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UNIVERSITY OF MUMBAI



**Syllabus for the S.Y.B.Sc.
Program: B.Sc.
Course: Information Technology**

(Credit Based Semester and Grading System with
effect from the academic year 2012–2013)

Courses	Theory Code	Practical Code
Logic and Discrete Mathematics	USIT301	USIT3P1
Computer Graphics	USIT302	USIT3P2
Advanced SQL	USIT303	USIT3P3
Object Oriented Programming with C++	USIT304	USIT3P4
Modern Operating Systems	USIT305	USIT3P5

CLASS: B. Sc (Information technology)		Semester – III
Theory Code : USIT301		Subject : Logic and Discrete Mathematics
Periods per week	Lectures - 5	3 Credits

Unit – I	Set Theory: Fundamentals - Sets and subsets, Venn Diagrams, Operations on sets, Laws of Set Theory, Power Sets and Products, Partition of sets, The principle of Inclusion-Exclusion. Logic: Propositions and Logical operations, Truth tables, Equivalence, Implications, Laws of Logic, Normal forms, Predicates and quantifiers, Mathematical Induction	8 Lectures
Unit- II	Relations, digraphs and lattices: – Product sets and partitions, relations and digraphs, paths in relations and digraphs, properties of relations, equivalence and partially ordered relations, computer representation of relations and digraphs, manipulation of relations, Transitive closure and Warshall’s algorithm, Posets and Hasse Diagrams, Lattice.	8 Lectures
Unit-III	Functions and Pigeon Hole Principle: Definitions and types of functions: injective, surjective and bijective, Composition, identity and inverse, Pigeon hole principle.	8 Lectures
Unit-IV	Graphs and Trees: Graphs, Euler paths and circuits, Hamiltonian paths and circuits, Planer graphs, coloring graphs, Isomorphism of Graphs. Trees: Trees, rooted trees and path length in rooted trees, Spanning tree and Minimal Spanning tree, Isomorphism of trees, Weighted trees and Prefix Codes.	8 Lectures
Unit -V	Algebraic Structures: Algebraic structures with one binary operation – semi groups, monoids and groups, Product and quotient of algebraic structures, Isomorphism, homomorphism, automorphism, Cyclic groups, Normal sub group, codes and group codes, Algebraic structures with two binary operations – rings, integral domains and fields. Ring homomorphism and Isomorphism.	8 Lectures
Unit-VI	Generating Functions and Recurrence relations: Series and Sequences, Generating Functions, Recurrence relations, Applications, Solving difference equations, Fibonacci.	8 Lectures

Books:

Discrete mathematical structures by B Kolman RC Busby, S Ross PHI Pvt. Ltd.
Discrete mathematical structures by RM somasundaram (PHI) EEE edition

References:

Discrete structures by Liu, TATAMCGRAW-HILL
Digital Logic John M Yarbrough Brooks/cole, Thompson Learning
Discrete Mathematics and its Applications, Kenneth H. Rosen, TATAMCGRAW-HILL
Discrete Mathematics for computer scientists and Mathematicians, Joe L.Mott, Abraham Kandel Theodore P. Baker, Prentice-Hall of India Pvt. Ltd.
Discrete Mathematics With Applications, Susanna S. Epp, Books/Cole Publishing Company
Discrete Mathematilcs, Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, TATAMCGRAW-HILL

Practical Code : USIT3P1

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

CLASS: B. Sc (Information technology)		Semester – III
Theory Code : USIT302		Subject : Computer Graphics
Periods per week	Lectures - 5	3 Credits

Unit – I	<p>Introduction Computer Graphics and Primitive Algorithms: Introduction to Image and Objects, Image Representation, Basic Graphics Pipeline, Bitmap and Vector-Based Graphics, Applications of Computer Graphics, Display Devices, Cathode Ray Tubes, Raster-Scan Display, Random-Scan Display, Flat Panel Display, Input Technology, Coordinate System Overview,</p> <p>Scan-Conversion of graphics primitives: Scan-Conversion of a Lines (Digital Differential Analyzer Algorithm, Bresenham's Line-Drawing Algorithm, Scan-Conversion of Circle and Ellipse (Bresenham's Method of Circle Drawing, Midpoint Circle Algorithm), Drawing Ellipses and Other Conics.</p>	8 Lectures
Unit- II	<p>Two Dimensional Transformation: Introduction to transformations, Transformation Matrix, Types of Transformations in Two-Dimensional Graphics: Identity Transformation, Scaling, Reflection, Shear Transformations, Rotation, Translation, Rotation about an Arbitrary Point, Combined Transformation, Homogeneous Coordinates, 2D Transformations using Homogeneous Coordinates</p>	8 Lectures

Unit-III	Three-dimensional transformations , Objects in Homogeneous Coordinates, Three-Dimensional Transformations: Scaling, Translation, Rotation, Shear Transformations, Reflection, World Coordinates and Viewing Coordinates, Projection, Parallel Projection, Perspective Projection.	8 Lectures
Unit-IV	Viewing and Solid Area Scan-Conversion: Introduction to viewing and clipping, Viewing Transformation in Two Dimensions, Introduction to Clipping, Two-Dimensional Clipping, Point Clipping, Line Clipping, Introduction to a Polygon Clipping, Viewing and Clipping in Three Dimensions, Three-Dimensional Viewing Transformations, Text Clipping Introduction to Solid Area Scan-Conversion , Inside–Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithm, Scan-Line Algorithm, Priority Algorithm, Scan Conversion of Character, Aliasing, Anti-Aliasing, Halftoning, Thresholding and Dithering	8 Lectures
Unit –V	Introduction to curves , Curve Continuity, Conic Curves, Piecewise Curve Design, Parametric Curve Design, Spline Curve Representation, Bezier Curves, B-Spline Curves, Fractals and its applications. Surface Design: Bilinear Surfaces, Ruled Surfaces, Developable Surfaces, Coons Patch, Sweep Surfaces, Surface of Revolution, Quadric Surfaces, Constructive Solid Geometry, Bezier Surfaces, B-Spline Surfaces, Subdivision Surfaces Visible Surfaces: Introduction to visible and hidden surfaces, Coherence for visibility, Extents and Bounding Volumes, Back Face Culling, Painter’s Algorithm, Z-Buffer Algorithm, Floating Horizon Algorithm, Roberts Algorithm.	8 Lectures
Unit-VI	Object Rendering: Introduction Object-Rendering, Light Modeling Techniques, Illumination Model, Shading, Flat Shading, Polygon Mesh Shading, Gourand Shading Model, Phong Shading, Transparency Effect, Shadows, Texture and Object Representation, Ray Tracing, Ray Casting, Radiosity, Color Models. Introduction to animation , Key-Frame Animation, Construction of an Animation Sequence, Motion Control Methods, Procedural Animation, Key-Frame Animation vs. Procedural Animation, Introduction to Morphing, Three-Dimensional Morphing	8 Lectures

Books:

Computer Graphics, R. K. Maurya, John Wiley.

Mathematical elements of Computer Graphics, David F. Rogers, J. Alan Adams, TATAMCGRAW-HILL

Procedural elements of Computer Graphics, David F. Rogers, Tata McGraw-Hill.

Reference:

Computer Graphics, Donald Hearn and M. Pauline Baker, Prentice Hall of India

Computer Graphics, Steven Harrington, McGraw-Hill

Computer Graphics Principles and Practice, J.D. Foley, A. Van Dam, S.K. Feiner and R.L. Phillips, Addison Wesley

Principles of Interactive Computer Graphics, Willaim M. Newman, Robert F. Sproull, TATAMCGRAW-HILL

Introduction to Computer Graphics, J.D. Foley, A. Van Dam, S.K. Feiner, J.F. Hughes and R.L. Phillips, Addison Wesley

Practical Code : USIT3P2

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Suggested Practical:

Should contain at least 10 programs development in C++. Some Sample practical are listed below.

