |

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| Lecture 22 | 3 | Topic: Representation of graphs isomorphism Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 23 | 3 | Topic: connectivity of graphs. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 24 | 3 | Topic: Euler and Hamiltonian Paths Ref: TB1 ; TB2; OR1;OR2, |
| Lecture 25 | 3 | Topic: Introduction to tree, definition with examples Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 26 | 3 | Topic: Introduction to tree traversal. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 27 | 3 | Topic: spanning tree and tree search Ref: TB1 ; TB2; OR2 |
| Lecture 28 | 3 | Topic: spanning tree and tree search: Breadth first search, Ref: TB1 ; TB2; OR2;OR1 |
| Lecture 29 | 3 | Topic: spanning tree and tree search: Depth first search Ref: TB1 ; TB2; OR2 |
| Lecture 30 | 3 | Topic: introduction to cut-set, cut-vertex. Ref: TB1 ; TB2; OR2 |
| Lecture 31 | 4 | Topic: Introduction to modelling computation. Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 32 | 4 | Topic: Finite State Machine, definition with examples Ref: TB1 ; TB2; OR2 |
| Lecture 33 | 4 | Topic: Finite-state machines with no output. Ref: TB1 ; TB2; OR2 |
| Lecture 34 | 4 | Topic: Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2 |
| Lecture 35 | 4 | Topic: Non Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 36 | 4 | Topic: Grammars and Language Ref: TB1 ; TB2; OR2 |
| Lecture 37 | 4 | Topic: Language Recognition, Regular sets and regular Grammars. Ref: TB1 ; RB1; OR1 |
| Lecture 38 | 4 | Topic: A set of not recognized by a finite-state automata Ref: TB1 ; TB2; OR2,OR3 |
| Lecture 39 | 4 | Topic: Application of Pumping Lemma for Regular Language. Ref: TB1 ; TB2; OR2 |
| Lecture 40 | 4 | Topic: computing functions with turning machines. Ref: TB1 ; TB2; OR2;OR3 |

LESSON PLAN

| Type | Code | PYTHON PROGRAMMING | L-T-P | Credits | Marks |
|------------------------|--|---------------------------|-------|---------|-------|
| CS | SEC-I | | 3-1-0 | 2 | 100 |
| Topic Objective | To learn the basic of Python programming To develop and create application using python code | | | | |
| Prerequisites | Basic knowledge about programming concept, flow chart, oops concept. | | | | |
| Lecture Scheme | Regular lectures (classroom /virtual class with Laptop/Desktop/Smartphone) with use of ICT, lectures are planned to be interactive with focus on problem solving activities. | | | | |

Evaluation Scheme

| Internal Assessment | | | Written Assessment | Total |
|---------------------|-----------|--------------------|--------------------|-------|
| Assignment(s) | Unit Test | Mid-Term (Written) | End-Term | |
| 0 | 0 | 20 | 80 | 100 |

University Syllabus

| Unit No | Topics | Hours | |
|----------------------|---|-------|-----------|
| Unit-1 | Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. | 05 | |
| Unit-2 | Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming. | 05 | |
| Unit-3 | Overview of Programming: Structure of a Python Program, Elements of Python Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator) | 05 | |
| Unit-4 | Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments. | 05 | |
| Total (Hours) | | | 20 |

Text Books:

1. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012

| Type | Code | LESSON PLAN PYTHON PROGRAMMING | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | | 3-1-0 | 2 | 100 |
| Lecture 1 | 1 | Topic: Planning the Computer Program: Concept of problem solving Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 2 | 1 | Topic: Problem definition Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 3 | 1 | Topic: Program design Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 4 | 1 | Topic: Debugging Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 5 | 1 | Topic: Types of errors in programming, Documentation. Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 6 | 2 | Topic: Techniques of Problem Solving: Flowcharting Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 7 | 2 | Topic: Decision table Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 8 | 2 | Topic: algorithms Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 9 | 2 | Topic: Structured programming concepts Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 10 | 2 | Topic: Programming methodologies viz. top-down and bottom-up programming. Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 11 | 3 | Topic: Overview of Programming: Structure of a Python Program, Elements of Python Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 12 | 3 | Topic: Introduction to Python: Python Interpreter, Using Python as calculator Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 13 | 3 | Topic: Python shell, Indentation. Atoms, Identifiers and keywords, Literals Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 14 | 3 | Topic: Strings Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 15 | 3 | Topic: Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator) Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 16 | 4 | Topic: Creating Python Programs: Input and Output Statements Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 17 | 4 | Topic: Control statements (Branching, Looping, Conditional Statement) Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 18 | 4 | Topic: Control statements (Exit function, Difference between break, continue and pass.) Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 19 | 4 | Topic: Defining Functions Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |
| Lecture 20 | 4 | Topic: Default arguments. Ref: https://www.geeksforgeeks.org/python-programming-language/ | | | |

