



**Janardan Bhagat Shikshan Prasarak Sanstha's**

**CHANGU KANA THAKUR  
ARTS, COMMERCE & SCIENCE COLLEGE,  
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC**

**'College with Potential for Excellence' Status Awarded by UGC**

**'Best College Award' by University of Mumbai**

**Program: Bachelor's in Science (B. Sc.)**

**Revised Syllabus of S.Y.B.Sc. Information Technology**

**Choice Based Credit System (60:40)**

**w.e.f. Academic Year 2023-2024**

**BACHELOR'S IN SCIENCE (B. Sc.)**

## **Preamble of the Syllabus:**

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

## **Objectives of the Course:**

The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Software Development (Programming)
- Website Development
- Mobile app development
- Embedded Systems Programming
- Embedded Systems Development
- Software Testing
- Networking
- Database Administration
- System Administration
- Cyber Law Consultant
- GIS (Geographic Information Systems)
- IT Service Desk
- Security

## **Course Outcome: By the end of the course, a student should develop the Ability:**

- Learners are able to use and apply current technical concepts and practices in the core information technologies.
- Learners are able to apply knowledge of computing and mathematics appropriate to the discipline.
- Learners are able to analyse a problem, and identify and define the computing requirements appropriate to its solution.
- Learners are able to effectively integrate IT based solutions into the user environment.
- Learners are able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs.

### Scheme of Examination

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination to be conducted in the given semester	20 Marks	
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks	
	Presentation		10 Marks
	Written Document		05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks	

### Question Paper Pattern for Class Test

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) ( 1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

### ➤ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

**Choice Based Credit Grading and Semester System (CBCS)**  
**S.Y.B. Sc. Information Technology Syllabus**  
**To be implemented from the Academic year 2023-2024**  
**SEMESTER III**

Course Code	Course Type	Course Title	Credits
UIT3PYP	Skill Enhancement Course	Python Programming	2
UIT3DST	Core Subject	Data Structures	2
UIT3CNT	Core Subject	Computer Networks	2
UIT3DMS	Core Subject	Advanced SQL	2
UIT3MAT	Core Subject	Applied Mathematics	2
UIT3PPP	Skill Enhancement Course Practical	Python Programming Practical	2
UIT3DSP	Core Subject Practical	Data Structures Practical	2
UIT3CNP	Core Subject Practical	Computer Networks Practical	2
UIT3DMP	Core Subject Practical	Advanced SQL Practical	2
UIT3MPP	Core Subject Practical	Mobile Programming Practical	2
UIT3GCM	Vocational Enhancement Course	Green Computing	2
<b>Total Credits</b>			<b>22</b>

**Choice Based Credit Grading and Semester System (CBCS)**  
**S.Y.B. Sc. Information Technology Syllabus**  
**To be implemented from the Academic year 2023-2024**  
**SEMESTER IV**

Course Code	Course Type	Course Title	Credits
UIT4CJT	Skill Enhancement Course	Core Java	2
UIT4EMB	Core Subject	Introduction to Embedded Systems	2
UIT4COS	Core Subject	Computer Oriented Statistical Techniques	2
UIT4SWE	Core Subject	Software Engineering	2
UIT4CGA	Core Subject	Computer Graphics and Animation	2
UIT4CJP	Skill Enhancement Course Practical	Core Java Practical	2
UIT4ESP	Core Subject Practical	Introduction to Embedded Systems Practical	2
UIT4COP	Core Subject Practical	Computer Oriented Statistical Techniques Practical	2
UIT4SEP	Core Subject Practical	Software Engineering Practical	2
UIT4CGP	Core Subject Practical	Computer Graphics and Animation Practical	2
UIT4DMT	Vocational Enhancement Course	Digital marketing	2
<b>Total Credits</b>			<b>22</b>

## Semester III

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Python Programming
<b>Course Code</b>	UIT3PYP
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to understand the fundamentals of coding in Python and problem-solving skills to enable students to develop simple programs.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain the basic principles of Python programming language
	2) Create the python programs in functions, strings, file handling and exception handling.
	3) Explain the facts of object oriented concepts and modules.
	4) Design GUI and database applications.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs .</b>
<b>I</b>	<p><b>Introduction:</b> 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><b>Variables and Expressions</b> Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p><b>Conditional Statements:</b> if, if-else, nested if –else</p> <p><b>Looping:</b> for, while, nested loops</p> <p><b>Control statements:</b> Terminating loops, skipping specific conditions</p>	12 hrs

<p style="text-align: center;"><b>II</b></p>	<p><b>Functions:</b> 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><b>Strings:</b> 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>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>III</b></p>	<p><b>Lists:</b> 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><b>Tuples and Dictionaries:</b> 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><b>Files:</b> Text Files, The File Object Attributes, Directories</p> <p><b>Exceptions:</b> Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>Regular Expressions</b> – Concept of regular expression, various types of regular expressions, using match function.</p> <p><b>Classes and Objects:</b> 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><b>Multithreaded Programming:</b> Thread Module, creating a thread, synchronizing threads, multithreaded priority queue</p> <p><b>Modules:</b> Importing module, Creating and exploring modules, Math module, Random module, Time module</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>V</b></p>	<p><b>Creating the GUI Form and Adding Widgets:</b></p> <p><b>Widgets:</b> 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><b>Layout Management:</b> Designing GUI applications with proper Layout Management features.</p> <p><b>Look and Feel Customization:</b> Enhancing Look and Feel of GUI using different appearances of widgets.</p>	<p style="text-align: center;">12 hrs</p>

	<p><b>Storing Data in Our MySQL Database via Our GUI:</b> 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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**References:**

- 1) “Think Python” , Allen Downey, First edition, O’Reilly publication
- 2) “An Introduction to Computer Science using Python 3” , Jason Montojo, First Edition, SPD publication.
- 3) “Python GUI Programming Cookbook”, Burkhard A. Meier, Packt Edition
- 4) “Introduction to Problem Solving with Python”, E Balagurusamy , First Edition ,Tata McGraw Hill.
- 5) “Murach’s Python Programming” , Joel Murach& Michael Urban, First Edition, SPD Publication
- 6) “Object Oriented Programming in Python”,Michael H. Glodwasser,First Edition, Pearson Prentice Hall Publication
- 7) “Exploring Python”, Budd, First Edition, TMH Publication