1. Write a program with menu option to input the line coordinates from the user to generate a line using Bresenham's method and DDA algorithm. Compare the lines for their values on the line.
2. Develop a program to generate a complete circle based on
 - a. Bresenham's circle algorithm
 - b. Midpoint Circle Algorithm
3. Implement the Bresenham's/DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants).
4. Write a program to implement a stretch band effect. (A user will click on the screen and drag the mouse/arrow keys over the screen coordinates. The line should be updated like rubber-band and on the right-click gets fixed).
5. Write program to perform the following 2D and 3D transformations on the given input figure
 - a. Rotate through θ .
 - b. Reflection
 - c. Scaling
 - d. Translation.
6. Write a program to demonstrate shear transformation in different directions on a unit square situated at the origin.
7. Develop a program to clip a line using Cohen-Sutherland line clipping algorithm between $(x_1, y_1)(x_2, y_2)$ against a window $(x_{\min}, y_{\min})(x_{\max}, y_{\max})$.
8. Write a program to implement polygon filling.
9. Write a program to generate a 2D/3D fractal figures (Sierpinski triangle, Cantor set, tree etc).
10. Write a program to draw Bezier and B-Spline Curves with interactive user inputs for control polygon defining the shape of the curve.
11. Write a program to demonstrate 2D animation such as clock simulation or rising sun
12. Write a program to implement the bouncing ball inside a defined rectangular window.

CLASS: B. Sc (Information technology)		Semester – III
Theory Code : USIT303		Subject : Advanced SQL
Periods per week	Lectures - 5	3 Credits

Unit – I	Structured Query Language: Writing Basic SQL Select Statements, Restricting and Sorting Data, Single-Row Functions, Joins (Displaying Data from Multiple Tables), Aggregating Data using Group Functions, Subqueries, Manipulating Data, Creating and Managing Tables, Including Constraints, Creating Views, Creating Other Database Objects(Sequences, Indexes and Synonyms)	8 Lectures
Unit- II	Advanced SQL: Controlling User Access, Using SET operators, DateTime Functions, Enhancements to Group by clause(cube, Rollup and Grouping), Advanced Subqueries (Multiple column subqueries, Subqueries in FROM clause, Scalar and correlated subqueries), WITH Clause, Hierarchical retrieval,	8 Lectures
Unit-III	PLSQL: Introduction, Overview and benefits of PL/SQL, Subprograms, types of PL/SQL blocks, Simple Anonymous Block, Identifiers, types of Identifiers, Declarative Section, variables, Scalar Data Types, The %TYPE Attribute, Bind Variables, Sequences in PL/SQL Expressions, Executable Statements, PL/SQL Block Syntax, Comment the Code, Deployment of SQL Functions in PL/SQL, Convert Data Types, Nested Blocks, Operators. Interaction with the Oracle Server, Invoke SELECT Statements in PL/SQL, SQL Cursor concept, Data Manipulation in the Server using PL/SQL, SQL Cursor Attributes to Obtain Feedback on DML, Save and Discard Transactions.	8 Lectures
Unit-IV	Control Structures: Conditional processing using IF Statements and CASE Statements, Loop Statement, While Loop Statement, For Loop Statement, the Continue Statement, Composite Data Types: PL/SQL Records, The %ROWTYPE Attribute, Insert and Update with PL/SQL Records, INDEX BY Tables, INDEX BY Table Methods, Use INDEX BY Table of Records, Explicit Cursors , Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Cursor FOR loop, The %NOTFOUND and %ROWCOUNT Attributes, the FOR UPDATE Clause and WHERE CURRENT Clause, Exception Handling , Handle Exceptions with PL/SQL, Trap Predefined and non-predefined Oracle Server Errors, User-Defined Exceptions, Propagate Exceptions, RAISE_APPLICATION_ERROR Procedure,	8 Lectures

Unit – V	<p>Stored Procedures: Create a Modularized and Layered Subprogram Design, the PL/SQL Execution Environment, differences between Anonymous Blocks and Subprograms, Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes, View Procedure Information, Stored Functions and Debugging Subprograms, 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, Restrictions when calling Functions, Control side effects when calling Functions, View Functions Information, debug Functions and Procedures, Packages, 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, Invoke the Package Constructs, View the PL/SQL Source Code using the Data Dictionary, Deploying Packages, Overloading Subprograms in PL/SQL, Use the STANDARD Package, Use Forward Declarations, Implement Package Functions in SQL and Restrictions, Persistent State of Packages, Persistent State of a Package Cursor, Control side effects of PL/SQL Subprograms, Invoke PL/SQL Tables of Records in Packages</p>	8 Lectures
Unit – VI	<p>Dynamic SQL: The Execution Flow of SQL, Declare Cursor Variables, Dynamically Executing a PL/SQL Block, Configure Native Dynamic SQL to Compile PL/SQL Code, invoke DBMS_SQL Package, Implement DBMS_SQL with a Parameterized DML Statement, Dynamic SQL Functional Completeness, Triggers, the Trigger Event Types and Body, Business Application Scenarios for Implementing Triggers, Create DML Triggers using the CREATE TRIGGER Statement and SQL Developer, Identify the Trigger Event Types, Body, and Firing (Timing), Statement Level Triggers and Row Level Triggers, Create Instead of and Disabled Triggers, Manage, Test and Remove Triggers. Creating Compound, DDL and Event Database Triggers, Compound Trigger Structure for Tables and Views, Compound Trigger to Resolve the Mutating Table Error, Comparison of Database Triggers and Stored Procedures, Create Triggers on DDL Statements, Create Database-Event and System-Events Triggers, System Privileges Required to Manage Triggers</p>	8 Lectures

Books:

Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
Oracle Database 11g PL/SQL Programming Workbook, ISBN: 9780070702264,
 By: Michael McLaughlin, John Harper, TATAMCGRAW-HILL

Reference:

Oracle PL/SQL Programming, Fifth Edition By Steven Feuerstein, Bill Pribyl

Oracle 11g: SQL Reference Oracle press

Oracle 11g: PL/SQL Reference Oracle Press.

Expert Oracle PL/SQL, By: Ron Hardman, Michael McLaughlin, TATAMCGRAW-HILL

Oracle database 11g: hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition

Practical Code : USIT3P3

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Suggested Practical:

Should contain at least 10 programs. Some sample practicals are listed below.

1. Practical 1: Select queries and joins

- a. Select queries on single table using alias, where and order by clause.
- b. Select queries on single table using aggregate functions and group by clause.
- c. Querying data from multiple tables using all types of joins.

2. Practical 2: Subqueries, DML and DDL

- a. Querying single and multiple tables using subqueries.
- b. Manipulating data (Insert, update and delete)
- c. Creating simple tables and tables with constraints.

3. Practical 3: Creating database objects, Controlling user access and using set operators

- a. Creating Views, Sequences, Indexes and synonyms.
- b. Granting and revoking privileges on user objects.
- c. Using set operators, date-time functions, roll up, cube and grouping sets.

4. Practical 4: Working with advanced subqueries and WITH clause

- a. Multiple column subqueries, subqueries in from clause,
- b. Scalar subqueries and correlated subqueries,
- c. WITH Clause and hierarchical retrieval.

5. Practical 5: Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.

- a. Creating anonymous PL/SQL blocks.
- b. Define, create, and use INDEX BY tables and a PL/SQL record.
- c. Process a number of rows from a table and populate another table with the results using a cursor FOR loop.

6. Practical 6: Cursors, Exceptions and procedures issuing DML and query commands.

- a. Cursors with parameters to process a number of rows from multiple tables.
- b. Create exception handlers for specific situations.
- c. Create procedures that issue DML and query commands.

7. Practical 7: Functions and Stored Procedures

- a. Creating and invoking functions from SQL statements.
- b. Creating and invoking stored procedures.
- c. Re-create the source code for a procedure and a function.

