



Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College of Arts, Science & Commerce
(Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for the S.Y.B.Sc.

Program: B.Sc. INFORMATION TECHNOLOGY
Program Code: RJSUIT

(CBCS 2021-22)

Eligibility for Lateral Admission

Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course.

DISTRIBUTION OF TOPICS AND CREDITS**S.Y. B.Sc. INFORMATION TECHNOLOGY SEMESTER III**

Course	Nomenclature	Credits	Topics
RJSUIT301	Object Oriented Programming	2	<ul style="list-style-type: none"> ● Object Oriented Principles ● Introduction to Java ● Exception Handling, Multithreading ● File Handling ● Packages
RJSUIT302	Data Structures	2	<ul style="list-style-type: none"> ● Introduction to DS ● Arrays, LinkedList, Stacks, Queues, Trees, Graphs, ● Sorting, Searching and Hashing techniques
RJSUIT303	Computer Networks	2	<ul style="list-style-type: none"> ● OSI and TCP/IP network model ● Details of different layers ● Wireless LAN
RJSUIT304	Database Management Systems	2	<ul style="list-style-type: none"> ● Introduction to databases and data models ● Relational Database model, relational algebra and normalization ● Constraints, views, Triggers ● Transaction management and Concurrency Control
RJSUIT305	Applied Mathematics	2	<ul style="list-style-type: none"> ● Matrices ● Complex Numbers ● Linear Differential Equations with Constant Coefficients ● The Laplace Transform ● Multiple Integrals ● Beta and Gamma Functions ● Error Function

S.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester III & IV

RJSUITP301	Object Oriented Programming Practical	2	
RJSUITP302	Data Structures Practical	2	
RJSUITP303	Computer Networks Practical	2	
RJSUITP304	Database Management Systems Practical	2	
RJSUITP305	Mobile Programming Practical	2	
Total		20	

SEMESTER IV

Course	Nomenclature	Credits	Topics
RJSUIT401	Advanced Java	2	<ul style="list-style-type: none"> ● GUI Programming using JAVA ● Database Connectivity using JDBC ● Servlet, Cookies, Session object ● Introduction to JSP ● Networking with Java ● Hibernate Programming
RJSUIT402	Introduction to Embedded Systems	2	<ul style="list-style-type: none"> ● Introduction to embedded system core ● Types and components of embedded systems ● 8051 microcontroller ● Arduino uno
RJSUIT403	Computer Oriented Statistical Techniques	2	<ul style="list-style-type: none"> ● Measures of central tendency and dispersion ● Sampling, Decision and Estimation theory ● Correlation theory
RJSUIT404	Software Engineering	2	<ul style="list-style-type: none"> ● Software Development Process Models, Agile S/W development ● Requirements engineering processes ● System models, Architectural designs

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			<ul style="list-style-type: none"> ● Project management ● Software testing
RJSUIT405	Computer Graphics and Animation	2	<ul style="list-style-type: none"> ● Introduction to Computer Graphics ● Different drawing algorithms ● Scaling, Translation, Reflection, Rotation and Shearing ● Visible surface detection, viewing in 3D ● Planes, Curves and surface. ● Animation
RJSUITP401	Advanced Java Practical	2	
RJSUITP402	Introduction to Embedded Systems Practical	2	
RJSUITP403	Computer Oriented Statistical Techniques Practical	2	
RJSUITP404	Software Engineering Practical	2	
RJSUITP405	Computer Graphics and Animation Practical	2	
Total		20	

Mapping of the courses to employability / entrepreneurship / skill development**SEMESTER III**

Course Code	Course Name	Unit No. And topics focusing on Employability / Entrepreneurship / Skill development
RJSUIT301	Object Oriented Programming	Core Course/Skill Enhancement: Unit-I: Principles of OOPS: OOPS, Introduction to classes and Objects. Unit-II: Introduction to JAVA Basic Concepts Unit -III: Polymorphism, Inheritance Unit - IV: Interfaces, Multi-threaded programming. Unit- V: Exception handling, Packages, Managing I/O files.
RJSUIT302	Data Structures	Skill Enhancement Unit I: Introduction, Array Unit II: Linked List

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		Unit III: Stack, Queue Unit IV: Sorting and Searching Techniques, Tree, Advanced Tree Structures Unit V: Hashing Techniques, Graph
RJSUIT303	Computer Networks	Skill Enhancement, Employability Unit I: Introduction, Network Models, Introduction to Physical layer, Digital and Analog transmission Unit II: Bandwidth Utilization: Multiplexing and Spectrum Spreading, Transmission media, Switching, Introduction to the Data Link Layer Unit III: Data Link Control, Media Access Control, Wireless LANs, Connecting devices Unit IV: Introduction to the Network Layer, Unicast Routing, Next generation IP Unit V: Introduction to the Transport Layer, Standard Client Server Protocols
RJSUIT304	Database Management Systems	Skill Enhancement, Employability Unit I: Introduction to Databases, Data Models, ER Diagram and Database Schema. Unit II: Relational database model, Relational Algebra and Calculus Relational algebra, Calculus Unit III: Constraints, Views and SQL Unit IV: Transaction management and Concurrency Unit V: PL-SQL
RJSUIT305	Applied Mathematics	Skill Enhancement Unit I: Matrices, Complex Numbers Unit II: Equation of the first order and of the first degree, Linear Differential Equations with Constant Coefficients Unit III: The Laplace Transform, Inverse Laplace Transform Unit IV: Multiple Integrals, Applications of integration Unit V: Beta and Gamma Functions, Differentiation Under the Integral Sign, Error Functions
RJSUITP301	Object Oriented Programming Practical	Skill Enhancement Object Oriented Programming with JAVA Practical
RJSUITP302	Data Structures Practical	Skill Enhancement
RJSUITP303	Computer Network Practical	Skill Enhancement
RJSUITP304	Database Management Systems Practical	Skill Enhancement, Employability
RJSUITP305	Mobile Programming Practical	Skill Enhancement Android development using App Inventor and App Inventor IDE