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Python Programming Practical
<b>Course Code</b>	UIT3PPP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	The objective of this course is to understand the fundamentals of coding in Python and problem-solving skills to enable students to develop simple programs.
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<b>Course Outcomes</b>	<b>After completing the course, Learners will be able to:</b>
	1) Create programs of objects, strings, array, functions, etc.
	2) Solve programming errors using exception handling.
	3) Construct the concepts of OOP like class, inheritance, polymorphism, encapsulation, etc.
	4) Design GUI using database applications.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<p><b>Write the program for the following:</b></p> <p>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.</p> <p>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.</p> <p>c. Write a program to generate the Fibonacci series.</p>	2hrs
<b>2</b>	<p>Write a function that reverses the user defined value.</p> <p>Write a function to check the input value is Armstrong and also write the function for Palindrome.</p>	2hrs
<b>3</b>	<p>a. Write a recursive function to print the factorial for a given number.</p> <p>b. Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.</p>	2hrs
<b>4</b>	<p><b>Write the program for the following:</b></p>	2hrs



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	<p>a. Define a function that computes the <i>length</i> of a given list or string.</p> <p>b. Define a procedure histogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following:  <pre>**** ***** *****</pre></p>	
<b>5</b>	<p><b>Write the program for the following:</b>  A pangram is a sentence that contains all the letters of the English alphabet at least once, for example: The quick brown fox jumps over the lazy dog. Your task here is to write a function to check a sentence to see if it is a pangram or not. 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.</p>	2hrs
<b>6</b>	<p><b>Write the program for the following:</b></p> <p>a. Write a program that takes two lists and returns True if they have at least one common member.</p> <p>b. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.</p> <p>c. Write a Python program to clone or copy a list</p>	2hrs
<b>7</b>	<p><b>Write the program for the following:</b></p> <p>a. Write a Python script to sort (ascending and descending) a dictionary by value.</p> <p>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 }</p> <p>c. Write a Python program to sum all the items in a dictionary.</p>	2hrs
<b>8</b>	<p><b>Write the program for the following:</b></p> <p>a. Write a Python program to read an entire text file.</p> <p>b. Write a Python program to append text to a file and display the text.</p> <p>c. Write a Python program to read last n lines of a file.</p>	2hrs
<b>9</b>	<p><b>Write the program for the following:</b>  Design a class that store the information of student and display the same Implement the concept of Inheritance using python.</p>	2hrs
<b>10</b>	<p><b>Write the program for the following:</b></p> <p>a. Open a new file in IDLE (“NewWindow” in the “File” menu) and save it as geometry.py 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. Now open a new file and save it in the</p>	2hrs

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	same directory. You should now be able to import your own module like this:  Write a program to implement exception handling.	
<b>11</b>	<b>Write the program for the following:</b> Try to configure the widget with various options like: bg="red", family="times", size=18 Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.	2hrs
<b>12</b>	Write a program to Design Registration Page.	2hrs
<b>13</b>	Design a simple database application that stores the records and retrieve the same.	2hrs
<b>14</b>	Design a database application to search the specified record from the database.	2hrs
<b>15</b>	Design a database application to that allows the user to add, delete and modify the records.	2hrs

**Reference Books:**

- 1) "Think Python" , Allen Downey, First edition, O'Reilly publication
- 2) "An Introduction to Computer Science using Python 3" , Jason Montojo, First Edition, SPD publication.
- 3) "Python GUI Programming Cookbook", Burkhard A. Meier, Packt Edition
- 4) "Introduction to Problem Solving with Python", E Balagurusamy , First Edition ,Tata McGraw Hill.
- 5) "Murach's Python Programming" , Joel Murach& Michael Urban, First Edition, SPD Publication
- 6) "Object Oriented Programming in Python",Michael H. Glodwasser,First Edition, Pearson Prentice Hall Publication
- 7) "Exploring Python", Budd, First Edition, TMH Publication

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Data Structures
<b>Course Code</b>	UIT3DST
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the basic knowledge of algorithms and its complexity, array, linked list, stack, queue, tree, searching and sorting techniques, graph and hashing.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Define the basics of algorithm analysis and array operations.
	2) Elaborate Operations on Linked lists, Stack and Queue.
	3) Explain Different searching and sorting techniques, tree and AVL tree structures.
	4) Solve Problems based on graph and hashing techniques.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs .</b>
<b>I</b>	<p><b>Introduction:</b> 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><b>Array:</b> Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Fibonacci search, 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 hrs

<b>II</b>	<p><b>Linked List:</b> 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, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.</p>	12 hrs
<b>III</b>	<p><b>Stack:</b> 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. Recurrence relation.</p> <p><b>Queue:</b> 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 hrs
<b>IV</b>	<p><b>Sorting and Searching Techniques</b></p> <p>Bubble, Selection, Insertion, Merge Sort.</p> <p><b>Tree:</b> 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><b>Advanced Tree Structures:</b> Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, 2-3 Tree, B-Tree, B+ tree</p>	12 hrs
<b>V</b>	<p><b>Hashing Techniques</b></p> <p>Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing</p> <p><b>Graph:</b> Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph,</p>	12 hrs

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	Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	
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**References:**

- 1) A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
- 2) An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson.
- 3) Data Structure and Algorithm -Maria RukadikarTata McGraw Hill

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Data Structure Practical
<b>Course Code</b>	UIT3DSP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the basic knowledge of algorithms and its complexity, array, linked list, stack, queue, tree, searching and sorting techniques, graph and hashing.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Develop different data structure techniques.
	2) Create Linked list, Stack and Queue Operations.
	3) Make use of searching and sorting techniques
	4) Build a tree and display its elements

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Write a program to store the elements in 1-D array & perform the operations like searching, sorting, reversing the elements.	2hrs
<b>2</b>	Read the two arrays from user & merge them & display the element in sorted order.	2hrs
<b>3</b>	Write a program to perform the Matrix addition, multiplication, and transpose operations.	2hrs
<b>4</b>	Write a program to implement the concept of Stack Push, Pop, Display and Exit operations.	2hrs
<b>5</b>	Write a program to implement the concept of Queue Insert, Delete, Display and Exit operations.	2hrs
<b>6</b>	Write a program to implement bubble sort.	2hrs
<b>7</b>	Write a program to implement selection sort.	2hrs