8. Practical 8: Working with packages

- a. Create package specifications and package bodies. Invoke the constructs in the packages.
- b. Create a package containing an overloaded function.
- c. Create a one-time-only procedure within a package to populate a PL/SQL table.

9. Practical 9: Working with Large Objects and triggers

- a. Create a table with both BLOB and CLOB columns. Use the DBMS_LOB package to populate the table and manipulate the data.
- b. Create statement and row triggers.
- c. Create procedures that will be invoked from the triggers.

10. Practical 10: Working with INSTEAD OF triggers, business rules and recompiling procedures, functions, packages and views.

- a. Create instead of triggers for views.
- b. Implement a number of business rules. Create triggers for those rules that should be implemented as triggers. The triggers must execute procedures that are placed in a package.
- c. Use the DEPTREE_FILL procedure and the IDEPTREE view to investigate dependencies in your schema. Recompile invalid procedures, functions, packages, and views.

CLASS: B. Sc (Information technology)		Semester – III
Theory Code : USIT304		Subject : Object Oriented Programming with C++
Periods per week	Lectures - 5	3 Credits
Unit – I	Introduction to OOPs: Need object oriented programming, comparison of procedural and object oriented approach, characteristics of OOPs – object , classes , polymorphism, inheritance, reusability, data hiding and abstraction, applications of OOPs	8 Lectures
Unit- II	Classes and Objects: Class declaration, constructors, constructor initialization lists, access functions, private member functions, the copy constructor, the class destructor ,constant objects, structures, pointers to objects, static data members, static function members	8 Lectures
Unit-III	Operator Overloading: overloading the assignment operator, the this pointer, overloading arithmetic operators, overloading the arithmetic assignment, operators, overloading the relational operators ,overloading the stream operators, conversion operators ,overloading the increment and decrement operators, overloading the subscript operator	8 Lectures
Unit-IV	Composition and Inheritance: inheritance, protected class members , overriding and dominating inherited members, private access verses protected access, virtual functions and polymorphism, virtual destructors, abstract base classes File Handling: Classes for file stream operations, opening and closing a file, detecting end of file, file modes, file pointers and their manipulations, sequential input and output operations, random access, file operations error handling, command line argument	8 Lectures
Unit –V	Strings and Streams: the string class interface, the constructors and destructor , the copy constructor, the assignment operator, the addition operator , an append operator, access functions , the comparison operators, stream operators, stream classes, the ios class, ios format flags, ios state , variables ,the istream and ostream classes, unformatted input functions , unformatted output functions, stream manipulators.	8 Lectures
Unit-VI	Templates and Iterators: function templates, class templates, container classes, subclass templates, passing template classes to template parameters, iterator classes Libraries: the standard C++ library, proprietary libraries, contents of the standard c headers, string streams, file processing, the standard template library	8 Lectures

Books:

SCHAUM'S OUTLINE OF THEORY AND PROBLEMS of PROGRAMMING WITH C++
JOHN R. HUBBARD, TATAMCGRAW-HILL

Object Oriented Programming with C++, E.Balagurusamy, Fourth Edition,
TATAMCGRAW-HILL.

Object Oriented Programming with C++, by P. Sarang 2nd Edition, (PHI) EEE edition

Reference:

C++ programming, 3rd Edition, Bjarne Stroustrup

Mastering C++, 2nd Edition, Venugopalan, TataMcgrawHill

C++ Programming, Robert Lafore,

C++ for Beginners, P. M. Harwani, X-Team Series,

Practical Code : USIT3P4

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Suggested Practical:

Should contain at least 10 programs. Some sample practicals are listed below.

1 Implement the following

- a. Design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used respectively. Where getInfo() will be private method.
- b. Design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively. Where getData() will be private method.
- c. Design the class Demo which will contain the following methods: readNo() ,factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, isPalindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is armStrong or not. Where readNo() will be private method.

2 Implement the following

- a. Write a friend function for adding the two complex numbers, using a single class.
- b. Write a friend function for adding the two different distances and display its sum, using two classes.
- c. Write a friend function for adding the two matrix from two different classes and display its sum.

3 Implement the following

- a. Design a class Complex for adding the two complex numbers and also show the use of constructor.
- b. Design a class Geometry containing the methods area() and volume() and also overload the area() function .
- c. Design a class StaticDemo to show the implementation of static variable and static function.

4 Implement the following

- a. Overload the operator unary(-) for demonstrating operator overloading.
- b. Overload the operator + for adding the timings of two clocks, And also pass objects as an argument.
- c. Overload the + for concatenating the two strings. For e.g "c" + "++" = c++

- 5. Implement the following**
 - a. Design a class for single level inheritance using public and private type derivation.
 - b. Design a class for multiple inheritance.
 - c. Implement the hierarchical inheritance.
- 6. Implement the following**
 - a. Implement the concept of method overriding.
 - b. Show the use of virtual function
 - c. Show the implementation of abstract class.
- 7. Implement the following**
 - a. String operations for string length , string concatenation
 - b. String operations for string reverse, string comparison,
 - c. Console formatting functions.
- 8. Implement the following:**
 - a. Show the implementation of exception handling
 - b. Show the implementation for exception handling for strings
 - c. Show the implementation of exception handling for using the pointers.
- 9. Show the implementation**
 - a. Design a class FileDemo open a file in read mode and display the total number of words and lines in the file.
 - b. Design a class to handle multiple files and file operations
 - c. Design a editor for appending and editing the files
- 10. Show the implementation for the following**
 - a. Show the implementation of template class library for swap function.
 - b. Design the template class library for sorting ascending to descending and vice-versa
 - c. Design the template class library for concatenating two strings

CLASS: B. Sc (Information technology)		Semester – III
Theory Code : USIT305		Subject : Modern Operating Systems
Periods per week	Lectures - 5	3 Credits

Unit – I	Introduction to Operating Systems: OS and Computer System, System performance, Classes of OS, Batch processing, time-sharing, multiprocessing, real time, distributed and modern operating systems, Desktop Systems, Handheld Systems, Clustered Systems, Assemblers, Compilers and Interpreters, Linkers.	8 Lectures
Unit- II	Operating-System Structures: Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation, System Boot.	8 Lectures
Unit-III	Processes and Process Synchronization: Process Concept, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Operations on Processes, Interprocess Communication, Multithreading Models, Threading Issues, Thread Scheduling, Communication in Client–Server Systems, The Critical-Section Problem, Peterson’s Solution, Semaphores.	8 Lectures

Unit-IV	Memory Management: Memory management without swapping or paging; Swapping, Virtual Memory, Page replacement algorithms, Modeling paging algorithms, Design issues for paging systems, segmentation	8 Lectures
Unit –V	File-System Interface and Implementation: File Concept, File-System Mounting, Free-SpaceManagement, File Sharing, NFS. Mass-Storage Structure: Disk Structure, Disk Management, Swap-Space Management, RAID Structure, Stable-Storage Implementation. Deadlocks , Deadlock detection and recovery, avoidance and prevention	8 Lectures
Unit-VI	I/O Systems: Application I/O Interface, Transforming I/O Requests to Hardware Operations, STREAMS, Performance. Protection and Security: Principles of Protection, Domain of Protection, Access Matrix, Access Control, Capability-Based Systems, Language-Based Protection, The Security Problem, System and Network Threats, Implementing Security Defenses.	8 Lectures

Books:

Modern Operating Systems, Andrew Tanenbaum,

Operating Systems, 2nd Edition, K. A.Sumitra Devi and N.P Banashree, SPD

Operating System Concepts, 8th Edition, Abraham Silberschatz, Peter B.Galvin, Greg Gagne, Wiley publication

Reference:

Operating Systems- A concept based approach , 2nd Edition, D.M. Dhamdhare, McGrawHill publications

Operating Systems, 3rd Edition , Godbole and Kahate, McGrawHill publications.

