

**UNIVERSITY OF MUMBAI**



**Syllabus for S.Y.B.Sc.**

**Programme: B.Sc.**

**Course: Information Technology**

with effect from the academic year

2017 – 2018

<b>Semester – 3</b>			
<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
USIT301	Skill Enhancement Course	Python Programming	2
USIT302	Core Subject	Data Structures	2
USIT303	Core Subject	Computer Networks	2
USIT304	Core Subject	Database Management Systems	2
USIT305	Core Subject	Applied Mathematics	2
USIT3P1	Skill Enhancement Course Practical	Python Programming Practical	2
USIT3P2	Core Subject Practical	Data Structures Practical	2
USIT3P3	Core Subject Practical	Computer Networks Practical	2
USIT3P4	Core Subject Practical	Database Management Systems Practical	2
USIT3P5	Core Subject Practical	Mobile Programming Practical	2
<b>Total Credits</b>			<b>20</b>

<b>Semester – 4</b>			
<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
USIT401	Skill Enhancement Course	Core Java	2
USIT402	Core Subject	Introduction to Embedded Systems	2
USIT403	Core Subject	Computer Oriented Statistical Techniques	2
USIT404	Core Subject	Software Engineering	2
USIT405	Core Subject	Computer Graphics and Animation	2
USIT4P1	Skill Enhancement Course Practical	Core Java Practical	2
USIT4P2	Core Subject Practical	Introduction to Embedded Systems Practical	2
USIT4P3	Core Subject Practical	Computer Oriented Statistical Techniques Practical	2
USIT4P4	Core Subject Practical	Software Engineering Practical	2
USIT4P5	Core Subject Practical	Computer Graphics and Animation Practical	2
<b>Total Credits</b>			<b>20</b>

# **SEMESTER III**

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Python Programming</b>		<b>Course Code: USIT301</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

<b>Unit</b>	<b>Details</b>	<b>Lectures</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>	<b>12</b>
<b>II</b>	<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>	<b>12</b>
<b>III</b>	<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>	<b>12</b>

	<b>Exceptions:</b> Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions	
<b>IV</b>	<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>	<b>12</b>
<b>V</b>	<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. 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><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>	<b>12</b>

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Think Python	Allen Downey	O'Reilly	1 <sup>st</sup>	2012
2.	An Introduction to Computer Science using Python 3	Jason Montojo, Jennifer Campbell, Paul Gries	SPD	1 <sup>st</sup>	2014
3.	Python GUI Programming Cookbook	Burkhard A. Meier	Packt		2015
4.	Introduction to Problem Solving with Python	E. Balagurusamy	TMH	1 <sup>st</sup>	2016
5.	Murach's Python programming	Joel Murach, Michael Urban	SPD	1 <sup>st</sup>	2017
6.	Object-oriented Programming in Python	Michael H. Goldwasser, David Letscher	Pearson Prentice Hall	1 <sup>st</sup>	2008
7.	Exploring Python	Budd	TMH	1 <sup>st</sup>	2016

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Data Structures</b>		<b>Course Code: USIT302</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

<b>Unit</b>	<b>Details</b>	<b>Lectures</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, 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>	<b>12</b>
<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, 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>	<b>12</b>
<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.</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>	<b>12</b>

<b>IV</b>	<p><b>Sorting and Searching Techniques</b> Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches, Binary Search. <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. <b>Advanced Tree Structures:</b> Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.</p>	<b>12</b>
<b>V</b>	<p><b>Hashing Techniques</b> Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing <b>Graph:</b> 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>	<b>12</b>

<b>Books and References:</b>					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A Simplified Approach to Data Structures	Lalit Goyal, Vishal Goyal, Pawan Kumar	SPD	1 <sup>st</sup>	2014
2.	An Introduction to Data Structure with Applications	Jean – Paul Tremblay and Paul Sorenson	Tata MacGraw Hill	2 <sup>nd</sup>	2007
3.	Data Structure and Algorithm	Maria Rukadikar	SPD	1 <sup>st</sup>	2017
4.	Schaum’s Outlines Data structure	Seymour Lipschutz	Tata McGraw Hill	2 <sup>nd</sup>	2005
5.	Data structure – A Pseudocode Approach with C	AM Tanenbaum, Y Langsam and MJ Augustein	Prentice Hall India	2 <sup>nd</sup>	2006
6.	Data structure and Algorithm Analysis in C	Weiss, Mark Allen	Addison Wesley	1 <sup>st</sup>	2006