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<b>8</b>	Write a program to implement insertion sort.	<b>2hrs</b>
<b>9</b>	Write a program to implement the merge sort.	<b>2hrs</b>
<b>10</b>	Write a program to search the element using sequential search.	<b>2hrs</b>
<b>11</b>	Write a program to search the element using binary search.	<b>2hrs</b>
<b>12</b>	Write a program to create a single link list and its node element.	<b>2hrs</b>
<b>13</b>	Write a program to create a tree and display the element.	<b>2hrs</b>
<b>14</b>	Write a program to insert the element into a maximum heap.	<b>2hrs</b>
<b>15</b>	Write a program to insert the element into a minimum heap.	<b>2hrs</b>

**References:**

- 1) A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
- 2) An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson.
- 3) Data Structure and Algorithm -Maria RukadikarTata McGraw Hill

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Computer Networks
<b>Course Code</b>	UIT3CNT
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	On completion of this course, a learner will be able to understand about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Learners will be able to explain the functions of each layer in OSI and TCP/IP model.
	2) Learners will be able to elaborate functions of data link layer and its protocol.
	3) Learners will be able to define the concepts of network layer routing protocol and IP addressing.
	4) Learners will be able to explain the working of different transport layer protocols.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction:</b> Data communications, networks, network types, Internet history, standards and administration.</p> <p><b>Network Models:</b> Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p><b>Introduction to Physical layer:</b> Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p><b>Digital and Analog transmission:</b> Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.</p>	12hrs



<b>II</b>	<p><b>Bandwidth Utilization:</b> Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum  <b>Transmission media:</b> Guided Media, Unguided Media  <b>Switching:</b> Introduction, circuit switched networks, packet switching, and structure of a switch.  <b>Introduction to the Data Link Layer:</b> 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>	12hrs
<b>III</b>	<p><b>Data Link Control:</b> DLC services, data link layer protocols, HDLC, Point-to-point protocol.  <b>Media Access Control:</b> Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabitethernet, 10 gigabit Ethernet.  <b>Wireless LANs:</b> Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.  <b>Connecting devices and Virtual LANs.</b></p>	12hrs
<b>IV</b>	<p><b>Introduction to the Network Layer:</b> Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP  <b>Unicast Routing:</b> Introduction, routing algorithms, unicast routing protocols.  <b>Next generation IP:</b> IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.</p>	12hrs
<b>V</b>	<p><b>Introduction to the Transport Layer:</b> Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol,  <b>Standard Client0Server Protocols:</b> World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.</p>	12hrs

**References:**

- 1) “Data Communication and Networking”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- 2) “TCP/IP protocol suite”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- 3) “Computer Networks”, Andrew Tanenbaum ,Pearson , Fifth Edition,2013

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Computer Networks Practical
<b>Course Code</b>	UIT3CNP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	Objective of this course is gaining practical experience in installation, monitoring, and troubleshooting of current network systems.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Learners should be able to determine information about IP address.
	2) Learners should be able to apply network commands for network configuration.
	3) Learners should be able to utilize IP routing using routing techniques.
	4) Learners should be able to make use of wireshark tools for IP packet scanning.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<b>IPv4 Addressing and Subnetting</b> Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none"> <li>• Network address</li> <li>• Network broadcast address</li> </ul>	2hrs
<b>2</b>	Given an IP address and network mask, determine other information <ul style="list-style-type: none"> <li>• Total number of host bits</li> <li>• Number of hosts</li> </ul>	2hrs
<b>3</b>	Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none"> <li>• The subnet address of this subnet</li> </ul>	

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	<ul style="list-style-type: none"><li>• The broadcast address of this Subnet</li><li>• The number of hosts for each subnet</li></ul>	2hrs
4	Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none"><li>• The range of host addresses for this subnet</li><li>• The maximum number of subnets for this subnet mask.</li></ul>	2hrs
5	Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none"><li>• The number of subnet bits</li><li>• The number of this subnet</li></ul>	2hrs
6	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.	2hrs
7	Configure IP static routing.	2hrs
8	Configure IP routing using RIP.	2hrs
9	Configuring Simple OSPF.	2hrs
10	Configuring DHCP server and client.	2hrs
11	Create virtual PC based network using virtualization software and virtual NIC.	2hrs
12	Configuring DNS Server and client.	2hrs
13	Configuring OSPF with multiple areas.	2hrs
14	Use of Wireshark to scan and check the packet information of following protocols <ul style="list-style-type: none"><li>• HTTP</li><li>• ICMP</li></ul>	2hrs
15	Use of Wireshark to scan and check the packet information of following protocols <ul style="list-style-type: none"><li>• TCP</li><li>• SMTP</li><li>• POP3</li></ul>	2hrs

**Reference Books:**

- 1) "Data Communication and Networking", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- 2) "TCP/IP protocol suite", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- 3) "Computer Networks", Andrew Tanenbaum ,Pearson , Fifth Edition,2013

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Advanced SQL
<b>Course Code</b>	UIT3DMS
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concept of the Advanced SQL with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases.
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<b>Course Outcomes</b>	<b>After completing the course, Learners will be able to:</b>
	1) Define different database objects to access oracle database.
	2) Elaborate the DDL and DML database statements and associated naming rules.
	3) Explain advanced database objects required for PL/SQL programs
	4) Explain the basic concepts of Big Data Analytics

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<b>Structured Query Language:</b> Writing Basic SQL Select Statements, Restricting and Sorting Data, Single-Row Functions, Aggregating Data using Group Functions, Manipulating Data, Creating and Managing Tables	12
<b>II</b>	<b>Advanced SQL:</b> Subqueries, Creating Views, Creating Other Database Objects(Sequences, Indexes and Synonyms) Controlling User Access, Using SET operators, DateTime Functions, Joins (Displaying Data from Multiple Tables), <b>Constraints :</b> Constraints, types of constrains, Integrity constraints WITH Clause, Hierarchical retrieval	12