Practical Code : USIT3P5

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

Case Studies (Suggested):

- a) MS-DOS
- b) Windows NT
- c) Windows 2008 Server
- d) Windows 7
- e) Unix
- f) Linux
- g) OS/2
- h) MAC OS
- i) Symbian
- j) Chrome
- k) Android

Semester IV

Courses	Theory Code	Practical Code
Software Engineering	USIT401	USIT4P1
Multimedia	USIT402	USIT4P2
Java and Data Structures	USIT403	USIT4P3
Quantitative Techniques	USIT404	USIT4P4
Embedded Systems	USIT405	USIT4P5

CLASS: B. Sc (Information technology)		Semester – IV
Theory Code : USIT401		Subject : Software Engineering
Periods per week	Lectures - 5	3 Credits
Unit – I	<p>An Introduction : To Software, Software Engineering, Software Process, Software Engineering Methods; CASE Tools, Attributes of good software. Socio-technical system : Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems. Critical system : Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems</p>	8 Lectures
Unit- II	<p>Software processes : Fundamental activities of software process, Different software process models, Process Iteration and Activities, The Rational Unified Process, CASE in detail. Project Management : Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management. Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements</p>	8 Lectures
Unit-III	<p>Requirements Engineering Processes : Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management. System Models : Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.</p> <p>Architectural Design : Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures</p>	8 Lectures
Unit-IV	<p>Application Architectures : Data Processing Systems, Transaction Processing Systems, Event Processing Systems, Language Processing Systems</p> <p>Object Oriented Design : Objects and Object Classes, An object Oriented Design Process, Design Evolution</p> <p>User Interface Design : Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation; Rapid Software Development : Agile Methods, Extreme Programming, Rapid Application Development, Software Prototyping</p>	8 Lectures

Unit –V	Component based Software Engineering : Components and Component models, The CBSE Process, Component Composition. Verification and Validation : Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing : System Testing, Component Testing, Test Case Design, Test Automation. Software Cost Estimation : Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing	8 Lectures
Unit-VI	Quality Management : Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics Process Improvement : Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework. Security Engineering : Security Concepts, Security Risk Management, Design for Security, System Survivability. Service Oriented Software Engineering : Services as reusable components, Service Engineering, Software Development with Services	8 Lectures

Books:

Software Engineering, “Ian Somerville”, 8th edition, Pearson Education.

Software Engineering, Pankaj Jalote, Narosa Publication

Reference:

Software Design, “D.Budgen”, 2nd edition, Pearson education.

Software engineering, A practitioner’s approach, Roger Pressman, TATAMCGRAW-HILL.

Software Engineering by KL James, PHI(2009) EEE edition

Software Engineering principles and practice by WS Jawadekar TATAMCGRAW-HILL

Practical Code : USIT4P1

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

Case Studies (Suggested)

1. Project Initiation and scheduling.
2. Analyzing a system and specifying the requirements
 - a. Structured Approach
 - b. Object oriented Approach
3. Project Cost Estimation
4. Designing the database design
5. Designing the User interface design
6. Use of testing methodologies
7. Cost Estimation Techniques
8. Cost benefit Analysis

CLASS: B. Sc (Information technology)		Semester – IV
Theory Code : USIT402 Subject : Multimedia		
Periods per week	Lectures - 5	3 Credits

Unit – I	Introduction: What is multimedia? Defining the scope of multimedia. Applications of multimedia, hardware and software requirements, multimedia database.	8 Lectures
Unit- II	Digital representation: Introduction, Analog representation, waves, digital representation, need for digital representation, A to D conversion, D to A conversion, relation between sampling rate and bit depth, Quantization error, Fourier representation, pulse modulation. Importance and drawback of digital representation.	8 Lectures
Unit-III	Text and Image: Introduction, Types of text, Font, insertion, compression, File formats. Types of images, colour models, Basic steps for image processing, principle and working of scanner and digital camera, Gamma and gamma correction.	8 Lectures
Unit-IV	Audio and Video technology: Fundamental characteristics of sound, psycho-acoustics, Raster scanning principles, sensors for TV cameras, color fundamentals, additive and subtractive color mixing, Liquid crystal display (LCD), Plasma Display Panel (PDP), file formats	8 Lectures
Unit –V	Compression and coding: What is compression? Need for compression, Types of compression- basic compression techniques- run length, Huffman’s coding, JPEG, zip coding. Overview of Image and Video compression techniques.	8 Lectures
Unit-VI	Multimedia presentation and authoring: Overview, multimedia authoring metaphor, multimedia production, presentation and automatic authoring, Design paradigms and user interface, overview of tools like adobe premier, director, flash and dreamweaver. Barriers to wide spread use.	8 Lectures

Books:

Principles of Multimedia by Ranjan Parekh. TATAMCGRAW-HILL

Reference:

Multimedia Systems Design by Prabhat K. Andleigh and Kiran Thakrar-PHI publication

Multimedia systems by John F. Koegal Buford-Pearson Education.

Fundamentals of multimedia by Ze-Nian Li and MS Drew. PHI EEE edition.

Practical Code : USIT4P2

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

Mini Project: Develop a multimedia application

CLASS: B. Sc (Information technology)		Semester – IV
Theory Code : USIT403 Subject : Java and Data Structures		
Periods per week	Lectures - 5	3 Credits

Unit – I	Core Java: Features of Java, JVM, Data Types, Variables, and Arrays, Operators, Control Statements, type-casting, Classes, Objects and Methods, Constructor, method overriding, finalize methods.	8 Lectures
Unit- II	Derived concepts: Inheritance, Packages and Interfaces, Exception Handling, String handling, Multithreaded Programming	8 Lectures
Unit-III	The Java I/O Classes and Interfaces: File, Directories, Using FilenameFilter, The listFiles() Alternative, Creating Directories, The Stream Classes, The Byte Streams, InputStream, OutputStream, FileInputStream, FileOutputStream, ByteArrayInputStream, ByteArrayOutputStream, Filtered Byte Streams, Buffered Byte Streams, SequenceInputStream, PrintStream, RandomAccessFile, The Character Streams, Reader, Writer, FileReader , FileWriter, CharArrayReader, CharArrayWriter, BufferedReader, BufferedWriter, PushbackReader, PrintWriter	8 Lectures
Unit-IV	Data Structures: Complexity and analysis of algorithms – algorithm, time and space complexity, asymptotic notations, Types of data structures, Arrays - Properties of Arrays, Duplicating an Array, sequential search algorithm, binary search algorithm, Stacks- Stack Operations, indexed Implementation, Linked Implementation, Applications - recursion, Queue - Queue Operations, indexed Implementation, Applications, Circular Queue – insertion , deletion	8 Lectures
Unit –V	Linked Lists – representation of linked list, traversing, searching, insertion, deletion and doubly linked list. Hash table methods – hashing functions , collision-resolution techniques Trees- Binary Trees, traversing binary tree, traversing algorithm using stacks, header nodes, threads, binary search trees (insertion and deletion), AVL trees , B trees	8 Lectures
Unit-VI	Heaps – insertion and deletion Sorting – selection, bubble, merge, tree , radix , insertion Graphs – graph theory, sequential representation, adjacency matrix, path matrix, Warshall’s algorithm, linked representations, operations, traversing.	8 Lectures

Books:

Core Java for Beginners, Sharanam Shah and V Shah, The X Team SPD
Java 2 Complete Reference, 5th Edition , Osborne , Tata-McGrawhill
Data Structures, S Lipschutz, Tata-McGrawhill

Reference:

An introduction to data structures with applications, second edition, Jean-Paul Tremblay, P Sorenson, Tata-McGrawhill
Data Structures with Java, 2nd edition, J Hubbard, Tata-McGrawhill

Practical Code : USIT4P3

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Practical List:

1 **Implement the following**

- a. Design a java program for type casting different types of variables.
- b. Design a Calculator class in java, and implement all the methods required by calculator operations.
- c. Design a java class for method overloading and method overriding.