SEMESTER IV

Course Code	Course Name	Topics
RJSUIT401	Advanced Java	Skill Enhancement, Employability Unit -I: Introduction- Applet, AWT, Event Handling Unit - II: Java EE Architecture, Server and Containers, Working with Servlet Unit - III: Working with databases (JDBC) Unit - IV: Introduction To Java Server Pages Unit - V: Networking in Java, Introduction to Hibernate
RJSUIT402	Introduction to Embedded Systems	Skill Enhancement, Employability Unit I: Introduction, Core of embedded systems, Unit II: Embedded Systems – Application and Domain Specific, Embedded Hardware, Peripherals Unit III: The 8051 Microcontrollers, 8051 Programming in C Unit IV: Arduino Programming Unit V: Real Time Operating System (RTOS), Design and Development
RJSUIT403	Computer Oriented Statistical Techniques	Skill Enhancement Unit I: The Mean, Median, Mode, and Other Measures of Central Tendency, The Standard Deviation and Other Measures of Dispersion, Introduction to R Unit II: Moments, Skewness, and Kurtosis, Elementary Probability Theory, Elementary Sampling Theory Unit III: Statistical Estimation Theory, Statistical Decision Theory, Statistics in R Unit IV: Small Sampling Theory, The Chi-Square Test Unit V: Curve Fitting and the Method of Least Squares, Correlation Theory
RJSUIT404	Software Engineering	Skill Enhancement Unit I: Introduction, Software Requirements, Software Processes, Software Development Process Models, Agile software development Unit II: Socio-technical system, Critical system, Requirements Engineering Processes, System Models Unit III: Architectural Design, User Interface Design, Project Management, Quality Management Unit IV: Verification and Validation, Software Testing, Software Measurement, Software Cost Estimation

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		Unit V: Process Improvement, Service Oriented Software Engineering, Software reuse, Distributed software engineering
RJSUIT405	Computer Graphics and Animation	Skill Enhancement Unit I: Scan conversion Unit II: Two-Dimensional Transformations, Three-Dimensional Transformations Unit III: Viewing in 3D, Light, Color Models and Color Applications Unit IV: Visible-Surface Determination, Plane Curves and Surfaces Unit V: Computer Animation, Image Manipulation and Storage
RJSUITP401	Advanced Java Practical	Skill Enhancement Practical on all concepts in advanced Java.
RJSUITP402	Introduction to Embedded Systems Practical	Skill Enhancement, Employability Arduino Programming
RJSUITP403	Computer Oriented Statistical Techniques Practical	Skill Enhancement
RJSUITP404	Software Engineering Practical	Skill Enhancement
RJSUITP405	Computer Graphics and Animation Practical	Skill Enhancement

B.Sc.(Information Technology)		Semester–III	
Course Name: Object Oriented Programming		Course Code: RJSUIT301	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lectures
I	<p>Object Oriented Methodology: Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS.</p> <p>Principles of OOPS: OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing</p> <p>Introduction to classes and Objects: Class fundamentals, Declaring objects, Assigning object reference variables, Defining member functions, passing object as an argument, Returning object from functions, access specifier, static method, garbage collection</p> <p>Reference: 1</p>	12
II	<p>Introduction to Java: Java features, How java differ from C++,Java Environment, Java Runtime Environment, Java development kit, Simple java program, Java program structure, Java tokens, Implementing A Java program, Java Virtual Machine, Constants, Variables, Data types, operators and Expressions, Decision Making: branching and looping</p> <p>ByteStreams: InputStream, OutputStream, FileInputStream, FileOutputStream, CharacterStream: Reader, Writer, FileReader, FileWriter, BufferedReader, BufferedWriter, PrintWriter</p> <p>Reference: 1, 3 (bytestream)</p>	12

III	<p>Polymorphism: Concept of function overloading, overloaded operators, Data Conversion between objects and basic types, constructors and destructors</p> <p>Inheritance: Inheritance basics, defining derived classes, single inheritance, making private member inheritable, multilevel, multiple inheritance, hybrid, hierarchical inheritance, constructors in derived classes, limitations of using inheritance in java</p> <p>Reference: 2</p> <p>Virtual Functions: Introduction and need, Pure Virtual Functions, Abstract class</p>	12
IV	<p>Interfaces: Multiple inheritance in java, defining, extending and implementing interfaces. Accessing interface variables, Abstract methods and classes, final methods, variables and classes, this and super keywords.</p> <p>Multithreaded Programming: creating threads, extending thread class, stopping and blocking a thread, lifecycle of thread, using thread method</p> <p>Reference: 2</p>	12
V	<p>Managing Errors and Exceptions: Types of errors, Exceptions, Syntax of Exception handling code, multiple catch statement, using finally statement, throwing our own exception, using exceptions for debugging.</p> <p>Packages: Introduction, creating and accessing packages</p> <p>Managing i/o files : using the file class, creation of files, reading / writing characters, reading/ writing bytes, concatenating and buffering files, random access files</p> <p>Reference: 2</p>	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Object Oriented Programming with C++	E. Balagurusamy	Tata McGrawHill	4 th	
2.	Programming with Java A Primer	E. Balagurusamy	Tata McGrawHill	4th Edition	

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			1		
3.	The Complete Reference Java	Herbet Schildt			
4.	Core Java for Beginners	Sharnam Shah Vaishali Shah	SPD		

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Course Name: Object Oriented Programming Practical		Course Code: RJSUITP301	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical: To be implemented using C++ and Java