<b>III</b>	<p><b>PL-SQL:</b> Beginning with PL / SQL, <b>Control Structures:</b> Conditional processing using IF Statements and CASE Statements, Loop Statement, While Loop Statement, For Loop Statement, the Continue Statement</p> <p><b>Explicit Cursors:</b> Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Cursor FOR loop, The %NOTFOUND and %ROWCOUNT Attributes</p> <p><b>Exception Handling:</b> Handle Exceptions with PL/SQL, Propagate Exceptions</p> <p>Composite Type: PL/SQL Records, The %ROWTYPE Attribute, INDEX BY Tables, INDEX BY Table Methods</p>	12
<b>IV</b>	<p><b>Stored Procedures:</b> Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes</p> <p><b>Stored Functions</b> Create, Call, and Remove a Stored Function, advantages of using Stored Functions, the steps to create a stored function, Invoke User-Defined Functions in SQL Statements</p> <p><b>Packages:</b> advantages of Packages, components of a Package, Develop a Package, enable visibility of a Package's Components, Create the Package Specification and Body using the SQL CREATE Statement and SQL Developer,</p> <p><b>Triggers:</b> the Trigger Event Types and Body, Create DML Triggers using the CREATE TRIGGER Statement, Identify the Trigger Event Types, Body, and Firing (Timing), Statement Level Triggers and Row Level Triggers, Manage, Test and Remove Triggers.</p>	12
<b>V</b>	<p><b>Unit V:</b></p> <p><b>Introduction to Big data Analytics:</b> Characteristics of data, Definition of Big data, Evolution of Big data, Challenges with Big data, 3 Vs of Big data, Why Big data, Data Warehousing Environment, Hadoop Environment, What is Big Data Analytics, Classification of Big Data Analytics, Data Analytics Life cycle</p>	12

**References:**

- 1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
- 2) Oracle database 11g : hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
- 3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition  
X- Team, 2011
- 4) PL/SQL Programming, Ivan Bayross, First Edition, BPB 2010
- 5) Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Advanced SQL Practical
<b>Course Code</b>	UIT3DMP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concept of the Advanced SQL with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Apply DDL and DML statements to access database.
	2) Create database objects using SET operators.
	3) Build basic PL/SQL programs
	4) Develop PL/SQL program using Advanced Database objects.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<b>Select queries</b> a. Select queries on single table using alias, where and order by clause. b. Select queries on single table using aggregate	2hrs
<b>2</b>	<b>Select queries using joins and unions</b> a. Querying data from multiple tables using all types of joins. b. Querying data from multiple tables using all types of joins.	2hrs
<b>3</b>	<b>Subqueries, DML and DDL</b> a. Querying single and multiple tables using subqueries. b. Manipulating data (Insert, update and delete) c. Creating simple tables and tables with constraints.	2hrs
<b>4</b>	<b>Creating database objects, using set operators</b> a. Creating Views, Sequences, Indexes and synonyms.	2hrs

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	b. Using set operators, date-time functions.	
5	<b>Working with advanced subqueries and WITH clause</b> a. Multiple column subqueries, subqueries in from clause. b. WITH Clause and hierarchical retrieval.	2hrs
6	<b>Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.</b> Creating anonymous PL/SQL blocks.	2hrs
7	<b>Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.</b> Define, create, and use INDEX BY tables and a PL/SQL record.	2hrs
8	<b>Cursors, Exceptions and procedures issuing DML and query commands.</b> Cursors with parameters to process a number of rows from multiple table	2hrs
9	<b>Cursors, Exceptions and procedures issuing DML and query commands.</b> Create exception handlers for specific situations.	2hrs
10	<b>Functions and Stored Procedures</b> Creating and invoking functions from SQL statements.	2hrs
11	<b>Functions and Stored Procedures</b> Creating and invoking stored procedures.	2hrs
12	<b>Working with packages</b> Create package specifications and package bodies. Invoke the constructs in the packages.	2hrs
13	<b>Working with packages</b> Create a package containing an overloaded function.	2hrs
14	<b>Working with Large Objects and triggers</b> Create statement triggers.	2hrs
15	<b>Working with Large Objects and triggers</b> Create row triggers.	2hrs

**Reference Books:**

- 1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
- 2) Oracle database 11g : hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
- 3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition  
X- Team, 2011
- 4) PL/SQL Programming, Ivan Bayross, First Edition, BPB 2010
- 5) Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Applied Mathematics
<b>Course Code</b>	UIT3MAT
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The learners will understand the concepts of applications of the methods for solving different mathematical structures. This course introduces the advance learning of matrices and complex numbers, differential equations, Laplace transforms and the error functions.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Evaluate matrices using different methods and polar, exponential forms of complex as well as hyperbolic functions.
	2) Analyze different solutions of the differential equation using various methods and differential equations with constant coefficients.
	3) Explain the properties and theorems of laplace and integrate the laplace transform and evaluate differential equations using laplace transform.
	4) Analyze double and triple integrals in polar coordinates and area, volume using double and triple integrals

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Matrices:</b> 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.</p> <p><b>Complex Numbers:</b> Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of <math>x+iy</math> for different signs of <math>x,y</math>, Exponential form of complex numbers, Mathematical</p>	12hrs



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	operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles.	
<b>II</b>	<p><b>Equation of the first order and of the first degree:</b> 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><b>Linear Differential Equations with Constant Coefficients:</b> Introduction, The Differential Operator, Linear Differential Equation <math>f(D) y = 0</math>, Different cases depending on the nature of the root of the equation <math>f(D) = 0</math>, Linear differential equation <math>f(D) y = X</math>, The complimentary Function, The inverse operator <math>1/f(D)</math> and the symbolic expiration for the particular integral <math>1/f(D) X</math>; the general methods, Particular integral : Short methods.</p>	12hrs
<b>III</b>	<p><b>The Laplace Transform:</b> 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,</p> <p><b>Inverse Laplace Transform:</b> 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.</p>	12hrs
<b>IV</b>	<p><b>Multiple Integrals:</b> Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals.</p> <p><b>Applications of integration:</b> Areas, Volumes of solids.</p>	12hrs
<b>V</b>	<p><b>Beta and Gamma Functions</b> – Definitions, Properties and Problems. Duplication formula.</p> <p><b>Differentiation Under the Integral Sign</b> Error Functions</p>	12hrs

**References:**

- 1) A text book of Applied Mathematics Vol I, P. N. Wartikar and J. N. Wartikar, Pune VidyathiGraha
- 2) Applied Mathematics II, P. N. Wartikar and J. N. Wartikar, Pune VidyathiGraha
- 3) Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna publications.

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Mobile Programming Practical
<b>Course Code</b>	UIT3MPP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	The student will learn the basics of platform and get to understand the application lifecycle student will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Build a simple basic program using Cordova commands.
	2) Create an application using battery plugin and camera plugin
	3) Develop an application using contacts plugin, device plugin and accelerometer plugin.
	4) Make use of Network Information plugin, splash screen plugin and vibration plugin.

