



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 2019-20)

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

Course	Nomenclature	Credits	Topics
RJSUIT301	Python Programming	2	<ol style="list-style-type: none"> 1. Basic Programming Concepts. 2. Functions, Lists, Tuples, Dictionaries. 3. Object Oriented Concepts using python 4. Regular Expressions.
RJSUIT302	Data Structures	2	<ol style="list-style-type: none"> 1. Introduction to DS 2. Arrays, LinkedList, Stacks, Queues, Trees, Graphs 3. Sorting, Searching and Hashing techniques
RJSUIT303	Computer Networks	2	<ol style="list-style-type: none"> 1. OSI and TCP/IP network model. 2. Details of different layers. 3. Wireless LAN.
RJSUIT304	Database Management Systems	2	<ol style="list-style-type: none"> 1. Introduction to databases and data models. 2. Relational Database model, relational algebra and normalization. 3. Constraints, views, Triggers. 4. Transaction management and Concurrency Control.
RJSUIT305	Applied Mathematics	2	<ol style="list-style-type: none"> 1. Matrices 2. Complex Numbers 3. Linear Differential Equations with Constant Coefficients 4. The Laplace Transform 5. Multiple Integrals 6. Beta and Gamma Functions 7. Error Function
RJSUITP301	Python Programming Practical	2	
RJSUITP302	Data Structures Practical	2	
RJSUITP303	Computer Networks Practical	2	
RJSUITP304	Database Management Systems Practical	2	
RJSUITP305	Mobile Programming Practical	2	

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

Course	Nomenclature	Credits	Topics
RJSUIT401	Core Java	2	<ol style="list-style-type: none"> 1. Basic Programming using JAVA 2. Object Oriented Programming using JAVA 3. Multithreading, Enumerations. 4. Event Handling, AWT.
RJSUIT402	Introduction to Embedded Systems	2	<ol style="list-style-type: none"> 1. Introduction to embedded system core. 2. Types and components of embedded systems 3. 8051 microcontroller 4. Arduino uno
RJSUIT403	Computer Oriented Statistical Techniques	2	<ol style="list-style-type: none"> 1. Measures of central tendency and dispersion. 2. Sampling, Decision and Estimation theory. 3. Correlation theory.
RJSUIT404	Software Engineering	2	<ol style="list-style-type: none"> 1. Software Development Process Models, Agile S/W development. 2. Requirements engineering processes. 3. System models, Architectural designs. 4. Project management. 5. Software testing.
RJSUIT405	Computer Graphics and Animation	2	<ol style="list-style-type: none"> 1. Introduction to Computer Graphics 2. Different drawing algorithms. 3. Scaling, Translation, Reflection, Rotation and Shearing 4. Visible surface detection, viewing in 3D. 5. Planes, Curves and surfaces. 6. Animation
RJSUITP401	Core 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	

B.Sc.(Information Technology)		Semester–III	
Course Name: Python 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	Lect ures
I	<p>Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,</p> <p>Variables and Expressions: Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p>Conditional Statements: if, if-else, nested if –else</p> <p>Looping: for, while, nested loops</p> <p>Control statements: Terminating loops, skipping specific conditions</p>	12
II	<p>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types</p> <p>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.</p>	12

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III	<p>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods</p> <p>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions</p> <p>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods</p> <p>Files: Text Files, The File Object Attributes, Directories</p> <p>Exceptions: Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions</p>	12
IV	<p>Regular Expressions: Concept of regular expression, various types of regular expressions, using match function.</p> <p>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding</p> <p>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue</p> <p>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module</p>	12
V	<p>Creating the GUI Form and Adding Widgets:</p> <p>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessageBox.</p> <p>Handling Standard attributes and Properties of Widgets.</p> <p>Layout Management: Designing GUI applications with proper Layout Management features.</p>	12