1.	Classes and methods
a.	Write a C++ / Java program to design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used respectively. (use C++ and Java programming)
b.	Write a C++ / Java program to design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively. Where getData() will be private method
c.	Write a Java Program to design the class Demo which will contain the following methods: readNo(), factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, is Palindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is arm Strong or not. Where readNo() will be private method.
d.	Write a Java program to demonstrate function definition outside class and accessing class members in function definition.
2.	Constructors and method overloading.
a.	Write a C++ program to design a class “Complex” for adding the two complex numbers. Use constructor. (Use C++)

b.	Write a Java Program to design a class Geometry containing the methods area() and volume() and also overload the area() function.
c.	Write a Java Program to demonstrate basic String handling
d.	Write a Java program to count the letters, spaces, numbers and other characters of an input string.
3.	Inheritance
a.	Write a C++/ Java program to implement single level inheritance.
b.	Write a java program to implement method overriding
c.	Write a C++ / java program to implement multiple inheritance.
d.	Write a C++ program to implement the hierarchical inheritance.
6.	Virtual functions and abstract classes
a.	Write a C++ / Java program to implement the concept of method overriding.
b.	Write a java program to show the use of virtual function
c.	Write a java program to show the implementation of abstract class.
7.	Multithreading
a.	Write a java program to implement multithreading.
8.	Exception handling
a.	Write a java program to show the implementation of exception handling
b.	Write a java program to show the implementation for exception handling for strings
9.	File handling
a.	Write a java program to open a file and display the contents in the console window.
b.	Write a java program to copy the contents from one file to other file.
c.	Write a java program to read the student data from user and store it in the file.
10.	Packages and Arrays

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a.	Create a package, Add the necessary classes and import the package in java class.
b.	Write a java program to add two matrices and print the resultant matrix.
c.	Write a java program for multiplying two matrices and print the product for the same.

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RJSUIT301 Object Oriented Programming	<p>Course Outcomes 3.1 :</p> <p>Students will be able to</p> <ol style="list-style-type: none">1. Understand object-oriented principals2. Create C++ and Java Implementations for Object oriented principal3. Understand concepts of Multithreading, packages, File and Exception handling. <p>Learning outcomes:</p> <ul style="list-style-type: none">➤ Students will design, code, test and debug C++ and Java language programs.
RJSUITP301 Object Oriented Programming Practical	<p>Course Outcomes:</p> <ol style="list-style-type: none">1. Students will be able to design, code, test, and debug Object Oriented programs using C++ and Java.

B.Sc.(Information Technology)		Semester–III	
Course Name: Data Structures		Course Code: RJSUIT302	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation.</p> <p>Array: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General Multi- Dimensional Arrays, Sparse Arrays, Sparse Matrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.</p>	12
II	<p>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, CircularLinked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.</p>	12

III	<p>Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.</p> <p>Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues.</p>	12
IV	<p>Sorting and Searching Techniques Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches, Binary Search.</p> <p>Tree: Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort.</p> <p>Advanced Tree Structures: Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.</p>	12
V	<p>Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Buckethashing, Deletion and rehashing</p> <p>Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.</p>	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A Simplified Approach to Data Structures	Lalit Goyal, Vishal Goyal, Pawan Kumar	SPD	1 st	2014
2.	An Introduction to Data Structure with Applications	Jean – Paul Tremblay and Paul Sorenson	Tata MacGraw Hill	2 nd	2007
3.	Data Structure	Maria Rukadikar	SPD	1 st	2017

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	and Algorithm				
4.	Schaum's Outlines Data structure	Seymour Lipschutz	Tata McGraw Hill	2 nd	2005
5.	Data structure – A Pseudocode Approach with C	AM Tanenbaum, Y Langsam and MJ Augustein	Prentice Hall India	2 nd	2006
6.	Data structure and Algorithm Analysis in C	Weiss, Mark Allen	Addison Wesley	1 st	2006

B.Sc.(Information Technology)		Semester–III	
Course Name: Data Structures Practical		Course Code: RJSUITP302	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	Implement the following:
a.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]
b.	Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven]

c.	Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
2.	Implement the following for Linked List:
a.	Write a program to create a single linked list and display the node elements in reverse order.
b.	Write a program to search the elements in the linked list and display the same
c.	Write a program to create double linked list and sort the elements in the linked list.
3.	Implement the following for Stack:
a.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
b.	Write a program to convert an infix expression to postfix and prefix conversion.
c.	Write a program to implement Tower of Hanoi problem.
4.	Implement the following for Queue:
a.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
b.	Write a program to implement the concept of Circular Queue
c.	Write a program to implement the concept of Deque.
5.	Implement the following sorting techniques:
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
c.	Write a program to implement insertion sort.
6.	Implement the following data structure techniques:
a.	Write a program to implement merge sort.
c.	Write a program to search the element using binary search.
7.	Implement the following data structure techniques:
a.	Write a program to create the tree and display the elements.
8.	Implement the following data structure techniques:

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a.	Write a program to insert the element into maximum heap.
b.	Write a program to insert the element into minimum heap.
9.	Implement the following data structure techniques:
a.	Write a program to implement the collision technique.
b.	Write a program to implement the concept of linear probing.
10.	Implement the following data structure techniques:
a.	Write a program to generate the adjacency matrix.
b.	Write a program for shortest path diagram.

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RJSUIT302 Data Structures	<p>Course Outcomes 3.2 :</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 1. Understand advantages and disadvantages of specific algorithms and data structure, array and its representation in memory. 2. Define basic static and dynamic data structures like linked list, trees, graphs, heap, queue, hash tables and relevant standard algorithms for them <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will understand use of different data structures. ➤ Students will understand how different basic operations are performed on different data structures.
RJSUITP302 Data Structures Practical	<p>Course Outcomes :</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 1. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. 2. Implement algorithms of various data structure for operations like Creation, Insertion, Deletion, Searching and Sorting.

B.Sc.(Information Technology)		Semester–III	
Course Name: Computer Networks		Course Code: RJSUIT303	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Introduction: Data communications, networks, network types, Internet history, standards and administration.</p> <p>Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p>Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p>Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.</p>	12
II	<p>Bandwidth Utilization: Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum</p> <p>Transmission media: Guided Media, Unguided Media</p> <p>Switching: Introduction, circuit switched networks, packet switching, and structure of a switch.</p> <p>Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.</p>	12
III	<p>Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.</p> <p>Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet</p> <p>Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, Cellular</p>	12

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	telephony, Satellite networks. Connecting devices	
IV	Introduction to the Network Layer: Network layer services, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing: Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, transition from IPv4 to IPv6.	12
V	Introduction to the Transport Layer: Introduction, Transport layer protocols, Sliding Window Protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols: World-wide-web and HTTP, FTP, Electronic mail, Domain name system.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw Hill	5 th	2013
2.	TCP/IP Protocol Suite	Behrouz A. Forouzan	Tata McGraw Hill	4 th	2010
3.	Computer Networks	Andrew Tanenbaum	Pearson	5 th	2013

B.Sc.(Information Technology)		Semester–III	
Course Name: Computer Networks Practical		Course Code: RJSUITP303	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	External	--	--

Sr No	Details
	<p>IPv4 Addressing and Subnetting</p> <p>a) Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> • Network address • Network broadcast address • Total number of host bits • Number of hosts <p>b) Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> • The subnet address of this subnet • The broadcast address of this subnet • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask • The number of hosts for each subnet • The number of subnet bits • The number of this subnet
2.	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
3.	Configure IP static routing.
4.	Configure IP routing using RIP.
5.	Configuring Simple OSPF.
6.	Configuring DHCP server and client.
7.	Create virtual PC based network using virtualization software and virtual NIC.
8.	Configuring DNS Server and client.