<b>Module/ Unit</b>	<b>Course Description  List of Practical</b>	<b>Hrs</b>
<b>1</b>	Setting up CORDOVA, PhoneGAP Project and environmental variable.	2hrs
<b>2</b>	1. Creating and building simple “Hello World” App using cordova. 2. Adding and Using Buttons	2hrs
<b>3</b>	1. Adding and Using Event Listeners	2hrs
<b>4</b>	1. Creating and Using Functions 2. Handling and Using Back Button	2hrs
<b>5</b>	1. Installing and Using Plugins 2. Installing and Using Battery Plugin	2hrs
<b>6</b>	1. Installing and Using Camera Plugin	2hrs

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<b>7</b>	1. Installing and Using Contacts Plugin 2. Installing and Using Device Plugin	2hrs
<b>8</b>	1. Installing and Using Accelerometer Plugin	2hrs
<b>9</b>	1. Install and Using Device Orientation plugin 2. Install and Using Device Orientation plugin	2hrs
<b>10</b>	1. Create and Using Prompt and Confirm Function	2hrs
<b>11</b>	1. Installing and Using File Plugin 2. Installing and Using File Transfer Plugin 3. Using Download and Upload functions	2hrs
<b>12</b>	1. Installing and Using Globalization Plugin 2. Installing and Using Media Plugin 3. Installing and Using Media Capture Plugin	2hrs
<b>13</b>	1. Installing and Using Network Information Plugin 2. Installing and Using Splash Screen Plugin 3. Installing and Using Vibration Plugin	2hrs
<b>14</b>	1. Developing Single Page Apps 2. Developing Multipage Apps 3. Storing Data Locally in a Cordova App	2hrs
<b>15</b>	1. Use of sqlite plugin with PhoneGap / apache Cordova 2. Using Sqlite read/write and search 3. Populating Cordova SQLite storage with the JQuery API	2hrs

**Reference Books:**

- 1) Apache Cordova 4 Programming John M. Wargo Addison- Wesley Professional 1<sup>st</sup> 2015
- 2) Apache Cordova in Action Raymond Camden Manning Publications 1st 2015
- 3) PhoneGap By Example Andrey Kovalenko PACKT Publishing 1st 2015

## 2- Credit Courses

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	III
<b>Course Name</b>	Green Computing
<b>Course Code</b>	UIT3GCM
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	To acquire knowledge to adopt green computing for minimising negative impact on the environment.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain overview and issues of green computing.
	2) Elaborate the concept of minimising power usage.
	3) Make use of knowledge for going paperless using green computing.

Course Code	Unit No.	Topics	Duration
UIT3GCM	I	<p><b>Unit-I</b></p> <p><b>Overview and Issues:</b> Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.</p> <p><b>Initiatives and Standards:</b> Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.</p> <p><b>Minimizing Power Usage:</b> Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Bigger Drives, Involving the Utility Company, Low-Power Computers: PCs,</p>	15 L

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		Linux, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.	
	II	<p><b>Unit-II</b></p> <p><b>Cooling:</b> Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, Optimizing Airflow, Aisle, Raised Floors, Cable Management, Prevent Recirculation of Equipment Exhaust, System Design, Datacentre Design, Centralized Control.</p> <p><b>Going Paperless:</b> Paper Problems, General impact of paper making on Environment, Costs: Paper and Office, Storage, Destruction, Going Paperless, Organizational Realities, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets</p> <p><b>Recycling :</b> Introduction and Problems, Recycling in China and Africa, Recyclable Materials, Means of Disposal, Refurbishing, Make the Decision, Green Design, Recycling companies in Mumbai, Good and Bad about CDs and DVDs Disposal, Change the Mindset.</p>	15 L

## Semester IV

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Core Java
<b>Course Code</b>	UIT4CJT
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concept of the java programming language and understand its fundamentals.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain the basic concepts of java programming.
	2) Build java code using control structures, iteration.
	3) Explain advance class features.
	4) Elaborate multithreading, IO File handling and exception handling and AWT application.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction:</b> 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><b>Data types:</b> primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators,</p>	<b>12Hrs</b>

	Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.	
II	<p><b>Control Flow Statements:</b> The If...Else If...Else Statement, The Switch...Case Statement</p> <p><b>Iterations:</b> The While Loop, The Do ... While Loop, The For Loop, The Foreach Loop, Labelled Statements, The Break And Continue Statements, The Return Statement</p> <p><b>Classes:</b> Types of Classes, Scope Rules, Access Modifier, Instantiating Objects 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</p>	12hrs
III	<p><b>Inheritance:</b> Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.</p> <p>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, 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, Defining An Interface, Implementing Interfaces.</p> <p><b>Packages:</b> Creating Packages, Default Package, Importing Packages, Using A Package.</p>	12Hrs
IV	<p><b>Enumerations, Arrays:</b> 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><b>Multithreading:</b> the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.</p> <p><b>Exceptions:</b> Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause</p> <p><b>Byte streams:</b> 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>	12Hrs

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<b>V</b>	<p><b>Event Handling:</b> Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes.</p> <p><b>Abstract Window Toolkit:</b> Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames</p> <p><b>Layouts:</b> Flow Layout, Grid Layout, Border Layout, Card Layout.</p>	<b>12Hrs</b>
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**References:**

- 1) “Core Java 8 for Beginners” , Vaishali Shah, Sharnam Shah, First edition, SPD publication
- 2) “Java: The Complete Reference” , Herbert Schildt, Ninth Edition, McGraw Hill.



<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Core Java Practical
<b>Course Code</b>	UIT4CJP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concept of the java basic programming including multithreading and Exception handling.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Build basic programs by using operators.
	2) Make use of the data types, methods and constructors to write java program.
	3) Create a program on inheritance, vectors, packages and arrays, multithreading and file handling concepts.
	4) Design GUI by using Exception handling.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<b>Java Basics</b> 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 patterns.	2 hrs
<b>2</b>	<b>Use of Operators</b> a. Write a Java program to print the area and perimeter of a circle. b. Write a Java program to add two binary numbers.	2 hrs
<b>3</b>	<b>Use of Operators</b> a. Write a Java program to convert a decimal number to binary number and vice versa. b. Write a Java program to reverse a string.	2 hrs
<b>4</b>	<b>Java Data Types</b> a. Write a Java program to count the letters, spaces, numbers and other characters of an input string. b. Find the smallest and largest element from the array.	2 hrs