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	<p>Look and Feel Customization: Enhancing Look and Feel of GUI using different appearances of widgets.</p> <p>Storing Data in Our MySQL Database via Our GUI: Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.</p>	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Think Python	Allen Downey	O'Reilly	1 st	2012
2.	An Introduction to Computer Science using Python 3	Jason Montojo, Jennifer Campbell, Paul Gries	SPD	1 st	2014
3.	Python GUI Programming Cookbook	Burkhard A. Meier	Packt		2015
4.	Introduction to Problem Solving with Python	E. Balagurusamy	TMH	1 st	2016
5.	Murach's Python programming	Joel Murach, Michael Urban	SPD	1 st	2017
6.	Object-oriented Programming in Python	Michael H. Goldwasser, David Letscher	Pearson Prentice Hall	1 st	2008
7.	Exploring Python	Budd	TMH	1 st	2016

B.Sc.(Information Technology)		Semester–III	
Course Name: Python Programming Practical		Course Code: RJSUITP301	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	External	--	--

Practical No	Details
1.	Write the program for the following:
a.	Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
b.	Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
c.	Write a program to generate the Fibonacci series.
d.	Write a function that reverses the user defined value.
e.	Write a function to check the input value is Armstrong and also write the function for Palindrome.
f.	Write a recursive function to print the factorial for a given number.
2.	Write the program for the following:
a.	Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.
b.	Define a function that computes the <i>length</i> of a given list or string.
c.	Define a <i>procedure</i> histogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following: **** ***** *****
3.	Write the program for the following:

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a.	A <i>pangram</i> is a sentence that contains all the letters of the English alphabet at least once, for example: <i>The quick brown fox jumps over the lazy dog</i> . Your task here is to write a function to check a sentence to see if it is a pangram or not.
b.	Take a list, say for example this one: a=[1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5
4.	Write the program for the following:
a.	Write a program that takes two lists and returns True if they have at least one common member.
b.	Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
c.	Write a Python program to clone or copy a list
5.	Write the program for the following:
a.	Write a Python script to sort (ascending and descending) a dictionary by value.
b.	Write a Python script to concatenate following dictionaries to create a new one. Sample Dictionary : dic1={ 1:10, 2:20} dic2={ 3:30, 4:40} dic3={ 5:50,6:60} Expected Result : { 1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
c.	Write a Python program to sum all the items in a dictionary.
6.	Write the program for the following:
a.	Write a Python program to read an entire text file.
b.	Write a Python program to append text to a file and display the text.
c.	Write a Python program to read last n lines of a file.
7.	Write the program for the following:
a.	Design a class that store the information of student and display the same
b.	Implement the concept of inheritance using python

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c.	<p>Create a class called <code>Numbers</code>, which has a single class attribute called <code>MULTIPLIER</code>, and a constructor which takes the parameters <code>x</code> and <code>y</code> (these should all be numbers).</p> <ol style="list-style-type: none">Write a method called <code>add</code> which returns the sum of the attributes <code>x</code> and <code>y</code>.Write a class method called <code>multiply</code>, which takes a single number parameter <code>a</code> and returns the product of <code>a</code> and <code>MULTIPLIER</code>.Write a static method called <code>subtract</code>, which takes two number parameters, <code>b</code> and <code>c</code>, and returns <code>b - c</code>.Write a method called <code>value</code> which returns a tuple containing the values of <code>x</code> and <code>y</code>. Make this method into a property, and write a setter and a deleter for manipulating the values of <code>x</code> and <code>y</code>.
8.	Write the program for the following:
a.	<p>Open a new file in IDLE (“New Window” in the “File” menu) and save it as <code>geometry.py</code> in the directory where you keep the files you create for this course. Then copy the functions you wrote for calculating volumes and areas in the “Control Flow and Functions” exercise into this file and save it.</p> <p>Now open a new file and save it in the same directory. You should now be able to import your own module like this:</p> <pre>import geometry</pre> <p>Try and add <code>print dir(geometry)</code> to the file and run it.</p> <p>Now write a function <code>pointyShapeVolume(x, y, squareBase)</code> that calculates the volume of a square pyramid if <code>squareBase</code> is <code>True</code> and of a right circular cone if <code>squareBase</code> is <code>False</code>. <code>x</code> is the length of an edge on a square if <code>squareBase</code> is <code>True</code> and the radius of a circle when <code>squareBase</code> is <code>False</code>. <code>y</code> is the height of the object. First use <code>squareBase</code> to distinguish the cases. Use the <code>circleArea</code> and <code>squareArea</code> from the <code>geometry</code> module to calculate the base areas.</p>
b.	Write a program to implement exception handling.
9.	Design the database applications for the following:
a.	Design a simple database application that stores the records and retrieve the same.