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Computer Networks</b>		<b>Course Code: USIT303</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

<b>Unit</b>	<b>Details</b>	<b>Lectures</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>	<b>12</b>
<b>II</b>	<p><b>Bandwidth Utilization: Multiplexing and Spectrum Spreading:</b> Multiplexing, Spread Spectrum</p> <p><b>Transmission media:</b> Guided Media, Unguided Media</p> <p><b>Switching:</b> Introduction, circuit switched networks, packet switching, structure of a switch.</p> <p><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>	<b>12</b>
<b>III</b>	<p><b>Data Link Control:</b> DLC services, data link layer protocols, HDLC, Point-to-point protocol.</p> <p><b>Media Access Control:</b> Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet,</p> <p><b>Wireless LANs:</b> Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.</p> <p><b>Connecting devices and Virtual LANs.</b></p>	<b>12</b>
<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</p> <p><b>Unicast Routing:</b> Introduction, routing algorithms, unicast routing protocols.</p> <p><b>Next generation IP:</b> IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.</p>	<b>12</b>
<b>V</b>	<p><b>Introduction to the Transport Layer:</b> Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n</p>	<b>12</b>



	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.	
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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
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	Fourth Edition	2010
3.	Computer Networks	Andrew Tanenbaum	Pearson	Fifth	2013

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Database Management Systems</b>		<b>Course Code: USIT304</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

<b>Unit</b>	<b>Details</b>	<b>Lectures</b>
<b>I</b>	<p><b>Introduction to Databases and Transactions</b> What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management</p> <p><b>Data Models</b> The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.</p> <p><b>Database Design, ER Diagram and Unified Modeling Language</b> Database design and ER Model: overview, ER Model, Constraints, ER Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML</p>	<b>12</b>
<b>II</b>	<p><b>Relational database model:</b> 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><b>Relational Algebra and Calculus</b> Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison.</p> <p><b>Calculus:</b> Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities</p>	<b>12</b>
<b>III</b>	<p><b>Constraints, Views and SQL</b> Constraints, types of constrains, 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.</p>	<b>12</b>
<b>IV</b>	<p><b>Transaction management and Concurrency</b> Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.</p>	<b>12</b>
<b>V</b>	<p><b>PL-SQL:</b> 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.</p>	<b>12</b>

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw- Hill	Fifth Edition	
2.	Database Systems	Rob Coronel	Cengage Learning	Twelfth Edition	
3.	Programming with PL/SQL for Beginners	H. Dand, R. Patil and T. Sambare	X –Team	First	2011
4.	Introduction to Database System	C.J.Date	Pearson	First	2003

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Applied Mathematics</b>		<b>Course Code: USIT305</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

<b>Unit</b>	<b>Details</b>	<b>Lectures</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, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.</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 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, <math>j(=i)</math> as an operator(Electrical circuits)</p>	<b>12</b>
<b>II</b>	<p><b>Equation of the first order and of the first degree:</b> Separation of variables, Equations homogeneous in <math>x</math> and <math>y</math>, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.</p> <p><b>Differential equation of the first order of a degree higher than the first:</b> Introduction, Solvable for <math>p</math> (or the method of factors), Solve for <math>y</math>, Solve for <math>x</math>, Clairaut’s form of the equation, Methods of Substitution, 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, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.</p>	<b>12</b>
<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</p>	<b>12</b>

	Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, <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, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	
<b>IV</b>	<b>Multiple Integrals:</b> Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. <b>Applications of integration:</b> Areas, Volumes of solids.	<b>12</b>
<b>V</b>	<b>Beta and Gamma Functions</b> – Definitions, Properties and Problems. Duplication formula. <b>Differentiation Under the Integral Sign</b> <b>Error Functions</b>	<b>12</b>

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
2.	Applied Mathematics II	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
3.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications		

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Python Programming Practical</b>		<b>Course Code: USIT3P1</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>3</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2½</b>	<b>50</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>Write the program for the following:</b>
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.
<b>2.</b>	<b>Write the program for the following:</b>
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:  <pre>**** ***** *****</pre>
<b>3.</b>	<b>Write the program for the following:</b>
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:  <pre>a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]</pre> and write a program that prints out all the elements of the list that are less than 5.
<b>4.</b>	<b>Write the program for the following:</b>