2 **Implement the following**

- a. Design a java program for different types of inheritance.
- b. Design a java class for the use of interface.
- c. Design a java class performing string operations.

3 **Implement the following**

- a. Design a class in java to add two complex numbers using constructors.
- b. Design a java class for performing all the matrix operations i.e addition, multiplication, transpose etc.
- c. Design a java class for implementing the packages.

4 **Implement the following**

- a. Design a java class for implementing the concept of threading and multithreading.
- b. Design a java class for performing all the file-operations.
- c. Design a java class for operating the random access files using

5 **Implement the following**

- a. Design a class for sorting the names or numbers in ascending and descending order.
- b. Design a java class for implementing the operations of stack.

6. **Implement the following**

- a. Design a class in java for implementing the operations of queue.(insert, delete, display, exit)
- b. Design a class in java for implementing the operations of circular queue.

7. **Implement the following**

- a. Design a class to implement the operations of singly link-list. (insertion , deletion, sorting, display)
- b. Design a class to implement the operations of doubly-linked list.

8. **Implement the following**

- a. Implement the concept of hashing technique and also show its collision avoidance.
- b. Design a class to create a tree and also implement the binary search tree.

9. **Show the implementation**

- a. Design a class in java for creating the heap and also show heap sort for it.
- b. Design a class in java for implementing selection and insertion sort.

10. **Show the implementation for the following**

- a. Design a class in java for bubble and merge sort.
- b. Design a class in java for implementing the graph

CLASS: B. Sc (Information technology)		Semester – IV
Theory Code : USIT404 Subject : Quantitative Techniques		
Periods per week	Lectures - 5	3 Credits

Unit – I	Errors, Solutions of Algebraic and Transcendental Equations using - Bisection Method, the Method of False Position, Newton-Raphson Method. Interpolation: Interpolation: - Forward Difference, Backward Difference, Newton’s Forward Difference Interpolation, Newton’s Backward Difference Interpolation, Lagrange’s Interpolation.	8 Lectures
Unit- II	Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method. Numerical Integration: Trapezoidal Rule, Simpson’s 1/3 rd and 3/8 th rules. Numerical solution of 1st and 2nd order differential equations: - Taylor series, Euler’s Method, Modified Euler’s Method, Runge-Kutta Method for 1 st and 2 nd Order Differential Equations.	8 Lectures
Unit-III	Data types of Data, Mean, Variance, measures of skewness and kurtosis based on moments, Bivariate data Covariance, Correlation, Karl Pearson’s coefficient properties of correlation coefficient and derivation of the formula for Spearman’ s Rank, correlation coefficient, Regression coefficients and derivation of equation for lines of regression. Fitting of curves: Least square method, Fitting the straight line and parabolic curve,	8 Lectures
Unit-IV	Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance. Moments Relation between Raw moments and Central moments. Distributions: Discrete distributions: Uniform, Binomial, Poisson, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications.	8 Lectures
Unit –V	Central Limit theorem (statement only) and problems based on this theorem, Sampling distributions of i)sample mean ii) difference in the sample means iii) sample proportion,ans iv) difference in the sample proportions. Test of Hypothesis, Level of Significance, Critical Region, One Tailed and Two Tailed Test , Test of Significance for large Samples, Student’s ‘t’ Distribution and its applications, Interval Estimation of Population Parameters.	8 Lectures
Unit-VI	Chi-Square Distribution and its applications, Test of the Goodness of Fit and Independence of Attributes, Contingency Table, Yates Correction Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution, Primal Simplex Method.	8 Lectures

Books:

Introductory Methods of Numerical Methods, Vol-2, S.S.Shastri, PHI
Fundamentals of Mathematical Statistics, S.C.Gupta, V.K.Kapoor

Reference:

Elements of Applied Mathematics, Volume 1 and 2, P.N.Wartikar and J.N.Wartikar, A. V. Griha, Pune
Engineering Mathematics, Vol-2, S.S.Shastri, PHI
Applied Numerical Methods for Engineers using SCILAB and C, Robert J.Schilling and Sandra L.Harris, ” , Thomson Brooks/Cole

Practical Code : USIT4P4

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Practical List to be performed in Scilab:**1. Practical 1: Solution of algebraic and transcendental equations:**

- a. Program to solve algebraic and transcendental equation by bisection method.
- b. Program to solve algebraic and transcendental equation by false position method.
- c. Program to solve algebraic and transcendental equation by Newton Raphson method.

2. Practical 2: Interpolation

- a. Program for Newton's forward interpolation.
- b. Program for Newton's backward interpolation.
- c. Program for Lagrange's interpolation.

3. Practical 3: Solving linear system of equations by iterative methods:

- a. Program for solving linear system of equations using Gauss Jordan methods.
- b. Program for solving linear system of equations using Gauss Seidel methods.

4. Practical 4: Numerical Integration

- a. Program for numerical integration using Trapezoidal rule.
- b. Program for numerical integration using Simpson's 1/3rd rule.
- c. Program for numerical integration using Simpson's 3/8th rule.

5. Practical 5: Solution of differential equations:

- a. Program to solve differential equation using Euler's method
- b. Program to solve differential equation using modified Euler's method.
- c. Program to solve differential equation using Runge-kutta 2nd order and 4th order methods.

6. Practical 6: Random number generation and distributions

- a. Program for random number generation using various techniques.
- b. Program for fitting of Binomial Distribution.
- c. Program for fitting of Poisson Distribution.
- d. Program for fitting of Negative Binomial Distribution.

7. Practical 7: Moments, Correlation and Regression

- a. Computation of raw and central moments, and measures of skewness and kurtosis.
- b. Computation of correlation coefficient and Fitting of lines of Regression (Raw and Frequency data)
- c. Spearman's rank correlation coefficient.

8. Practical 8: Fitting of straight lines and second degree curves

- a. Curve fitting by Principle of least squares. (Fitting of a straight line, Second degree curve)

9. Practical 9: Sampling:

- Model sampling from Binomial and Poisson Populations.
- Model sampling from Uniform, Normal and Exponential Populations.
- Large sample tests-(Single mean, difference between means, single proportion, difference between proportions, difference between standard deviations.)
- Tests based on students 't-test'(Single mean, difference between means and paired 't')

10. Practical 10: Chi-square test and LPP

- Test based on Chi-square- Distribution (Test for variance, goodness of Fit,)
- Chi-square test of independence of attributes.
- Solution of LPP by Simplex method.

CLASS: B. Sc (Information technology)		Semester – IV
Theory Code : USIT405 Subject : Embedded Systems		
Periods per week	Lectures - 5	3 Credits

Unit – I	Introduction: Embedded Systems and general purpose computer systems, history , classifications, applications and purpose of embedded systems Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.	8 Lectures
Unit- II	Characteristics and quality attributes of embedded systems: characteristics, operational and non-operational quality attributes, application specific embedded system – washing machine, domain specific - automotive.	8 Lectures
Unit-III	Programming embedded systems: structure of embedded program, infinite loop, compiling , linking and locating, downloading and debugging	8 Lectures
Unit-IV	Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory	8 Lectures
Unit –V	Peripherals: Control and Status Registers, Device Driver, Timer Driver- Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process	8 Lectures
Unit-VI	Design and Development: embedded system development environment – IDE, types of file generated on cross compilation, disassembler/ decompiler, simulator , emulator and debugging , embedded product development life-cycle, trends in embedded industry.	8 Lectures

Books:

Programming Embedded Systems in C and C++, First Edition January, Michael Barr ,O'Reilly

Introduction to embedded systems, Shibu K V, TATAMCGRAW-HILL.