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<b>5</b>	<b>Methods and Constructors</b> a. Designed a class SortData that contains the method asc() and desc(). b. Designed a class that demonstrates the use of constructor and destructor.	2 hrs
<b>6</b>	<b>Abstract class and method overriding</b> a. Write a java program to demonstrate the implementation of abstract class. b. Write a java program to implement method overriding	2 hrs
<b>7</b>	<b>Inheritance</b> a. Write a java program to implement single level inheritance. b. Write a java program to implement multiple inheritance.	2 hrs
<b>8</b>	<b>Packages</b> a. Create a package, Add the necessary classes and import the package in java class.	2 hrs
<b>9</b>	<b>Arrays</b> a. Write a java program to add two matrices and print the resultant matrix. b. Write a java program for multiplying two matrices and print the product for the same.	2 hrs
<b>10</b>	<b>Vectors</b> a. Write a java program to implement the vectors.	2hrs
<b>11</b>	<b>Multithreading</b> a. Write a java program to implement thread life cycle. b. Write a java program to implement multithreading.	2 hrs
<b>12</b>	<b>File Handling</b> a. Write a java program to copy the contents from one file to other file. b. Write a java program to read the student data from user and store it in the file.	2hrs
<b>13</b>	<b>GUI</b> a. Design a AWT program to print the factorial for an input value.	2 hrs
<b>14</b>	<b>Exception Handling</b> a. Write a java program to implement exception handling.	2 hrs
<b>15</b>	<b>GUI Programming.</b> a. Design an AWT application that contains the interface to add student information and display the same.	2 hrs

**Reference Books:**

- 1) "Core Java 8 for Beginners" , Vaishali Shah, Sharnam Shah, First edition, SPD publication
- 2) "Java: The Complete Reference" , Herbert Schildt, Ninth Edition, McGraw Hill.

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Introduction to Embedded System
<b>Course Code</b>	UIT4EMB
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To introduce learner with the core components of embedded system and 8051 programming in C. They will also be able to differentiate types of operating system.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Become familiar with classification, characteristics, core components of embedded system.
	2) Become familiar with memory, types of memory, registers Acquire skills in 8051 programming in C.
	3) Acquire skills for selecting microcontroller and developing basic applications.
	4) Become familiar with different types of operating system and its characteristics.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction:</b> Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems</p> <p><b>Core of embedded systems:</b> 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><b>Characteristics and quality attributes of embedded systems:</b> Characteristics, operational and non-operational quality attributes.</p>	<b>12Hrs</b>

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<b>II</b>	<p><b>Embedded Systems – Application and Domain Specific:</b> Application specific – washing machine, domain specific - automotive.</p> <p><b>Embedded Hardware:</b> Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.</p> <p><b>Peripherals:</b> Control and Status Registers, Device Driver, Timer Driver - Watchdog Timer</p>	<b>12Hrs</b>
<b>III</b>	<p><b>The 8051 Microcontrollers:</b> Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p><b>8051 Programming in C:</b> Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.</p>	<b>12Hrs</b>
<b>IV</b>	<p><b>Designing Embedded System with 8051 Microcontroller:</b> Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p> <p><b>Programming embedded systems:</b> structure of embedded program, infinite loop, compiling, linking and debugging</p>	<b>12Hrs</b>
<b>V</b>	<p><b>Real Time Operating System (RTOS):</b> Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p><b>Design and Development:</b> 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>	<b>12Hrs</b>

**Reference Books:**

- 1) Introduction to embedded systems ,Shibu K V, First, Tata Mcgraw-Hill
- 2) Embedded Systems Rajkamal Tata Mcgraw-Hill

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Introduction to Embedded System Practical
<b>Course Code</b>	UIT4ESP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	To provide basic knowledge and skills in embedded system, design and program an embedded system at the basic level.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Design a reprogrammable embedded computer using 8051 microcontroller.
	2) Develop a program to generate given time delay by using timer control registers.
	3) Make use of components like seven-segment display, Oscilloscope, D/A Converter and Stepper motor.
	4) Create a program to generate traffic signals, Temperature and Elevator controller and flash magic.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming b. Execution c. Debugging	2hrs
<b>2</b>	a) Configure timer control registers of 8051 and develop a program to generate given time delay. b) To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.	2hrs
<b>3</b>	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	2hrs

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	LED's b) To interface 8 LEDs at Input-output port and create different patterns.	
4	To demonstrate timer working in timer mode and blink LED without using any loop delay routine.	2hrs
5	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.	2hrs
6	To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.	2hrs
7	Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.	2hrs
8	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.	2hrs
9	Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.	2hrs
10	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.	2hrs
11	Generate traffic signal.	2hrs
12	Implement Temperature controller.	2hrs
13	Implement Elevator control.	2hrs
14	<b>Using Flash Magic</b> a. To demonstrate the procedure for flash programming for reprogrammable embedded system board using Flash Magic.	2hrs
15	<b>Using Flash Magic</b> To demonstrate the procedure and connections for multiple controllers programming of same type of controller with same source code in one go, using flash magic.	2hrs

**Reference Books:**

- 1) Introduction to embedded systems ,Shibu K V, First, Tata Mcgraw-Hill
- 2) Embedded Systems Rajkamal Tata Mcgraw-Hill

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Computer Oriented Statistical Techniques
<b>Course Code</b>	UIT4COS
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to provide an understanding for the learners on statistical concepts to include measures of dispersion probability distribution, sampling estimation, and hypothesis testing, and regression and correlation analysis.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) To calculate and apply measures of dispersion and to apply discrete and continuous probability distribution to various problems.
	2) The test of hypothesis as well as calculate confidence interval for a population parameter and learn the concept to p-value.
	3) Learn non parametric test such as the Chi- Square test for Independence as well as goodness of fit.
	4) To compute and interpret the results of bivariate and multivariate regression and correlation analysis and to perform ANOVA. Be able to perform multiple regression using computer software R.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<b>Measures of Central Tendency and measures of dispersion:</b> 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, Quartiles, Deciles, and Percentiles, <b>Measures of Dispersion:</b> 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, , Absolute and Relative Dispersion; Coefficient of Variation, Standardized Variable.	12hrs

	<b>Moments, Skewness, and Kurtosis</b> : Moments , Moments for Grouped Data ,Relations Between Moments , , Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis,	
II	<b>Elementary Probability Theory</b> : Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Probability distributions: Binomial, Poisson, Normal <b>Elementary Sampling Theory</b> : 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 Differences and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory .	12hrs
III	<b>Statistical Estimation Theory</b> : Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. <b>Statistical Decision Theory</b> : 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.	12hrs
IV	<b>Small Sampling Theory</b> : 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. <b>The Chi-Square Test</b> : 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, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi-square	12hrs
V	<b>Curve Fitting and the Method of Least Squares</b> : 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. <b>Correlation Theory</b> : Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares	12hrs



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	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	
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**References:**

- 1) STATISTICS, Murray R Spiegel, Larry J. Stephens, McGRAW –HILL INTERNATIONAL, Fourth edition.
- 2) FUNDAMENTAL OF MATHEMATICAL STATISTICS S.C. GUPTA and V.K. KAPOOR, SULTAN CHAND and SONS, ELEVENTH EDITION.
- 3) A Practical Approach using R , R.B. Patil, H.J. Dand and R. Bhavsar , SPD publication, First edition.