LESSON PLAN(THEORY)

Target No. Of Lectures: 40

Lectures actually conducted: 40

| | |
|---------------------------------------|---|
| Course-Sem-Year-Paper Code-Paper Name | BCA-3 rd Sem-2 nd Year CC |
| Subject Credit | 4 |
| Name of the Faculty | Smita Dey |

| Type | Code | | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | Discrete mathematical structures | 3-1-0 | 4 | 80 |
| Lecture 1 | 1 | Topic: Financial accounting – Nature and Scope | | | |
| Lecture 2 | 1 | Topic: Objectives of Financial Accounting Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 3 | 1 | Topic: Accounting v/s Bookkeeping Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 4 | 1 | Topic: Users of Accounting information&Limitation of Financial Accounting Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 5 | 1 | Topic: Accounting concept,Principles and conventions Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 6 | 1 | Topic : Accounting Standard Concept Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 7 | 1 | Topic : Accounting Standard – Objective ,benefit Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 8 | 1 | Topic: Accounting Standard in India Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 9 | 1 | Topic : Accounting Policies Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 10 | 1 | Topic: Accounting as a measurement discipline. Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 11 | 2 | Topic: Valuation Principles Ref: TB1 ; TB2; OR2 | | | |
| Lecture 12 | 2 | Topic: Accounting estimates. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 13 | 2 | Topic: voucher system ,Accounting Process Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 14 | 2 | Topic: Journals Principle of journal Ref: TB1 ; TB2; OR1;OR2. | | | |
| Lecture 15 | 2 | Topic: Subsidiary Book Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 16 | 2 | Topic: Rules of Ledger .Preparation of ledger from journal Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 17 | 2 | Topic: Preparation of Cashbook Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 18 | 2 | Topic: Bank Reconciliation Statement Ref: TB1 ; TB2; OR1;OR2 | | | |

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|------------|---|---|
| Lecture 19 | 2 | Topic: Preparation of Trail Balance Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 20 | 2 | Topic: Trail Balance – Total method. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 21 | 3 | Topic: Trail Balance- Balance method Ref: TB1 ; TB2; OR1;OR2;OR3 |
| Lecture 22 | 3 | Topic: Trail balance- Compound Method Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 23 | 3 | Topic: Preparation of Trading Accounting. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 24 | 3 | Topic: Preparation Of Profit and Loss Accounting Ref: TB1 ; TB2; OR1;OR2, |
| Lecture 25 | 3 | Topic: Balance Sheet of Sole Proprietary business Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 26 | 3 | Topic: Preparation of Final Accounts. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 27 | 3 | Topic: Important provision of companies Act 1956 Ref: TB1 ; TB2; OR2 |
| Lecture 28 | 3 | Topic: Understanding of Final accounts of a Company, Ref: TB1 ; TB2; OR2;OR1 |
| Lecture 29 | 3 | Topic: Computers and Financial application Ref: TB1 ; TB2; OR2 |
| Lecture 30 | 3 | Topic: Accounting software packages Ref: TB1 ; TB2; OR2 |
| Lecture 31 | 4 | Topic: Computerized Accounting System Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 32 | 4 | Topic: Sailent features of Computerized Accounting system Ref: TB1 ; TB2; OR2 |
| Lecture 33 | 4 | Topic: Computerized accounting – Significance Ref: TB1 ; TB2; OR2 |
| Lecture 34 | 4 | Topic: Concept of grouping of accounts Ref: TB1 ; TB2; OR2 |
| Lecture 35 | 4 | Topic: Codificationof accounts Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 36 | 4 | Topic: Maintaining the hierarchy of ledger Ref: TB1 ; TB2; OR2 |
| Lecture 37 | 4 | Topic: Generating Accounting Reports Ref: TB1 ; RB1; OR1 |
| Lecture 38 | 4 | Topic: What is Flow chart ? Ref: TB1 ; TB2; OR2,OR3 |
| Lecture 39 | 4 | Topic: Difference between Manual Accounting System and Computerized Accounting Ref: TB1 ; TB2; OR2 |
| Lecture 40 | 4 | Topic: Advantages and Disadvantages of Computerized Accounting Ref: TB1 ; TB2; OR2;OR3 |

LESSON PLAN(THEORY)