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
<b>5. Write the program for the following:</b>	
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.
<b>6. Write the program for the following:</b>	
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.
<b>7. Write the program for the following:</b>	
a.	Design a class that store the information of student and display the same
b.	Implement the concept of inheritance using python
c.	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). i. Write a method called <code>add</code> which returns the sum of the attributes <code>x</code> and <code>y</code> . ii. 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> . iii. 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> . iv. 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> .
<b>8. Write the program for the following:</b>	
a.	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.  Now open a new file and save it in the same directory. You should now be able to import your own module like this:  <code>import geometry</code>

	<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.
<b>9.</b>	<b>Write the program for the following:</b>
a.	Try to configure the widget with various options like: <code>bg="red"</code> , <code>family="times"</code> , <code>size=18</code>
b.	Try to change the widget type and configuration options to experiment with other widget types like <code>Message</code> , <code>Button</code> , <code>Entry</code> , <code>Checkbutton</code> , <code>Radiobutton</code> , <code>Scale</code> etc.
<b>10.</b>	<b>Design the database applications for the following:</b>
a.	Design a simple database application that stores the records and retrieve the same.
b.	Design a database application to search the specified record from the database.
c.	Design a database application to that allows the user to add, delete and modify the records.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Think Python	Allen Downey	O'Reilly	1 <sup>st</sup>	2012
2.	An Introduction to Computer Science using Python 3	Jason Montojo, Jennifer Campbell, Paul Gries	SPD	1 <sup>st</sup>	2014



<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Data Structures Practical</b>		<b>Course Code: USIT3P2</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>3</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2½</b>	<b>50</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>Implement the following:</b>
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]
<b>2.</b>	<b>Implement the following for Linked List:</b>
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.
<b>3.</b>	<b>Implement the following for Stack:</b>
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.
<b>4.</b>	<b>Implement the following for Queue:</b>
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.
<b>5.</b>	<b>Implement the following sorting techniques:</b>
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
c.	Write a program to implement insertion sort.
<b>6.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to implement merge sort.
b.	Write a program to search the element using sequential search.
c.	Write a program to search the element using binary search.

<b>7.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to create the tree and display the elements.
b.	Write a program to construct the binary tree.
c.	Write a program for inorder, postorder and preorder traversal of tree
<b>8.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to insert the element into maximum heap.
b.	Write a program to insert the element into minimum heap.
<b>9.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to implement the collision technique.
b.	Write a program to implement the concept of linear probing.
<b>10.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to generate the adjacency matrix.
b.	Write a program for shortest path diagram.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Data Structures and Algorithms Using Python	Rance Necaise	Wiley	First	2016
2.	Data Structures Using C and C++	Langsam , Augenstein, Tanenbaum	Pearson	First	2015

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Computer Networks</b>		<b>Course Code: USIT3P3</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>3</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2½</b>	<b>50</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<p><b>IPv4 Addressing and Subnetting</b></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"> <li>• Network address</li> <li>• Network broadcast address</li> <li>• Total number of host bits</li> <li>• Number of hosts</li> </ul> <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"> <li>• The subnet address of this subnet</li> <li>• The broadcast address of this subnet</li> <li>• The range of host addresses for this subnet</li> <li>• The maximum number of subnets for this subnet mask</li> <li>• The number of hosts for each subnet</li> <li>• The number of subnet bits</li> <li>• The number of this subnet</li> </ul>
<b>2.</b>	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
<b>3.</b>	Configure IP static routing.
<b>4.</b>	Configure IP routing using RIP.
<b>5.</b>	Configuring Simple OSPF.
<b>6.</b>	Configuring DHCP server and client.
<b>7.</b>	Create virtual PC based network using virtualization software and virtual NIC.
<b>8.</b>	Configuring DNS Server and client.
<b>9.</b>	Configuring OSPF with multiple areas.
<b>10.</b>	<p>Use of Wireshark to scan and check the packet information of following protocols</p> <ul style="list-style-type: none"> <li>• HTTP</li> <li>• ICMP</li> <li>• TCP</li> <li>• SMTP</li> <li>• POP3</li> </ul>