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S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT301 Python Programming	Course Outcomes 3.1 : Students will be able to <ol style="list-style-type: none">1. Understand basics of Python programming.2. Use object oriented concepts using Python. Learning outcomes: ➤ Students will design, code, test and debug Python language programs.
RJSUITP301 Python Programming Practical	Course Outcomes : <ol style="list-style-type: none">1. Students will be able to design, code, test, and debug Python language programs.

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, Circular Linked 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

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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</p> <p>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</p> <p>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 and Algorithm	Maria Rukadikar	SPD	1 st	2017
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	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:

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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:
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.

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT302 Data Structures	Course Outcomes 3.2 : Students will be able to <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 Learning outcomes: <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	Course Outcomes : Students will be able to <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>	12

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	<p>Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, Cellular telephony, Satellite networks.</p> <p>Connecting devices</p>	
IV	<p>Introduction to the Network Layer: Network layer services, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP</p> <p>Unicast Routing: Introduction, routing algorithms, unicast routing protocols.</p> <p>Next generation IP: IPv6 addressing, IPv6 protocol, transition from IPv4 to IPv6.</p>	12
V	<p>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.</p>	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	--	--

Practical No	Details
1.	<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.

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT303 Computer Networks	Course Outcomes 3.3 : Students will be able to <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. Learning outcomes: <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	Course Outcomes : Students will be able to <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	Lectures
I	<p>Introduction to Databases</p> <p>What is database system, purpose of database system, view of data, relational databases, database architecture, Database administrator, Role of DBA</p> <p>Data Models:</p> <p>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:</p> <p>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:</p> <p>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	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	
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

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT304 Database Management Systems	<p>Course Outcomes 3.4 :</p> <p>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 :</p> <p>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	Lect ures
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>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, 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>	12
II	<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, The</p>	

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	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 expiration 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.	12
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	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		
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		

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT305 Applied Mathematics	<p>Course Outcomes 3.5 :</p> <p>Students will be able to</p> <ol style="list-style-type: none"> 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. <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Students will understand concepts of transformations of matrices. ➤ Students will be familiar with complex forms of integrals. ➤ Students will understand the use of beta and gamma functions.

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	50
	External	--	--

Practical No	Details
1	Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals: Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple “Hello World” program.
2	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image),
3	Programming Activities and fragments Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments.
4	Programs related to different Layouts Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.
5	Programming UI elements AppBar, Fragments, UI Components
6	Programming menus, dialog, dialog fragments
7	Programs on Intents, Events, Listeners and Adapters The Android Intent Class, Using Events and Event Listeners
8	Database Programming with SQLite

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Head first Android development	Dawn Griffiths David Griffiths	O'Reilly		2018
2.	Android Development with Kotlin	Igor Wojda			2017

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RJSUITP305 Mobile Programming Practical	Course Outcomes : Students will be able to 1. Develop android applications to perform simple tasks using resources and layouts 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: Core Java		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	Lect ures
I	<p>Introduction: History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name</p> <p>Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.</p>	12
II	<p>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement</p> <p>Iterations: The While Loop, The Do ... While Loop, The For Loop, The For each Loop, Labeled Statements, The Break And Continue Statements, The Return Statement</p> <p>Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects</p>	12