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Computer Oriented Statistical Techniques Practical
<b>Course Code</b>	UIT4COP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	The objective of this course is to provide an understanding for the learners on statistical concepts and implementing various commands to calculate all these statistical measures with the help of R tool.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Illustrate basic commands and basic operations of the R tool.
	2) Make use of R tool commands to calculate summary statistics.
	3) Evaluate testing of hypothesis estimate probability distribution using R tool.
	4) Develop the R programme to infer statistical analysis.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Getting start with R, data entry. Commands for basic algebraic functions, entering sequences, repetition of observations, inclusion and exclusion of observations from data sets.	2hrs
<b>2</b>	Using R execute the basic commands, arrays, lists and data frames	2hrs
<b>3</b>	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.	2hrs
<b>4</b>	Import the data files, datasets, packages.	2hrs
<b>5</b>	Using R import the data from Excel / .CSV file and Perform the statistical functions: mean, median, mode,	2hrs
<b>6</b>	Using R import the data from Excel / .CSV file and executing functions as standard deviation, variance, co-variance, quartiles, range, inter quartile range	2hrs
<b>7</b>	Using R, executing graphs and plots.	2hrs
<b>8</b>	Using R import the data from Excel / .CSV file and draw the scenes and kurtosis.	2hrs

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<b>9</b>	Using R perform the binomial distribution on the data.	2hrs
<b>10</b>	Using R perform normal distribution on the data.	2hrs
<b>11</b>	Import the data from Excel / .CSV and perform the hypothetical testing.	2hrs
<b>12</b>	Import the data from Excel / .CSV and perform the Chi-squared Test.	2hrs
<b>13</b>	Perform the Linear Regression using R.	2hrs
<b>14</b>	Compute the Least squares means using R.	2hrs
<b>15</b>	Compute the Linear Least Square Regression	2hrs

**Reference Books:**

1) A Practical Approach using R , R.B. Patil, H.J. Dand and R. Bhavsar , SPD publication, First edition.

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Software Engineering
<b>Course Code</b>	UIT4SWE
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	Basic knowledge and understanding of the analysis and design of complex systems. Ability to apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To produce efficient, reliable, robust and cost-effective software solutions.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain software life cycle model and knowledge about different phases of software life cycle.
	2) Make use of different methodologies in software engineering.
	3) Explain current theories, models and techniques that provide a basis for the software life cycle.
	4) Elaborate techniques and tools necessary for engineering practice.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction:</b> What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.</p> <p><b>Software Processes:</b> Process and Project, Component Software Processes.</p> <p><b>Software Development Process Models.</b></p> <ul style="list-style-type: none"> <li>• Waterfall Model.</li> <li>• Prototyping.</li> <li>• Iterative Development.</li> <li>• Rational Unified Process.</li> </ul>	12hrs

	<ul style="list-style-type: none"> <li>• The RAD Model</li> <li>• Time boxing Model.</li> </ul> <p><b>Agile software development:</b> Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>	
<b>II</b>	<p><b>Socio-technical system:</b> Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.</p> <p><b>Critical system:</b> Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p><b>Requirements Engineering Processes:</b> Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.</p> <p><b>System Models:</b> Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.</p>	12hrs
<b>III</b>	<p><b>Architectural Design:</b> Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p><b>User Interface Design:</b> Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p><b>Project Management:</b> Software Project Management, Management activities, Project Planning, Project Scheduling, and Risk Management.</p> <p><b>Quality Management:</b> Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p>	12hrs
<b>IV</b>	<p><b>Verification and Validation:</b> Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. <b>Software Testing:</b> System Testing, Component Testing, Test Case Design, Test Automation.</p> <p><b>Software Measurement:</b> Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics</p> <p><b>Software Cost Estimation:</b> Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p>	12hrs
<b>V</b>	<p><b>Process Improvement:</b> Process and product quality, Process Classification, Process Measurement, Process Analysis and Modelling, Process Change, The CMMI Process Improvement Framework.</p> <p><b>Service Oriented Software Engineering:</b> Services as reusable components, Service Engineering, Software Development with Services.</p> <p><b>Software reuse:</b> The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p>	12hrs

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	<b>Distributed software engineering:</b> Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service.	
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**References:**

- 1) Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
- 2) Software Engineering Pankaj JaloteNarosa Publication
- 3) Software engineering, a practitioner’s approach Roger Pressman Tata Mcgraw-hill Seventh edition
- 4) Software Engineering principles and practice WS Jawadekar Tata Mcgraw-hill

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Software Engineering Practical
<b>Course Code</b>	UIT4SEP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	Basic knowledge and understanding of the analysis and design of complex systems. Ability to apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To produce efficient, reliable, robust and cost-effective software solutions.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Evaluate products-startups implementing software process models in software engineering methods.
	2) Design the diagram in an open-source tool: Star UML.
	3) Construct systems using design principles.
	4) Design the existing software using UML diagrams.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Study and implementation of class diagrams.	2hrs
<b>2</b>	Study and implementation of Use Case Diagrams.	2hrs
<b>3</b>	Study and implementation of Entity Relationship Diagrams.	2hrs
<b>4</b>	Study and implementation of Entity Relationship Diagrams in Hospital Management System.	2hrs
<b>5</b>	Study and implementation of Entity Relationship Diagrams in Company Management System.	2hrs
<b>6</b>	Study and implementation of Sequence Diagrams.	2hrs
<b>7</b>	Study and implementation of State Transition Diagrams.	2hrs
<b>8</b>	Study and implementation of Data Flow Diagrams.	2hrs
<b>9</b>	Study and implementation of Data Flow Diagrams Level-0	2hrs

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<b>10</b>	Study and implementation of Data Flow Diagrams Level-1	2hrs
<b>11</b>	Study and implementation of Data Flow Diagrams Level-1	2hrs
<b>12</b>	Study and implementation of Collaboration Diagrams.	2hrs
<b>13</b>	Study and implementation of Activity Diagrams.	2hrs
<b>14</b>	Study and implementation of Component Diagrams.	2hrs
<b>15</b>	Study and implementation of Deployment Diagrams.	2hrs