References:

Embedded Systems, Rajkamal, TATAMCGRAW-HILL

Practical Code : USIT4P5

Term Work: Should contain at least 6 assignments (one per unit) covering the syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

Practical List:

- 1) Configure timer control registers of 8051 and develop a program to generate given time delay.
- 2) Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's
- 3) 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.
- 4) Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
- 5) Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
- 6) Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
- 7) 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.
- 8) Generate traffic signal.
- 9) Temperature controller.
- 10) Elevator control.

Issues related to Term Work, tutorial, assignments and Practicals

Following is the marks distribution for Theory and Practical. Minimum 16 marks out of 40 and 24 marks out of 60 for passing in Theory and 8 marks out of 20 and 12 marks out of 30 for passing in Practical.

Credit of 3 of Theory and 1 of Practical for any course is to be awarded only if students clear.

Semester III

Theory

Course	Internal Assessment (40 Marks)			External Assessment (60 Marks)	Total(100 Marks)
	Assignment	Tutorial	Class Test	Theory Exam	
USIT301	10	10	20	60	100
USIT302	10	10	20	60	100
USIT303	10	10	20	60	100
USIT304	10	10	20	60	100
USIT305	10	10	20	60	100

Practical

Course	Internal Assessment (20 Marks)	External Assessment (30 Marks)	Total (50 Marks)
USIT3P1	Case Study	Case Study	50
USIT3P2	Problem Solving	Problem Solving	50
USIT3P3	Lab and Journal	Practical Exam	50
USIT3P4	Lab and Journal	Practical Exam	50
USIT3P5	Lab and Journal	Practical Exam	50

Semester IV

Theory

Course	Internal Assessment (40 Marks)			External Assessment (60 Marks)	Total(100 Marks)
	Assignment	Tutorial	Class Test	Theory Exam	
USIT401	10	10	20	60	100
USIT402	10	10	20	60	100
USIT403	10	10	20	60	100
USIT404	10	10	20	60	100
USIT405	10	10	20	60	100

Practical

Course	Internal Assessment (20 Marks)	External Assessment (30 Marks)	Total (50 Marks)
USIT4P1	Lab and Journal	Practical Exam	50
USIT4P2	Problem Solving	Problem Solving	50
USIT4P3	Lab and Journal	Practical Exam	50
USIT4P4	Lab and Journal	Practical Exam	50
USIT4P5	Case Study	Case Study	50

- Tutorials are theory /problems to be solved by the students in the class room at the end of practical / theory session
- Assignments are theory / problems to be solved by the students at home.
- Class Test is to be conducted in the class room with due notice. Test could be out of any sum total but is to be converted out of 20 for class test.
- Semester I,II,III,IV are college examinations. Question papers will be set by examiners appointed by Principals of the affiliated colleges.

Suggested Question Paper Format for END Semester Examination

Duration : 2 hrs.

Total Marks : 60

All Questions Compulsory:

Q. 1	From Unit I Attempt any two of following i. 5 marks ii. 5 marks iii. 5 marks	10 marks
Q. 2	From Unit II Attempt any two of following i. 5 marks ii. 5 marks iii. 5 marks	10 marks
Q. 3	From Unit III Attempt any two of following i. 5 marks ii. 5 marks iii. 5 marks	10 marks
Q. 4	From Unit IV Attempt any two of following i. 5 marks ii. 5 marks ii. 5 marks	10 marks
Q. 5	From Unit V Attempt any two of following i. 5 marks ii. 5 marks iii. 5 marks	10 marks
Q. 6	From Unit VI Attempt any two of following i. 5 marks ii. 5 marks iii. 5 marks	10 marks

Note: Internal choice should be given.

AC 19/3/2012

Item No. 4.83

UNIVERSITY OF MUMBAI



Syllabus for the T.Y. B. Sc. Sem. V & VI

Program: T.Y.B.Sc.

Subject: Information Technology

(with effect from the academic year 2012–2013)

Semester V
Paper 1: Network Security
Paper 2: *ASP.NET with C#
Paper 3: Software Testing
Paper 4: *Advanced Java
Paper 5: *Linux Administration
Semester VI
Paper 1: *Internet Technologies
Paper 2: Digital Signals and Systems
Paper 3: *Datawarehousing
Paper 4: Elective: IPR and Cyber Laws Project Management GIS
Paper V: Project Report
Paper VI: Project Viva-Voce

CLASS: B. Sc (Information technology)		Semester – V	
Paper I; SUBJECT: Network Security			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	<p>Cryptography: Introduction: Some Simple Cryptosystems, The Shift Cipher, The Substitution Cipher, The Affine Cipher, The Vigenere Cipher, The Hill Cipher, The Permutation Cipher, Stream Ciphers, Cryptanalysis, Cryptanalysis of the Affine Cipher, Cryptanalysis of the Substitution Cipher, Cryptanalysis of the Vigenere Cipher, Cryptanalysis of the LFSR-based Stream Cipher.</p> <p>Shannon’s Theory, Perfect Secrecy, Entropy, Huffman Encodings and Entropy, Properties of Entropy, Spurious Keys and Unicity Distance</p> <p>The Data Encryption Standard, Description of DES, An Example of DES Encryption, The DES Controversy, DES in Practice, DES Modes of Operation, A Time-memory Trade-off, Differential Cryptanalysis, An Attack on a 3-round DES, An Attack on a 6-round DES.</p> <p>Introduction to Public-key Cryptography, More Number Theory, The Euclidean Algorithm, The Chinese Remainder Theorem, Other Useful Facts, The RSA Cryptosystem, Implementing RSA, Probabilistic Primality Testing, Attacks On RSA, The Decryption Exponent, Partial Information Concerning Plaintext Bits, The Rabin Cryptosystem, Factoring Algorithms, The $p - 1$ Method, Dixon’s Algorithm and the Quadratic Sieve, Factoring Algorithms in Practice</p>
Unit-II	<p>Signature Schemes : Introduction, The ElGamal Signature Scheme, The Digital Signature Standard, One-time Signatures, Undeniable Signatures, Fail-stop Signatures</p> <p>Hash Functions</p> <p>Signatures and Hash Functions, Collision-free Hash Functions</p> <p>The Birthday Attack, A Discrete Log Hash Function, Extending Hash Functions, Hash Functions from Cryptosystems, The MD4 Hash Function, Timestamping.</p> <p>Key Distribution and Key Agreement</p> <p>Introduction, Key Predistribution, Blom’s Scheme, Diffie-Hellman Key Predistribution, Kerberos, Diffie-Hellman Key Exchange, The Station-to-station Protocol, MTI Key Agreement Protocols, Key Agreement Using Self-certifying Keys.</p>
Unit-III	Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security
Unit-IV	Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Recommended Reading and Web Sites, Key Terms, Review Questions, and Problems, A Kerberos Encryption Techniques, Electronic Mail Security, Pretty Good Privacy, S/MIME, Key Terms, Review Questions, and Problems, A Data Compression Using Zip, Radix-64 Conversion, PGP Random Number Generation
Unit-V	IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key

	Management, Recommended Reading and Web Site, Key Terms, Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer, Security, Secure Electronic Transaction.
Unit-VI	Intruders: Intrusion Detection, Password Management, Recommended Reading and Web Sites. Malicious Software: Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

Books:

Cryptography: Theory and Practice, Douglas Stinson, CRC Press, CRC Press LLC (Unit I and II)

Cryptography and Network Security Principles and Practices, Fourth Edition, William Stallings, PHI(Pearson), (Unit: III-VI)

References:

Information Security and cyber laws, Saurabh Sharma, student series, Vikas publication.
Encryption, Ankit Fadia and J. Bhattacharjee, Vikas publication

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical List:

1 Substitution Techniques

- a Write a program to perform substitution ciphers to encrypt the plain text to Caesar cipher and to decrypt it back to plain text.
- b Write a program to perform substitution ciphers to encrypt the plain text to Modified Caesar cipher and to decrypt it back to plain text.
- c Write a program to perform substitution ciphers to encrypt the plain text to homophonic cipher and to decrypt it back to plain text.
- d Write a program to perform substitution ciphers to encrypt the plain text to monoalphabetic cipher and to decrypt it back to plain text.
- e Write a program to perform substitution ciphers to encrypt the plain text to homophonic cipher and to decrypt it back to plain text.
- f Write a program to perform substitution ciphers to encrypt the plain text to polyalphabetic cipher and to decrypt it back to plain text.