Target No. Of Lectures: 40

Lectures actually conducted: 40

| | |
|---------------------------------------|--|
| Course-Sem-Year-Paper Code-Paper Name | BCA-3 rd Sem-2 nd Year CC-7- |
| Subject Credit | 4 |
| Name of the Faculty | Siva Ranjan Pradhan/ Tejaswini Pradhan |

| Type | Code | | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | Discrete mathematical structures | 3-1-0 | 4 | 75 |
| Lecture 1 | 1 | Topic: introduction to Logic Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 2 | 1 | Topic: The foundations: Logic and proofs Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 3 | 1 | Topic: Basic of propositional logic and propositional equivalences Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 4 | 1 | Topic: Predicates and quantifiers ,Nested quantifiers. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 5 | 1 | Topic: Rules inference, Mathematical Induction. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 6 | 1 | Topic : Basic of sets,Defination ,Types and operation of sets. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 7 | 1 | Topic : Relations and functions,types and definations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 8 | 1 | Topic Closures of Equivalence Relations Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 9 | 1 | Topic : Partial ordering well ordering definition with examples. Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 10 | 1 | Topic: ordering, Lattice, Sum of products and product of sums principle of Inclusions and Exclusions. Ref: TB1 ; TB2; OR1;OR2:OR3 | | | |
| Lecture 11 | 2 | Topic: The basic of counting,Fundamental principle of counting(FPC) Ref: TB1 ; TB2; OR2 | | | |
| Lecture 12 | 2 | Topic: Permutation:Defination ,Examples and numericals regarding permutations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 13 | 2 | Topic: Combinations:Defination formula and numerical regarding combinations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 14 | 2 | Topic: ThePigeonhole principle Ref: TB1 ; TB2; OR1;OR2. | | | |
| Lecture 15 | 2 | Topic: Some basicnumericals about Pigeonhole principle. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 16 | 2 | Topic: Recurrence Relation:Defination and types of recurrence relations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 17 | 2 | Topic: properties of recurrence relations Ref: TB1 ; TB2; OR1;OR2 | | | |

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|------------|---|--|
| Lecture 18 | 2 | Topic: Solving Recurrence relations Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 19 | 2 | Topic: generating functions. Solving Recurrence using generating functions. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 20 | 2 | Topic: addition problems regarding recurrence relation. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 21 | 3 | Topic: Introduction to graphs, graphs terminologies Ref: TB1 ; TB2; OR1;OR2;OR3 |
| Lecture 22 | 3 | Topic: Representation of graphs isomorphism Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 23 | 3 | Topic: connectivity of graphs. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 24 | 3 | Topic: Euler and Hamiltonian Paths Ref: TB1 ; TB2; OR1;OR2, |
| Lecture 25 | 3 | Topic: Introduction to tree,definition with examples Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 26 | 3 | Topic: Introduction to tree traversal. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 27 | 3 | Topic: spanning tree and tree search Ref: TB1 ; TB2; OR2 |
| Lecture 28 | 3 | Topic: spanning tree and tree search: Breadth first search, Ref: TB1 ; TB2; OR2;OR1 |
| Lecture 29 | 3 | Topic: spanning tree and tree search: Depth first search Ref: TB1 ; TB2; OR2 |
| Lecture 30 | 3 | Topic: introduction to cut-set,cut-vertex. Ref: TB1 ; TB2; OR2 |
| Lecture 31 | 4 | Topic: Introduction to modelling computation. Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 32 | 4 | Topic: Finite State Machine,definition with examples Ref: TB1 ; TB2; OR2 |
| Lecture 33 | 4 | Topic: Finite-state machines with no output. Ref: TB1 ; TB2; OR2 |
| Lecture 34 | 4 | Topic: Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2 |
| Lecture 35 | 4 | Topic: Non Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 36 | 4 | Topic: Grammars and Language Ref: TB1 ; TB2; OR2 |
| Lecture 37 | 4 | Topic: Language Recognition,Regular sets and regular Grammars. Ref: TB1 ; RB1; OR1 |
| Lecture 38 | 4 | Topic: A set of not recognized by a finite-state automata Ref: TB1 ; TB2; OR2,OR3 |
| Lecture 39 | 4 | Topic: Application of Pumping Lemma for Regular Language. Ref: TB1 ; TB2; OR2 |
| Lecture 40 | 4 | Topic: computing functions with Turing machines. Ref: TB1 ; TB2; OR2;OR3 |

LESSON PLAN(THEORY)