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RJSUIT303 Computer Networks	<p>Course Outcomes 3.3 :</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 1. Build and understand the fundamental concepts of computer networking. 2. Familiarize with the basic taxonomy and terminology of the computer networking area. 3. Enumerate the layers of OSI model and TCP/IP model. <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will acquire knowledge of Application layer, Presentation layer, Session layer, Transport layer and Physical layer paradigms and protocols. ➤ Students will gain core knowledge of Network layer routing protocols, IP addressing, data link layer concepts, design issues, and protocols.
RJSUITP303 Computer Networks Practical	<p>Course Outcomes:</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 1. To design network topologies using Packet Tracer. 2. To implement network layer routing protocols such as RIP, OSPF etc. 3. Learn to configure DHCP and DNS server and client. 4. Use Wireshark to scan and check the packet information of different protocol.

B.Sc.(Information Technology)		Semester–III	
Course Name: Database Management Systems		Course Code: RJSUIT304	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lec ture s
I	<p>Introduction to Databases What is database system, purpose of database system, view of data, relational databases, database architecture, Database administrator, Role of DBA</p> <p>Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.</p> <p>ER Diagram and Database Schema: Database design and E R Model: overview, ER Model: Entity set, Relationship set, Attributes, Types of attributes, Degree of relationship, Mapping Constraints, relationship participation, E R Diagrams, E R D Issues, weak entity sets, Codd's rules, Reduction of ER Schema to Tables</p>	12
II	<p>Relational database model: Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).</p> <p>Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities</p>	12

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III	Constraints, Views and SQL: Constraints, types of constraints, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	12
IV	Transaction management and Concurrency Control Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	12
V	PL-SQL: Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Control Structures, Cursors and Transaction, Collections and composite data types, Procedures and Functions, Exceptions Handling, Packages, With Clause and Hierarchical Retrieval, Triggers.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	5 th	
2.	Introduction to Database System	C. J. Date Pearson		1 st	2003
3.	Database Systems	Rob Coronel Cengage Learning		12 th	
4.	Programming with PL/SQL for Beginners	H. D and, R. Patil and T. Sambare X-Team		1 st	2011

B.Sc.(Information Technology)	Semester-III
Course Name: : Database Management System Practical	Course Code: RJSUITP304
Periods per week(1 Period is 50 minutes)	3
Credits	2

		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	Creating and Managing Tables
a.	Creating and Managing Tables
b.	Including Constraints
2.	Manipulating Data
a.	Using INSERT statement
b.	Using DELETE statement
c.	Using UPDATE statement
3.	SQL Statements – 1
a.	Writing Basic SQL SELECT Statements
b.	Restricting and Sorting Data
c.	Single-Row Functions
4.	SQL Statements – 2
a.	Displaying Data from Multiple Tables
b.	Aggregating Data Using Group Functions
c.	Subqueries
5.	Creating and managing other database objects
a.	Creating Views
b.	Other Database Objects

c.	Controlling User Access
6.	Using SET operators, Date/Time Functions, GROUP BY clause (advanced features) and advanced subqueries
a.	Using SET Operators
b.	Datetime Functions
c.	Enhancements to the GROUP BY Clause
d.	Advanced Subqueries
7.	PL/SQL Basics
a.	Declaring Variables
b.	Writing Executable Statements
c.	Interacting with the Oracle Server
d.	Writing Control Structures
8.	Composite data types, cursors and exceptions.
a.	Working with Composite Data Types
b.	Writing Explicit Cursors
c.	Handling Exceptions
9.	PL/SQL - Procedures and Functions
a.	Creating Procedures
b.	Creating Function
10.	PL/SQL - Creating Database Triggers

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	5 th	

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2.	Programming with PL/SQL for Beginners	H. D and , R. Patil and T. Sambare	X –Team	1 st	2011
3.	PL/SQL Programming	Ivan Bayross	BPB	1 st	2010

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RJSUIT304 Database Management Systems	<p>Course Outcomes 3.4: Students will be able to</p> <ol style="list-style-type: none"> 1. Give a good knowledge on the relational data model. 2. Give an introduction to systematic approaches to conceptual design and logical design. 3. Present the problems and solutions related to transaction management in multi user database environments. <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will understand the concept of Relational Database Model like Keys, Integrity Rules, and Normalization. ➤ Students will understand serializability, concurrency control in Transaction Management along with database Recovery Management.
RJSUITP304 Database Management Systems Practical	<p>Course Outcomes: Students will be able to</p> <ol style="list-style-type: none"> 1. Design and implement a database schema for a given problem domain. 2. Populate and query a database using SQL DML/DDL commands. 3. Declare and enforce integrity constraints on a database. 4. Program PL/SQL including procedures, functions, cursors, packages and triggers.