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	From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.	
III	<p>Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.</p> <p>Abstract Classes: Abstract Classes, Abstract Methods</p> <p>Interfaces: Defining An Interface, Implementing Interfaces. What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces</p> <p>Packages: Creating Packages, Default Package, Importing Packages, Using A Package</p>	12
IV	<p>Enumerations, Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.</p> <p>Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.</p> <p>Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause</p> <p>Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file</p>	12
V	<p>Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes.</p> <p>Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio</p>	

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Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.	12
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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

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

Practical No	Details
1.	Java Basics
a.	Write a Java program that takes a number as input and prints its multiplication table upto 10.
b.	Write a Java program to display the following pattern. <pre>***** **** *** ** *</pre>
c.	Write a Java program to print the area and perimeter of a circle.
2.	Use of Operators
a.	Write a Java program to add two binary numbers.
b.	Write a Java program to convert a decimal number to binary number and vice versa.
c.	Write a Java program to reverse a string.
3.	Java Data Types
a.	Write a Java program to count the letters, spaces, numbers and other characters of an input string.

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b.	Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value.
c.	Find the smallest and largest element from the array
4.	Methods and Constructors
a.	Designed a class SortData that contains the method asc() and desc().
b.	Designed a class that demonstrates the use of constructor and destructor.
c.	Write a java program to demonstrate the implementation of abstract class.
5.	Inheritance
a.	Write a java program to implement single level inheritance.
b.	Write a java program to implement method overriding
c.	Write a java program to implement multiple inheritance.
6.	Packages and Arrays
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.
7.	Vectors and Multithreading.
a.	Write a java program to implement the vectors.
8.	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.
9.	GUI and Exception Handling

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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.
c.	Write a java program to implement exception handling.
10.	GUI Programming.
a.	Design an AWT application that contains the interface to add student information and display the same.

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	DreamTech	1 st	2008

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT401 Core Java	<p>Course Outcomes 4.1:</p> <p>Students will be able to</p> <ol style="list-style-type: none">1. Understand basics of programming using JAVA, different control flow statements.2. Understand object oriented concepts in JAVA.3. Understand Enumeration, Arrays, Multithreading, Exceptions and byte streams4. Describe designing of GUI and how to handle events using AWT components. <p>Learning outcomes:</p> <ul style="list-style-type: none">➤ Students will understand the basic programming and object oriented concepts in JAVA➤ Students will understand how to design GUI applications using AWT.
RJSUITP401 Core Java Practical	<p>Course Outcomes :</p> <p>Students will be able to</p> <ol style="list-style-type: none">1. Able to implement basic programming concepts and object oriented concepts in JAVA using JDK1.82. Design GUI applications using different AWT layouts and classes.

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	Lectures
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>	12

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	8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.	
IV	Introduction to Arduino: Arduino uno, Arduino Mega and Arduino Nano, Arduino and display devices, Arduino and digital input output devices (push button), Arduino and motors Arduino Programming: Arduino IDE, Installing and launching the IDE, program structure, Data types, variables, constants, control structure and loops, Functions Arduino and wireless communication: RF modem, global system for mobile modem	12
V	Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS. 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	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		Course Code: RJSUITP402	
Practical			
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	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 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 square wave of given frequency on oscilloscope.
	b)	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
	c)	Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.

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6.		Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction.
7.		Generate traffic signal using 8051 microcontroller
8.		Implement temperature controller using 8051

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RJSUIT402	Course Outcomes 4.2 :
Introduction to Embedded Systems	<p>Students will be able to</p> <ol style="list-style-type: none"> 1. Understand basic idea behind embedded system and to study various circuit elements which can act as core of embedded system. 2. Study different types of Embedded systems, embedded hardware and peripheral devices. 3. Design and program embedded system using 8051 microcontroller 4. Understand real time operating system. 5. 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 ➤ Student will understand the process of development of Embedded project development.
RJSUITP402	Course Outcomes :
Introduction to Embedded Systems Practical	<p>Students will be able to</p> <ol style="list-style-type: none"> 1. use reprogrammable embedded computer using 8051 microcontroller, and arduino uno. 2. Burn a executable program image into the relevant microcontroller. 3. Implement a delay routine 4. Use serial and parallel communication ports of 8051 microcontroller and arduino uno 5. 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,</p>	