Target No. Of Lectures: 40

Lectures actually conducted: 40

| | |
|---------------------------------------|---|
| Course-Sem-Year-Paper Code-Paper Name | BCA-3 rd Sem-2 nd Year CC-7-DISCRETE MATHEMATICAL STRUCTURE |
| Subject Credit | 4 |
| Name of the Faculty | Siva Ranjan Pradhan/ Tejaswini Pradhan |

| Type | Code | | L-T-P | Credits | Marks |
|------------|---------|--|-------|---------|-------|
| Lecture No | Unit No | Discrete mathematical structures | 3-1-0 | 4 | 75 |
| Lecture 1 | 1 | Topic: introduction to Logic Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 2 | 1 | Topic: The foundations: Logic and proofs Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 3 | 1 | Topic: Basic of propositional logic and propositional equivalences Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 4 | 1 | Topic: Predicates and quantifiers ,Nested quantifiers. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 5 | 1 | Topic: Rules inference, Mathematical Induction. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 6 | 1 | Topic : Basic of sets,Defination ,Types and operation of sets. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 7 | 1 | Topic : Relations and functions,types and definations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 8 | 1 | Topic Closures of Equivalence Relations Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 9 | 1 | Topic : Partial ordering well ordering definition with examples. Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 10 | 1 | Topic: ordering, Lattice, Sum of products and product of sums principle of Inclusions and Exclusions. Ref: TB1 ; TB2; OR1;OR2;OR3 | | | |
| Lecture 11 | 2 | Topic: The basic of counting,Fundamental principle of counting(FPC) Ref: TB1 ; TB2; OR2 | | | |
| Lecture 12 | 2 | Topic: Permutation:Defination ,Examples and numericals regarding permutations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 13 | 2 | Topic: Combinations:Defination formula and numerical regarding combinations. Ref: TB1 ; TB2; OR1;OR2 | | | |
| Lecture 14 | 2 | Topic: ThePigeonhole principle Ref: TB1 ; TB2; OR1;OR2. | | | |
| Lecture 15 | 2 | Topic: Some basic numericals about Pigeonhole principle. | | | |

| | | |
|------------|---|--|
| | | Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 16 | 2 | Topic: Recurrence Relation:Defination and types of recurrence relations. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 17 | 2 | Topic: properties of recurrence relations Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 18 | 2 | Topic: Solving Recurrence relations Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 19 | 2 | Topic: generating functions. Solving Recurrence using generating functions. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 20 | 2 | Topic: addition problems regarding recurrence relation. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 21 | 3 | Topic: Introduction to graphs, graphs terminologies Ref: TB1 ; TB2; OR1;OR2;OR3 |
| Lecture 22 | 3 | Topic: Representation of graphs isomerphisim Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 23 | 3 | Topic: connectivity of graphs. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 24 | 3 | Topic: Euler and Hamiltonian Paths Ref: TB1 ; TB2; OR1;OR2, |
| Lecture 25 | 3 | Topic: Introduction to tree,definition with examples Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 26 | 3 | Topic: Introduction to tree traversal. Ref: TB1 ; TB2; OR1;OR2 |
| Lecture 27 | 3 | Topic: spanning tree and tree search Ref: TB1 ; TB2; OR2 |
| Lecture 28 | 3 | Topic: spanning tree and tree search: Breadth first search, Ref: TB1 ; TB2; OR2;OR1 |
| Lecture 29 | 3 | Topic: spanning tree and tree search: Depth first search Ref: TB1 ; TB2; OR2 |
| Lecture 30 | 3 | Topic: introduction to cut-set,cut-vertex. Ref: TB1 ; TB2; OR2 |
| Lecture 31 | 4 | Topic: Introduction to modelling computation. Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 32 | 4 | Topic: Finite State Machine,definition with examples Ref: TB1 ; TB2; OR2 |
| Lecture 33 | 4 | Topic: Finite-state machines with no output. Ref: TB1 ; TB2; OR2 |
| Lecture 34 | 4 | Topic: Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2 |
| Lecture 35 | 4 | Topic: Non Deterministic Finite Automata (DFA) Ref: TB1 ; TB2; OR2;OR3 |
| Lecture 36 | 4 | Topic: Grammars and Language Ref: TB1 ; TB2; OR2 |
| Lecture 37 | 4 | Topic: Language Recognition,Regular sets and regular Grammars. Ref: TB1 ; RB1; OR1 |
| Lecture 38 | 4 | Topic: A set of not recognized by a finite-state automa Ref: TB1 ; TB2; OR2,OR3 |
| Lecture 39 | 4 | Topic: Application of Pumping Lemma for Regular Language. Ref: TB1 ; TB2; OR2 |
| Lecture 40 | 4 | Topic: computing functions with turning machines. Ref: TB1 ; TB2; OR2;OR3 |