B.Sc.(Information Technology)		Semester–III	
Course Name: Applied Mathematics		Course Code: RJSUIT305	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lectures
I	<p>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, Caley- Hamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.</p> <p>Introduction to Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of $x+iy$ for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram</p>	12
II	<p>Complex Numbers: Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, $j(=i)$ as an operator(Electrical circuits)</p> <p>Introduction to Application of Derivatives</p> <p>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.</p> <p>Linear Differential Equations with Constant Coefficients: Introduction,</p>	12

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	The Differential Operator, Linear Differential Equation $f(D)y = 0$, Different cases depending on the nature of the root of the equation $f(D) = 0$, Linear differential equation $f(D)y = X$, The complimentary Function, The inverse operator $1/f(D)$ and the symbolic expression for the particular integral $1/f(D)X$; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	
III	The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function)	12
IV	Introduction to Partial derivatives Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. Applications of integration: Areas, Volumes of solids.	12
V	Beta and Gamma Functions – Definitions, Properties and Problems. Duplication formula. Differentiation Under the Integral Sign: Introduction, DUIS with one parameter, Leibniz theorem for DUIS Error Functions: Definition, Complimentary error function definition, Properties and Problems	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Higher Engineering Mathematics	Ravish Singh & Mukul Bhutt	Mcgraw Hill		

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2.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
3.	Applied Mathematics II	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
4.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications		

B.Sc.(Information Technology)		Semester–III	
Course Name: Mobile Programming Practical		Course Code: RJSUITP305	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1	Introduction to App Inventor and App Inventor IDE Introduction to User Interface components <ol style="list-style-type: none"> 1. Design an app to demonstrate use of button, label and notifier component 2. Design an app to demonstrate the use of math and logic block 3. Design a sequence calculator app using of slider component
2	Introduction to Layout component <ol style="list-style-type: none"> 1. Design an app for the Kilometer Converter 2. Design an app to calculate Test Average 3. Design an app with layout components and Color Blocks
3	Introduction to Sensor component <ol style="list-style-type: none"> 1. Design an app that demonstrates the use of TexttoSpeech component 2. Design an app that demonstrates the use of Accelerometer Sensor component 3. Design an app that demonstrates the use of Speech Recognizer component
4	Introduction to Media component <ol style="list-style-type: none"> 1. Design an app that uses the Camcorder component to capture a video and play it back using the MediaPlayer component 2. Design an app using camera component to capture image
5	Introduction to Drawing and Animation component <ol style="list-style-type: none"> 1. Design an app that demonstrates the use of canvas component 2. Design an app that demonstrates the use of a ball and an ImageSprite to simulate a golf game

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6	Introduction to Map component and Social component 1. Design an app that demonstrates the use of ContactPicker and PhoneNumberPicker component 2. Design an app that demonstrates the use of Map component
7	Introduction to storage component 1. Design an app uses the PhoneNumberPicker and a TinyDB to store a contact in a list and make a phone call to a contact from that list.
8	1. Design a Game Swat a Mosquito 2. Design an app that can be used as a replacement for a physical dice 3. Design a Scratchcard with App Inventor

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Starting Out with App Inventor for Android	Tony Gaddis and Rebecca Halsey	Pearson Education Limited	First	2015
2.	App Inventor 2: Create Your Own Android Apps	David Wolber, Hal Abelson, Ellen Spertus	OReilly	Second	2014

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT305 Applied Mathematics	Course Outcomes 3.5: Students will be able to 1. Understand matrices and perform various transformations on matrices. 2. Perform basic algebraic manipulation with complex numbers. 3. Describe basic definitions and terminology with differential equations and their solutions. 4. Solve linear differential equations with constant coefficients and unit step functions using Laplace Transform. 5. Understand computation of double and triple integrals. 6. Use Beta and Gamma functions and error functions. Learning outcomes: 1. Students will understand concepts of transformations of matrices. 2. Students will be familiar with complex forms of integrals.

	3. Students will understand the use of beta and gamma functions.
RJSUITP305 Mobile Programming Practical	Course Outcomes: Students will be able to 1. Use the basic user interface components of MIT App Inventor to create Android applications. 2. Extend applications to include database connectivity 3. Debug the app and previewing it in an emulator or in actual device.

B.Sc.(Information Technology)		Semester–IV	
Course Name: Advanced Java Programming		Course Code: RJSUIT401	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lectures
I	Introduction to GUI: Applet: Lifecycle of java applet, creating an applet, applet tag attributes, passing parameters to applet AWT: Window Fundamentals, basic UI components, Layouts Event Handling: event driven programs, delegating the event, java event type, event classes Reference: 1	12
II	Understanding Java EE: What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server Java EE Architecture, Server and Containers: Types of System Architecture, Java EE Server, Java EE Containers. Introduction to Java Servlets: The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? Servlet API and Lifecycle: Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet Working With Servlets: Getting Started, Using Annotations Instead of Deployment Descriptor. Reference: 2	12

III	<p>Working with Databases: What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.</p> <p>COOKIES: Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing The Colors Of A Page</p> <p>SESSION: What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example</p> <p>Request Dispatcher: Request dispatcher Interface, Methods of Request Dispatcher, Request Dispatcher Application.</p> <p>Reference: 2</p>	12
IV	<p>Introduction To Java Server Pages: Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages</p> <p>Getting Started With Java Server Pages: Comments, JSP Document, JSP Elements, JSP GUI Example.</p> <p>Action Elements: Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabeen.</p> <p>Implicit Objects, Scope And El Expressions: Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language.</p> <p>Java Server Pages Standard Tag Libraries: What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.</p> <p>Reference : 2</p>	12
V	<p>Networking in Java: socket and networking, socket overview, proxy server, internet addressing, DNS, using UDP connection, using TCP connection, working with URL</p> <p>Introduction to Hibernate: What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?</p> <p>Writing Hibernate Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, Creating a Web Application, Adding The Required Library Files, Creating a Javabeen Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.</p> <p>Reference : 1, 2</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1 st	2015
2.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9 th	2014
3.	Murach's beginning Java with Net Beans	Joel Murach , Michael Urban	SPD	1 st	2016
4.	Core Java, Volume I: Fundamentals	Hortsman	Pearson	9 th	2013
5.	Core Java, Volume II: Advanced Features	Gary Cornell and Hortsman	Pearson	8 th	2008
6.	Core Java: An Integrated Approach	R. Nageswara Rao	Dream Tech	1 st	2008