**Reference Books:**

- 1) Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
- 2) Software Engineering Pankaj JaloteNarosa Publication
- 3) Software engineering, a practitioner's approach Roger Pressman Tata Mcgraw-hill Seventh edition
- 4) Software Engineering principles and practice WS Jawadekar Tata Mcgraw-hill



<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Computer Graphics and Animation
<b>Course Code</b>	UIT4CGA
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To make the learners aware of the different algorithms that are actually used for developing different types of animations. This subject aims in making the learners capable of designing different animations programmatically.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Classify various 2D & 3D transformation.
	2) Define the basic computer graphics applications.
	3) Examine algorithm of visible surface detection.
	4) Elaborate principles of animation.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction to Computer Graphics:</b>                      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, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.</p> <p><b>Scan conversion</b> – Digital Differential Analyzer (DDA) algorithm, Bresenhams’ Line drawing algorithm. Bresenhams’ method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components. • Time boxing Model.</p>	12 hrs

	<p><b>Agile software development:</b> Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>	
II	<p><b>Two-Dimensional Transformations:</b>  Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.</p> <p><b>Three-Dimensional Transformations:</b>  Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.</p>	12 hrs
III	<p><b>Viewing in 3D</b>  Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid.</p> <p><b>Light:</b> Radiometry, Transport, Equation, Photometry  <b>Color:</b> Colorimetry, Color Spaces, Chromatic Adaptation, Color Appearance</p>	12 hrs
IV	<p><b>Visible-Surface Determination:</b>  Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p><b>Plane Curves and Surfaces:</b>  Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola,</p>	12 hrs

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	Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.	
V	<b>Computer Animation:</b> Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects. <b>Image Manipulation and Storage:</b> 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 hrs

**References:**

- 1) 1.Computer Graphics - Principles and Practice J. D. Foley, A. Van Dam, S. K. Feiner and J.F.
- 2) Hughes Pearson 2nd edition.
- 3) Computer Graphics Hearn, Baker Pearson 2nd edition.
- 4) Fundamentals of Computer Graphics Steve Marschner, Peter Shirley 4th edition.

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Computer Graphics and Animation Practical
<b>Course Code</b>	UIT4CGP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	This course provides an introduction to the principle of computer graphics. In particular, the course will consider method for modeling 2-D/ 3-D objects. The emphasis of the course will be placed on understanding how the various elements that like algebra, geometry, algorithms and data structures interact in design of graphics.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Make use of the graphics function.
	2) Create 2D, 3D animation
	3) Simplify line drawing, circle generation with the help of algorithm.
	4) Design program for circle using flood fill, boundary fill algorithm.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<b>Solve the following:</b> a. Study and enlist the basic functions used for graphics in C / C++ / Python language. b. Give an example for each of them. Draw a co-ordinate axis at the centre of the screen.	2hrs
<b>2</b>	<b>Solve the following:</b> a. Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message.	2hrs
<b>3</b>	Draw a simple hut on the screen.	2hrs
<b>4</b>	<b>Draw the following basic shapes in the center of the screen :</b> i. Circle    ii. Rectangle    iii. Square iv. Concentric Circles    v. Ellipse    vi. Line	2hrs

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5	<b>Solve the following:</b> Develop the program for the mid-point circle drawing algorithm.	2hrs
6	Develop the program for the mid-point ellipse drawing algorithm.	2hrs
7	<b>Solve the following:</b> a. Write a program to implement 2D scaling. b. Write a program to perform 2D translation	2hrs
8	a. Write a program to perform 2D Rotation. b. Write a program to perform 2D Reflection	2hrs
9	<b>Solve the following:</b> 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 $y = mx + c$ .	2hrs
10	<b>Solve the following:</b> Write a program to implement Cohen-Sutherland clipping.	2hrs
11	Write a program to implement Liang - Barsky Line Clipping Algorithm	2hrs
12	<b>Solve the following:</b> a. Write a program to fill a circle using Flood Fill Algorithm. b. Write a program to fill a circle using Boundary Fill Algorithm.	2hrs
13	<b>Solve the following:</b> a. Develop a simple text screen saver using graphics functions.	2hrs
14	Perform smiling face animation using graphic functions.	2hrs
15	Draw the moving car on the screen.	2hrs

**Reference Books:**

- 1) Computer Graphics - Principles and Practice J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes Pearson 2nd edition.
- 2) Computer Graphics Hearn, Baker Pearson 2nd edition.
- 3) Fundamentals of Computer Graphics Steve Marschner, Peter Shirley 4th edition.

**2- Credit Course**

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	IV
<b>Course Name</b>	Digital marketing
<b>Course Code</b>	UIT4DGM
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	This course provides an introduction to the digital marketing, Social Media Marketing, Email Marketing, Content Marketing, Mobile Marketing, Video Marketing.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain basics of Digital Marketing.
	2) Analyse emerging trends in Digital Marketing.
	3) Demonstrate Different types of social marketings.

Course Code	Unit No.	Topics	Duration
UIT4DGM	I	<p><b>Unit-I</b></p> <p><b>Introduction:</b> What is Digital Marketing?, Importance of Digital Marketing, Traditional Vs. Digital Marketing, Types of Digital Marketing</p> <p><b>Website Design and Development:</b> Basics of website design and development, Elements of a good website, Responsive web design and its importance, Understanding user experience and user interface design, Basics of HTML, CSS, and JavaScript</p> <p><b>Search Engine Optimization (SEO):</b> Introduction to Search Engine Optimization, On-page and off-page SEO techniques, Keyword research and analysis</p>	15L
	II	<p><b>Unit-II</b></p> <p><b>Pay-Per-Click Advertising (PPC):</b> Introduction to Pay-Per-Click Advertising, Google Ads and Bing Ads, Keyword research and selection</p>	15L

		<p><b>Social Media Marketing:</b> Introduction to social Media Marketing, Understanding different social media platforms</p> <p><b>Content Marketing:</b> Introduction to Content Marketing, Understanding different types of content</p> <p><b>Mobile Marketing:</b> Introduction to Mobile Marketing, Mobile website design and development, Mobile apps and app store optimization</p> <p><b>Video Marketing:</b> Introduction to Video Marketing, Different types of video content, Creating and Managing a Youtube Channel.</p>	
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