2 Transposition Ciphers

- a Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using rail fence technique.
 - b Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Simple Columnar technique.
 - c Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Columnar with multiple rounds.
- D** Write a program to encrypt a plain text to a cipher text and decrypt it back to plain text

- using vernam cipher as the transposition technique
- 3 Write a program to generate Symmetric Keys for the following Cipher algorithms DES, AES, Blowfish, TripleDES, HmacMD5 and HmacSHA1.
 - 4 Write a program to generate asymmetric Keys for the following Cipher algorithms a) DSA (Digital Signature Algorithm), b) DH (DiffieHellman), c) RSA.
 - 5 Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption:
 - a. DES
 - b. BlowFish
 - c. IDEA
 - d. Triple DES
 - 6 Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption:
 - a. RSA
 - b. AES
 - c. DSA
 - 7 Implement following HashFunctions: RSHash, JSHash, BKDRHash, SDBMHash, DJBHash
 - 8 Write a program to encrypt the given string by using RC4 , MD5, algorithms.
 - 9 Write a program for creating, exporting and validating Digital Certificate.
 - 10 Create a permission that controls access to pages of a book. The permission name consists of a book id, a colon, and a set of allowable pages.

CLASS: B. Sc (Information technology)		Semester – V	
Paper II; SUBJECT: ASP.NET with C#			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	Review of .NET frameworks, Introduction to C#, Variables and expressions, flow controls, functions, debugging and error handling, OOPs with C#, Defining classes and class members. Assembly, Components of Assembly, Private and Shared Assembly, Garbage Collector, JIT compiler. Namespaces
Unit-II	Collections, Comparisons and Conversions, Delegates and Events, Windows programming: Controls(Button, Label , Link Label, Radio Button, CheckBox, Text Box, Rich TextBox, List Box, Checked List Box, List View, Tabbed), Forms (Menus and ToolBars, SDI and MDI applications, Building MDI applications.

Unit-III	Introduction to ASP.NET 4: Microsoft.NET framework, ASP.NET lifecycle.
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	<p>Themes in ASP.NET</p> <p>CSS: Need of CSS, Introduction to CSS, Working with CSS with visual developer</p> <p>ASP.NET server controls: Types of control, ASP.NET state management engine. Web.config and global.asax files.</p>
Unit-IV	<p>Programming ASP.NET web pages: Introduction, data types and variables, statements, organizing code, object oriented basics. Master Pages, Caching.</p> <p>Navigation: Using navigation controls, programmatic redirection</p> <p>User Controls: Introduction to user controls</p> <p>Validating User Controls</p>
Unit-V	<p>Databases: Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports.</p> <p>LINQ: Operators, implementations, LINQ to objects,XML,ADO.NET, Query Syntax</p> <p>ASP.NET Security: Authentication, Authorization, Impersonation, ASP.NET provider model</p>
Unit-VI	<p>ASP.NET Ajax: Introducing AJAX, Using ASP.NET AJAX, Web Services and Page methods in AJAX websites,</p> <p>JQuery: Introduction to JQuery, JQuery syntax, modifying DOM with JQuery, effects with JQuery, JQuery and extensibility,</p>

Books:

Beginning Visual C# 2010, K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner, Wrox (Wiley) 2010. (Unit I and II).

Beginning ASP.NET 4 in C# and VB, I. Spanjaars, Reprint 2011 (Unit III to VI).

ASP.NET 4.0 programming, J. Kanjilal, Tata McGraw-Hill (Unit III to VI).

References:

Programming ASP.NET, D.Esposito, Microsoft Press (Dreamtech), Reprint 2011.

ASP.NET Visual C#.NET, Vijay Nicoel, TMH

Advanced .NET Technology, Patel, Dreamtech.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical:

1. Simple Programs with C#:

- a) Write a console application that obtains four int values from the user and displays the product. Hint: you may recall that the Convert.ToDouble() command was used to convert the input from the console to a double; the equivalent command to convert from a string to an int is Convert.ToInt32().
- b) If you have two integers stored in variables var1 and var2, what Boolean test can you perform to see if one or the other (but not both) is greater than 10?

- c) Write an application that includes the logic from Exercise 1, obtains two numbers from the user, and displays them, but rejects any input where both numbers are greater than 10 and asks for two new numbers.
 - d) Write a console application that places double quotation marks around each word in a string
 - e) Write an application that uses two command-line arguments to place values into a string and an integer variable, respectively. Then display these values.
 - f) Write an application that receives the following information from a set of students:
 - Student Id:
 - Student Name:
 - Course Name:
 - Date of Birth:
 The application should also display the information of all the students once the data is entered. Implement this using an Array of Structs.
 - g) Write programs using conditional statements and loops:
 - i. Generate Fibonacci series.
 - ii. Generate various patterns (triangles, diamond and other patterns) with numbers.
 - iii. Test for prime numbers.
 - iv. Generate prime numbers.
 - v. Reverse a number and find sum of digits of a number.
 - vi. Test for vowels.
 - vii. Use of foreach loop with arrays.
2. Object oriented programs with C#
 - a. Program using classes.
 - b. Program with different features of C#
 - Function Overloading
 - Operator Overloading
 - Inheritance (all types)
 - Constructor overloading
 - Interfaces
 - Using Delegates and events
 - Exception handling
 3. Programs using different controls.
 4. Programs using CSS.
 5. Programs using ASP.NET Server controls.
 6. Database programs with ASP.NET and ADO.NET
 7. Programs using Language Integrated query.
 8. Programs securing web pages.
 9. Programs using AJAX.
 10. Programs using JQuery.

CLASS: B. Sc (Information technology)		Semester – V	
Paper III; SUBJECT: Software Testing			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	Introduction to quality, software quality, fundamentals of software testing, VV model of testing.
Unit-II	Functional Testing: Boundary value Testing, Equivalence class testing, Decision Table based testing, Retrospection.
Unit-III	Structural Testing: Path Testing, Data Flow Testing, Retrospection
Unit-IV	Levels of Testing, Integration Testing, System Testing, Interaction Testing
Unit-V	Object Oriented Testing: Issues, Class Testing, Object Oriented Integration Testing, Object Oriented System Testing
Unit-VI	Testing Process: Planning, Metrics and Reports, Quantitative and Qualitative Analysis, Improvements.

Books:

Software Testing Principles, Techniques and Tools, M.G. Limaye, TMH, (Unit- I and VI)
Software Testing A Craftman’s Approach, Second Edition, Paul C. Jorgensen, CRC Press.(Unit-II to V)

References:

Software testing by Yogesh Singh. Cambridge University Press, 2012
Introduction to Software Testing, Paul Ammann, Jeff Offutt, Cambridge University Press.
Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing, Rex Black, Wiley.
Software Testing, Second Edition,Ron Patton,SAMS
Software Testing, Perry, Wiley India.
Software testing by Sandeep Desai, Abhishek Srivastava. (PHI) EEE edition.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical:

1. Prepare a small project and submit SRS, design, coding and test plan.
2. Study of any one of the testing tools. (e.g winrunner, testdirect,etc)
3. MANUAL TESTING for the project
 - a. Walkthrough
 - b. Whitebox Testing
 - c. Blackbox Testing
 - d. Unit Testing
 - e. Integration Testing
4. Functional Testing
 - a. Boundary value Testing
 - b. Equivalence class testing
 - c. Decision Table based testing
 - d. Cause-effect graphs
5. Structural Testing
 - a. Path testing
 - b. Data-flow testing
6. Regression Testing (use VTEST tool) using automated testing for website.
7. AUTOMATED TESTING for websites
 - a. Load Testing(use WAPT)
 - b. Performance Testing(use WAPT)
8. Implement the process Object oriented testing
9. For automated testing, design the test plan and test cases for integration testing on the given case.
10. For automated testing, design the test plan for unit testing.