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B.Sc.(Information Technology)		Semester–IV	
Course Name: Advanced Java Practical		Course Code: RJSUITP401	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	Applet Programming
a.	Write a Java program to demonstrate lifecycle of an applet
2.	GUI Programming
a.	Design a AWT program to print the factorial for an input value.
b.	Design an AWT program to perform various string operations like reverse string, string concatenation etc.
3.	Layouts and Event Handling
a.	Design an AWT application to demonstrate different layouts
b.	Write a java program to implement – Text Events Mouse Events Windows Event
4.	Introduction to Servlet Programming
a.	Create a simple calculator application using servlet.
b.	Create a servlet for a login page. If the username and password are correct then it says message “Hello <username>” else a message “login failed”

5.	Servlet Programming with Cookies and Session
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
b.	Create a servlet that uses Cookies to store the number of times a user has visited servlet.
c.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.
6.	Java Database Connectivity
a.	Write a servlet program to demonstrate simple database connectivity
b.	Develop Simple Servlet Question Answer Application using Database.
7.	JSP
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
b.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
8.	JSP with Database Connectivity
a.	Write a java program to generate a JSP application to demonstrate database connectivity.
b.	Generate a Guestbook application using taglib
9.	Networking in Java
a.	Create a socket program to implement TCP protocol
b.	Write a java program to implement UDP protocol
10.	Implement the following Hibernate applications.
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1 st	2015
2.	Java EE 6 For Beginners	Vaishali Shah, Sharnam Shah	SPD		2012
3.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9 th	2014

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT401 Core Java	<p>Course Outcomes 4.1: Students will be able to</p> <ol style="list-style-type: none"> 1. Understand basics of GUI programming using AWT in JAVA, 2. Understand different event handling techniques in JAVA. 3. Understand JDBC, Cookies and Session objects 4. Understand Servlet, Servlet lifecycle , SP 5. Understand implementation of network protocols using JAVA 6. Understand and implement Hibernate <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will understand how to design GUI applications using AWT. ➤ Students will be able to implement Java application using Servlet and JSP ➤ Students will be able to implement network protocols – UDP and TCP using Java ➤ Students will be able to understand Hibernate framework mapping
RJSUITP401 Core Java Practical	<p>Course Outcomes :</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 1. Design GUI applications using different AWT layouts and classes. 2. Able to implement servlet, JSP to build applications 3. Able to implement Network protocols using

B.Sc.(Information Technology)		Semester–IV	
Course Name: Introduction to Embedded Systems		Course Code: RJSUIT402	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems</p> <p>Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.</p> <p>Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p>	12
II	<p>Embedded Systems – Application and Domain Specific: Application specific – washing machine, domain specific - automotive.</p> <p>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.</p> <p>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging.</p>	12
III	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p> <p>8051 Programming in C:</p>	12

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	Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.	
IV	<p>Introduction to Arduino: Arduinouno, Arduino Mega and Arduino Nano, Arduino and display devices, Arduino and digital input output devices (push button), Arduino and motors</p> <p>Arduino Programming: Arduino IDE, Installing and launching the IDE, program structure, Data types, variables, constants, control structure and loops, Functions</p> <p>Arduino and wireless communication: RF modem, global system for mobile modem</p>	12
V	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p>Design and Development: Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry</p>	12

Books and References:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Introduction to embedded systems	Shibu K V	Tata Mcgraw-Hill	1 st	2012
2.	The 8051 Microcontroller and Embedded Systems	Muhammad Ali Mazidi	Pearson	2 nd	2011
3.	Embedded Systems	Rajkamal	Tata Mcgraw-Hill		
4.	Arduino-Based Embedded Systems: Interfacing, Simulation, and LabVIEW GUI	Rajesh Singh, Anita Gehlot, Bhupendra Singh, Sushabhan Choudhury	CRC		2018

B.Sc.(Information Technology)		Semester–IV	
Course Name: Introduction to Embedded Systems Practical		Course Code: RJSUITP402	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No		Details
1.		Demonstrate the use of reprogrammable computer to perform Programming, Execution and debugging of embedded program using - a. 8051 microcontroller b. Arduino Uno
2.	a)	To demonstrate use of general purpose port i.e. Input/ output port of two 8051 controllers for data transfer between them.
	b)	Demonstrate use of arduino ports using push button and LED
3.	a)	Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's
	b)	To interface 8 LEDs at Input-output port of 8051 microcontroller and create different patterns.
4.	a)	Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.
	b)	To demonstrate interfacing of a seven-segment LED display with 8051 microcontroller and generate counting from 0 to 99 with fixed time delay.
5.	a)	Interface 8051 with D/A converter and generate a square wave of given frequency on the oscilloscope.

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	b)	Interface 8051 with D/A converter and generate a triangular wave of given frequency on the oscilloscope.
	c)	Using a D/A converter generates sine waves on an oscilloscope with the help of a lookup table stored in a data area of 8051.
6.		Interface stepper motor with 8051 and write a program to move the motor through a given angle in clockwise or counterclockwise direction.
7.		Generate traffic signal using 8051 microcontroller
8.		Implement temperature controller using 8051

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT402 Introduction to Embedded Systems	<p>Course Outcomes 4.2:</p> <p>Students will be able to</p> <ul style="list-style-type: none"> Understand basic ideas behind embedded systems and to study various circuit elements which can act as core of embedded systems. Study different types of Embedded systems, embedded hardware and peripheral devices. Design and program embedded system using 8051 microcontroller Understand the real time operating system. Understand life cycle of an embedded product <p>Learning outcomes:</p> <ul style="list-style-type: none"> Student will understand the concepts – Embedded Systems, Real Time operating systems and their applications Students will understand the process of development of Embedded project development.
RJSUITP402 Introduction to Embedded Systems Practical	<p>Course Outcomes:</p> <p>Students will be able to</p> <ul style="list-style-type: none"> User programmable embedded computer using 8051 microcontroller, and arduino uno. Burn an executable program image into the relevant microcontroller. Implement a delay routine Use serial and parallel communication ports of 8051 microcontroller and arduino uno Use Digital to analog converter to generate waveforms using microcontroller