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Database Management System</b>		<b>Course Code: USIT3P4</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>3</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2½</b>	<b>50</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>SQL Statements – 1</b>
a.	Writing Basic SQL SELECT Statements
b.	Restricting and Sorting Data
c.	Single-Row Functions
<b>2.</b>	<b>SQL Statements – 2</b>
a.	Displaying Data from Multiple Tables
b.	Aggregating Data Using Group Functions
c.	Subqueries
<b>3.</b>	<b>Manipulating Data</b>
a.	Using INSERT statement
b.	Using DELETE statement
c.	Using UPDATE statement
<b>4.</b>	<b>Creating and Managing Tables</b>
a.	Creating and Managing Tables
b.	Including Constraints
<b>5.</b>	<b>Creating and Managing other database objects</b>
a.	Creating Views
b.	Other Database Objects
c.	Controlling User Access
<b>6.</b>	<b>Using SET operators, Date/Time Functions, GROUP BY clause (advanced features) and advanced subqueries</b>
a.	Using SET Operators
b.	Datetime Functions
c.	Enhancements to the GROUP BY Clause
d.	Advanced Subqueries
<b>7.</b>	<b>PL/SQL Basics</b>
a.	Declaring Variables
b.	Writing Executable Statements
c.	Interacting with the Oracle Server
d.	Writing Control Structures

<b>8.</b>	<b>Composite data types, cursors and exceptions.</b>
a.	Working with Composite Data Types
b.	Writing Explicit Cursors
c.	Handling Exceptions
<b>9.</b>	<b>Procedures and Functions</b>
a.	Creating Procedures
b.	Creating Functions
c.	Managing Subprograms
d.	Creating Packages
<b>10.</b>	<b>Creating Database Triggers</b>

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw- Hill	Fifth Edition	
2.	Programming with PL/SQL for Beginners	H.Dand , R.Patil and T. Sambare	X –Team	First	2011
3.	PL/SQL Programming	Ivan Bayross	BPB	First	2010

<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Mobile Programming</b>		<b>Course Code: USIT3P5</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>3</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2½</b>	<b>50</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

The practical's will be based on HTML5, CSS, CORDOVA and PhoneGAP API. (Android will be introduced later after they learn Java)

<b>List of Practical</b>	
	Setting up CORDOVA, PhoneGAP Project and environment.
1.	<ul style="list-style-type: none"> <li>• Creating and building simple “Hello World” App using Cordova</li> <li>• Adding and Using Buttons</li> <li>• Adding and Using Event Listeners</li> </ul>
2.	<ul style="list-style-type: none"> <li>• Creating and Using Functions</li> <li>• Using Events</li> <li>• Handling and Using Back Button</li> </ul>
3.	<ul style="list-style-type: none"> <li>• Installing and Using Plugins</li> <li>• Installing and Using Battery Plugin</li> <li>• Installing and Using Camera Plugin</li> </ul>
4.	<ul style="list-style-type: none"> <li>• Installing and Using Contacts Plugin</li> <li>• Installing and Using Device Plugin</li> <li>• Installing and Using Accelerometer Plugin</li> </ul>
5.	<ul style="list-style-type: none"> <li>• Install and Using Device Orientation plugin</li> <li>• Install and Using Device Orientation plugin</li> <li>• Create and Using Prompt Function</li> </ul>
6.	<ul style="list-style-type: none"> <li>• Installing and Using File Plugin</li> <li>• Installing and Using File Transfer Plugin</li> <li>• Using Download and Upload functions</li> </ul>
7.	<ul style="list-style-type: none"> <li>• Installing and Using Globalization Plugin</li> <li>• Installing and Using Media Plugin</li> <li>• Installing and Using Media Capture Plugin</li> </ul>
8.	<ul style="list-style-type: none"> <li>• Installing and Using Network Information Plugin</li> <li>• Installing and Using Splash Screen Plugin</li> <li>• Installing and Using Vibration Plugin</li> </ul>

9.	<ul style="list-style-type: none"> <li>• Developing Single Page Apps</li> <li>• Developing Multipage Apps</li> <li>• Storing Data Locally in a Cordova App</li> </ul>
10.	<ul style="list-style-type: none"> <li>• Use of sqlite plugin with PhoneGap / apache Cordova</li> <li>• Using Sqlite read/write and search</li> <li>• Populating Cordova.SQLite storage with the JQuery API</li> </ul>

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
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	1 <sup>st</sup>	2015
3.	PhoneGap By Example	Andrey Kovalenko	PACKT Publishing	1 <sup>st</sup>	2015