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	<p>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> <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>	12
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 Hypotheses 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,</p>	

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	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.	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 the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.</p>	12

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	1 st	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	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 dispersion2. Gain insight into consequences of plan by probability techniques and processing samples using sampling techniques3. Draw valid conclusion using estimation theory and proper decision using decision theory4. Measure experimental result based on hypothesis using chi square techniques5. Learn techniques to correlate the relationship between various variables <p>Learning outcomes: ➤ 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</p>
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 software2. 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, Behavioural Models, Data Models, Object Models, Structured Methods.</p> <p>Architectural Design: Architectural Design Decisions, System Organisation, 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	<p>Project Management Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.</p> <p>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p> <p>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.</p>	12
IV	<p>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods.</p> <p>Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.</p> <p>Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p>	12
V	<p>Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.</p> <p>Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p> <p>Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service</p>	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Engineering, edition,	Ian Somerville	Pearson Education.	9 th	
2.	Software Engineering	Pankaj Jalote	Narosa Publication		
3.	Software engineering, a practitioner's approach	Roger Pressman	Tata Mcgraw-hill	7 th	

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4.	Software Engineering principles and practice	WS Jawadekar	Tata Mcgraw-hill		
5.	Software Engineering- A Concise Study	S.A Kelkar	PHI India.		
6.	Software Engineering Concept and Applications	Subhajit Datta	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	50
	External	--	--

List of Practical (To be executed using Star UML 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
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 :</p> <p>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 :</p> <p>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:</p> <p>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:</p> <p>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:</p> <p>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-</p>	

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	<p>Barsky, Polygon Clipping Algorithms- Sutherland Hodgeman and Weiler Atherton, Curve Clipping, Text Clipping.</p> <p>Three-Dimensional Transformations:</p> <p>Three-Dimensional Translation, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotations, Three-Dimensional Reflection, Matrix Representation of 3D Transformations, Composite 3D Transformations.</p>	
III	<p>Viewing in 3D</p> <p>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.</p> <p>Light: Basic Light Sources, Basic Illumination Models: Ambient Light, Diffuse Reflection, Intensity Attenuation, Transparency, Shadows.</p> <p>Color Models and Color Applications: Chromaticity Diagram, Color Models.</p>	12
IV	<p>Visible-Surface Determination:</p> <p>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</p> <p>Plane Curves and Surfaces:</p> <p>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.</p>	12
V	<p>Computer Animation:</p> <p>Principles of Animation, General Computer Animation Functions, Key frame Systems, Morphing, Character Animation, Physics-Based Animation, Procedural Techniques.</p> <p>Image Manipulation and Storage:</p>	12

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	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.	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics	Donald Hearn, M. Pauline Baker	Pearson	2 nd	
2.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson	2 nd	
3.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	4 th	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	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 co-ordinate axis at the center of the screen.
2.	Solve the following:
a.	Divide your screen into four region, draw 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.

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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 Flood Fill Algorithm.
b.	Write a program to fill a circle using 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	Course Outcomes 4.5: Students will be able to <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 Learning outcomes: ➤ Students will demonstrate their ability to use computer graphics techniques, models, and algorithms to solve graphics problems.
RJSUITP405 Computer Graphics and Animation Practical	Course Outcomes : Students will be able to <ol style="list-style-type: none">1. Draw line, circle, rectangle, ellipse and half ellipse in C, C++ or python2. Develop programs for different algorithms like DDA, Bresenham's, midpoint circle drawing, midpoint ellipse drawing, Clipping and Fill algorithms.3. Implement 2D scaling and translation4. 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 Theory and Practical Exam is 40 %.
5. Student 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 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.