B.Sc.(Information Technology)		Semester–IV	
Course Name: Computer Oriented Statistical Techniques		Course Code: RJSUIT403	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency, The Arithmetic Mean, The Weighted Arithmetic Mean, Properties of the Arithmetic Mean, The Arithmetic Mean Computed from Grouped Data, The Median, The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H, The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency.</p> <p>The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation, The Range, The Mean Deviation, The Semi- Interquartile Range, The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of variation, Standardized Variable, Standard Scores, Software and Measures of Dispersion.</p> <p>Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R – Vectors, R – lists, R Arrays.</p>	12
II	<p>Moments, Skewness, and Kurtosis: Moments, Moments for Grouped Data, Relations Between Moments, Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis.</p>	12

	<p>Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to $n!$, Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability.</p> <p>Elementary Sampling Theory: Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory</p>	
III	<p>Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, Efficient estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.</p> <p>Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p- Values for Hypothesis Tests, Control Charts, Tests Involving Sample Differences, Tests involving Binomial Distributions.</p> <p>Statistics in R: mean, median, mode, Normal Distribution, Binomial Distribution, Frequency Distribution in R.</p>	12
IV	<p>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi- Square Distribution, Confidence Intervals for Sigma, Degrees of Freedom, The F Distribution.</p> <p>The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe Contingency, Correlation of Attributes, Additive Property of chi- square.</p>	12
V	<p>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.</p> <p>Correlation Theory: Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of correlation, Remarks concerning the Correlation coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and</p>	12

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	the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.	
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Books and References:					
Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Statistics	Murray R. Spiegel, Larry J. Stephens.	McGRAW – HILL INTERNATIONAL	4 th	
2.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1st	2017
3.	Fundamentals of Mathematical Statistics	S.C. GUPTA and V.K. KAPOOR	SULTAN CHAND and SONS	11 th	2011
4.	Mathematical Statistics	J.N. KAPUR and H.C. SAXENA	S. CHAND	20 th	2005

B.Sc.(Information Technology)		Semester–IV	
Course Name: Computer Oriented Statistical Techniques Practical		Course Code: RJSUITP403	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	Using R execute the basic commands, array, list and frames.
2.	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
3.	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram
4.	Using R import the data from Excel / .CSV file and Perform the above functions.
5.	Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance.
6.	Using R import the data from Excel / .CSV file and draw the skewness.
7.	Import the data from Excel / .CSV and perform the hypothetical testing.
8.	Import the data from Excel / .CSV and perform the Chi-squared Test.
9.	Perform the Linear Regression using R.
10.	Compute the Least squares means using R

Books and References:					
Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	A Practical Approach to R Tool	R.B. Patil,H.J. Dand, R. Dahake	SPD	1 st	2011
2.	STATISTICS	Murray R. Spiegel, Larry J. Stephens	McGRAW – HILL	4 th	2006

S.Y. BSc I.T.	Semester IV Theory
RJSUIT403 Computer Oriented Statistical Techniques	<p>Course Outcomes 4.3: Students will be able to</p> <ol style="list-style-type: none"> 1. Gain knowledge in techniques to calculate the measures of central tendency and different measures of dispersion 2. Gain insight into consequences of plan by probability techniques and processing samples using sampling techniques 3. Draw valid conclusion using estimation theory and proper decision using decision theory 4. Measure experimental result based on hypothesis using chi square techniques 5. Learn techniques to correlate the relationship between various variables <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ The objective of this course is to provide an understanding on statistical concepts to include measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, and correlation analysis, multiple regression and business/economic forecasting
RJSUITP403 Computer Oriented Statistical Techniques Practical	<p>Course Outcomes: Students will be able to</p> <ol style="list-style-type: none"> 1. Learn the basic programming concepts and implement various statistical techniques using R software 2. Calculate and apply measures of central tendency and measures of dispersion -- grouped and ungrouped data cases. 3. Perform Test of Hypothesis, non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit. 4. Compute and interpret the results of Regression and Correlation Analysis, for forecasting.

B.Sc.(Information Technology)		Semester–IV	
Course Name: Software Engineering		Course Code: RJSUIT404	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p>Software Development Process Models.</p> <ul style="list-style-type: none"> • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process. <p>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p> <p>Requirements Engineering Processes: Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.</p>	12
II	<p>System Models: Models and its types, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods.</p> <p>Architectural Design: Architectural Design Decisions, System Organization, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p>	12

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III	Project Management Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management. Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics. Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.	12
IV	Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component Testing, Test Case Design, Test Automation. Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing	12
V	Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services. Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse. Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Engineering, edition,	Ian Somervill e	Pearson Education.	9 th	
2.	Software Engineering	PankajJalote	Narosa Publication		
3.	Software engineering, a practitioner's approach	Roger Pressman	Tata Mcgraw-hill	7 th	
4.	Software Engineering principles and practice	WS Jawadekar	Tata Mcgraw-hill		
5.	Software Engineering-	S.A Kelkar	PHI India.		

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	A Concise Study				
6.	Software Engineering Concept and Applications	Subhajit Dutta	Oxford Higher Education		
7.	Software Design	D. Budgen	Pearson Education	2 nd	
8.	Software Engineering	KL James	PHI	EEE	2009

B.Sc.(Information Technology)		Semester–IV	
Course Name: Software Engineering Practical		Course Code: RJSUITP404	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

List of Practical (To be executed using StarUML or any similar software)	
1.	Study and implementation of class diagrams.
2.	Study and implementation of Use Case Diagrams.
3.	Study and implementation of Entity Relationship Diagrams.
4.	Study and implementation of Sequence Diagrams.
5.	Study and implementation of State Transition Diagrams.
6.	Study and implementation of Data Flow Diagrams.
7.	Study and implementation of Collaboration Diagrams.
8.	Study and implementation of Activity Diagrams.
9.	Study and implementation of Component Diagrams.
10.	Study and implementation of Deployment Diagrams.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year

S.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester III & IV

1.	Object - Oriented Modeling and Design	Michael Blaha, James Rumbaugh	Pearson		2011
2.	Learning UML 2. 0	Kim Hamilton, Russ Miles	O'Reilly Media		2006
3.	The unified modeling language user guide	Grady Booch, James Rumbaugh, Ivar Jacobson	Addison-Wesley		2005
4.	UML A Beginners Guide	Jason T. Roff	McGraw Hill Professional		2003

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT404 Software Engineering	<p>Course Outcomes 4.4: Students will be able to</p> <ol style="list-style-type: none"> 1. Gain a broad understanding of software engineering and its application in the development and management of software systems using System Modeling tool UML. <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will understand different approaches taken to develop different type of software systems during development life cycle. ➤ Students will understand the importance of Requirement Engineering, Project Management and Software Quality Assurance.
RJSUITP404 Software Engineering Practical	<p>Course Outcomes: Students will be able to</p> <ol style="list-style-type: none"> 1. Use StarUML - a complete solution to system modeling using several types of diagrams - Use Case Diagrams, Class Diagrams, Component Diagram, Sequence Diagram, Activity Diagram etc.

B.Sc.(Information Technology)		Semester–IV	
Course Name: Computer Graphics and Animation		Course Code: RJSUIT405	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Video Display Devices, Cathode Ray Tube Basics, Raster Refresh (Raster-Scan) Displays, Random-Scan Display, Color CRT Monitors, Graphics Monitors and Workstations.</p> <p>Scan conversion: Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm. Bresenham's method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Boundary-Fill algorithm, Flood-Fill algorithm</p>	12
II	<p>Two-Dimensional Transformations: Basic Transformations: Translation, Rotation, Scaling. Transformations and Matrices, Transformation Conventions, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composite Transformation: Translations, Rotation, Reflection, Scaling, Shearing, Transformation of Points, Transformation of The Unit Square, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations, Clipping Operations: Line Clipping algorithms–Cohen-Sutherland and Liang-Barsky, Polygon Clipping Algorithms- Sutherland Hodgeman and Weiler Atherton, Curve Clipping, Text Clipping.</p> <p>Three-Dimensional Transformations:</p>	

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	Three-Dimensional Translation, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotations, Three-Dimensional Reflection, Matrix Representation of 3D Transformations, Composite 3D Transformations.	
III	Viewing in 3D Viewing Pipeline, Viewing Coordinates, Examples of 3D Viewing, Projections: Parallel Projections, Perspective Projections, Orthographic Projections, Oblique Projections, View Volumes and General Projection Transformations, Viewport Clipping, Clipping in Homogeneous Coordinates. Light: Basic Light Sources, Basic Illumination Models: Ambient Light, Diffuse Reflection, Intensity Attenuation, Transparency, Shadows. Color Models and Color Applications: Chromaticity Diagram, Color Models.	12
IV	Visible-Surface Determination: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, Painter's algorithms, BSP tree Method, Curved Surfaces, Wireframe Methods Plane Curves and Surfaces: Curve Representation, Spline Representation, Cubic Splines, Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, and Quadric Surfaces. Bezier Surfaces.	12
V	Computer Animation: Principles of Animation, General Computer Animation Functions, Key frame Systems, Morphing, Character Animation, Physics-Based Animation, Procedural Techniques. Image Manipulation and Storage: What is an Image? Digital image file formats, Image compression standard–JPEG, Image Processing-Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics	Donald Hearn, M. Pauline Baker	Pearson	2nd	

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2.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson	2nd	
3.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	4th	2016

B.Sc.(Information Technology)		Semester–IV	
Course Name: Computer Graphics and Animation Practical		Course Code: RJSUITP405	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	Solve the following:
a.	Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them.
b.	Draw a coordinate axis at the center of the screen.
2.	Solve the following:
a.	Divide your screen into four regions, draw a circle, rectangle, ellipse and half ellipse in each region with appropriate message.
b.	Draw a simple hut on the screen.
3.	Draw the following basic shapes in the center of the screen :

	i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line
4.	Solve the following:
a.	Develop the program for DDA Line drawing algorithm.
b.	Develop the program for Bresenham's Line drawing algorithm.
5.	Solve the following:
a.	Develop the program for the mid-point ellipse drawing algorithm.
6.	Solve the following:
a.	Write a program to implement 2D scaling.
b.	Write a program to perform 2D translation
7.	Solve the following:
a.	Perform 2D Rotation on a given object.
b.	Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. iii. Reflect about the line $y = mx + c$.
8.	Solve the following:
a.	Write a program to implement Cohen-Sutherland clipping.
b.	Write a program to implement Liang - Barsky Line Clipping Algorithm
9.	Solve the following:
a.	Write a program to fill a circle using the Flood Fill Algorithm.
b.	Write a program to fill a circle using the Boundary Fill Algorithm.
10.	Solve the following:
a.	Develop a simple text screen saver using graphics functions.
b.	Perform smiling face animation using graphic functions.

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT405 Computer Graphics and Animation	<p>Course Outcomes 4.5: Students will be able to</p> <ol style="list-style-type: none"> 1. Understand core concepts of computer graphics and computer animation. 2. Learn different graphics algorithms. 3. Apply graphics programming techniques to design, and create computer graphics applications <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will demonstrate their ability to use computer graphics techniques, models, and algorithms to solve graphics problems.
RJSUITP405 Computer Graphics and Animation Practical	<p>Course Outcomes: Students will be able to</p> <ol style="list-style-type: none"> 1. Draw line, circle, rectangle, ellipse and half ellipse in C, C++ or python 2. Develop programs for different algorithms like DDA, Bresenham's, midpoint circle drawing, midpoint ellipse drawing, Clipping and Fill algorithms. 3. Implement 2D scaling and translation 4. Implement animation programs.

Scheme of Examinations

1. Two Internals of 20 marks each. Duration 30 min for each.
2. One External (Semester End Examination) of 60 marks. Duration 2 hours.
3. Practical Examination for each subject at the end of Semester. Total five practical components, one each subject 50 marks each with separate passing out of 50
4. Minimum marks for passing the Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of S.Y. B.Sc. Information Technology or a certificate from the Coordinator / Head of the Institute to the effect that the candidate has completed the practical course of S.Y. B.Sc. Information Technology as per the minimum requirements.
7. In case of loss of a journal, a candidate must produce a certificate from the Head of the department /Institute that the practicals for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal will not be granted.
8. Decision of the coordinator, in consultation with the Principal, shall remain final and abiding to all.