CLASS: B. Sc (Information technology)		Semester – V	
Paper IV; SUBJECT: Advanced Java			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	Swing: Event Handling, JFrames, Lists , Tables, Trees, Text Components, Progress Indicators, Component Organizers
Unit-II	Introduction to servlets: Need for dynamic content, java servlet technology, why servlets? Servlet API and Lifecycle: servlet API, servletConfig interface, ServletRequest and ServletResponse Interfaces, GenericServlet Class. ServletInputStream And ServletOutputStream Classes,RequestDispatcher Interface,HttpServlet Class, HttpServletRequest and HttpServletResponse Interfaces, HttpSession Interface, Servlet Lifecycle. Working with servlets: organization of a web application, creating a web application(using netbeans) , creating a servlet, compiling and building the web application
Unit-III	JDBC: Design of JDBC, JDBC configuration, Executing SQL statement, Query Execution, Scrollable and updatable result sets, row sets, metadata, Transaction. JSP: Introduction, disadvantages, JSP v/s Servlets, Lifecycle of JSP, Comments, JSP documents, JSP elements, Action elements, implicit objects, scope, characterquoting conventions, unified expression language.
Unit-IV	Java server Faces : Need of MVC , what is JSF?, components of JSF, JSF as an application, JSF lifecycle, JSF configuration, JSF web applications (login form, JSF pages) EJB: Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans , packaging beans, creating web applications, creating enterprise bean, creating web client, creating JSP file, building and running web application.
Unit-V	HIBERNATE: Introduction, Writing the application, application development approach, creating database and tables in MySQL, creating a web application, Adding the required library files, creating a java bean class, creating hibernate configuration and mapping file, adding a mapping resource, creating JSPs. STRUTS: Introduction, Struts framework core components, installing and setting up struts, getting started with struts.
Unit-VI	WEB Services: SOAP, Building a web services using JAX-WS, Building web service. JAVAMAIL: Mail Protocols, Components of the Javamail API, JAVAMAIL API, Starting with API. JNDI: NAMING Service, Directory service, JNDI, Resources and JNDI,

Books:

Java EE 6 for Beginners, Sharanam Shah, Vaishali Shah, SPD (Unit II to VI)
Core Java Vol. II – Advanced Features, Cay S. Horstmanns, Gary Coronell, Eight Edition, Pearson (Unit I and III)
Java Complete Reference, Herbert Schildt, Seventh Edition, TMH. (Unit I)

References:

Java EE Project using EJB 3, JPA and struts 2 for beginners, Shah, SPD
Java Programming A practical Approach, C Xavier, McGraw Hill
Java Server Faces A practical Approach for beginners, B M Harwani, Eastern Economy Edition (PHI).
Advanced Java Technology, Savaliya, Dreamtech.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practicals:
1. Write a java program to present a set of choices for a user to select Stationary products and display the price of Product after Selection from the list.
2. Write a java program to demonstrate typical Editable Table, describing employee details for a software company.
3. Write a java program using Split pane to demonstrate a screen divided in two parts, one part contains the names of Planets and another Displays the image of planet. When user selects the planet name form Left screen, appropriate image of planet displayed in right screen.
4. Develop Simple Servlet <u>Question Answer</u> Application to demonstrate use of HttpServletRequest and HttpServletResponse interfaces.
5. Develop Servlet Application of Basic Calculator (+, -, *, /, %) using ServletInputStream and ServletOutputStream.
6. Develop a JSP Application to accept Registration Details form user and Store it into the database table.
7. Develop a JSP Application to Authenticate User Login as per the registration details. If login success the forward user to Index Page otherwise show login failure Message.
8. Develop a web application to add items in the inventory using JSF.
9. Develop a Room Reservation System Application Using Enterprise Java Beans.
10. Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
11. a .Develop a simple Struts Application to Demonstrate 3 page Website of Teaching Classes which passes values from every page to another. b. Develop a simple Struts Application to Demonstrate E-mail Validator.
12. a. Develop a simple “Hello World” Web Service with SOAP in Java. b. Develop a Simple Web Service and Client with JAX-WS. c. Develop an application to show searching the Directory using JNDI capabilities.

CLASS: B. Sc (Information Technology)		Semester – V	
Paper V; SUBJECT: Linux Administration			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	<p>Introduction: Introduction to UNIX, Linux, GNU and Linux distributions</p> <p>Duties of the System Administrator, The Linux System Administrator, Installing and Configuring Servers, Installing and Configuring Application Software, Creating and Maintaining User Accounts, Backing Up and Restoring Files, Monitoring and Tuning Performance, Configuring a Secure System, Using Tools to Monitor Security</p> <p>Booting and shutting down: Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services,</p> <p>The File System: Understanding the File System Structure, Working with Linux-Supported File Systems, Memory and Virtual File Systems, Linux Disk Management</p> <p>Network Configuration Files:</p>
Unit-II	<p>System Configuration Files: System wide Shell Configuration Scripts, System Environmental Settings, Network Configuration Files, Managing the init Scripts, Configuration Tool, Editing Your Network Configuration</p> <p>TCP/IP Networking: Understanding Network Classes, Setting Up a Network Interface Card (NIC), Understanding Subnetting, Working with Gateways and Routers, Configuring Dynamic Host Configuration Protocol, Configuring the Network Using the Network,</p> <p>The Network File System: NFS Overview, Planning an NFS Installation, Configuring an NFS Server, Configuring an NFS Client, Using Automount Services, Examining NFS Security</p>
Unit-III	<p>Connecting to Microsoft Networks: Installing Samba, Configuring the Samba Server, Creating Samba Users 3, Starting the Samba Server, Connecting to a Samba Client, Connecting from a Windows PC to the Samba Server</p> <p>Additional Network Services: Configuring a Time Server, Providing a Caching Proxy Server, Optimizing Network Services</p> <p>Internet Services: Secure Services, SSH, scp, sftp Less Secure Services (Telnet ,FTP, sync,rsh ,rlogin,finger,talk and ntalk, Linux Machine as a Server, Configuring the xinetd Server, Comparing xinetd and Standalone, Configuring Linux Firewall Packages,</p>

Unit-IV	<p>Domain Name System: Understanding DNS, Understanding Types of Domain Servers, Examining Server Configuration Files, Configuring a Caching DNS Server, Configuring a Secondary Master DNS Server, Configuring a Primary Master Server, Checking Configuration</p> <p>Configuring Mail Services: Tracing the Email Delivery Process, Mail User Agent (MUA), Introducing SMTP, Configuring Sendmail, Using the Postfix Mail Server, Serving Email with POP3 and IMAP, Maintaining Email Security</p> <p>Configuring FTP Services: Introducing vsftpd, Configuring vsftpd, Advanced FTP Server Configuration, Using SFTP</p>
Unit-V	<p>Configuring a Web Server: Introducing Apache, Configuring Apache, Implementing SSI, Enabling CGI, Enabling PHP, Creating a Secure Server with SSL</p> <p>Providing Web Services: Creating Mailing Lists, Setting Up Web-Based Email, Configuring an RSS Feed, Adding Search Functionality,</p>
Unit-VI	<p>Optimizing Internet Services: Optimizing LDAP Services, Optimizing DNS Services, Optimizing Mail Services, Optimizing FTP Services, Optimizing Web Services</p> <p>System Administration: updating system, upgrading and customizing kernel, Administering Users and Groups Installing and Upgrading Software Packages</p>

Books:

1. Beginning Linux by Neil Mathew 4th Edition
2. Red hat Linux Networking and System Administration by Terry Collings

References:

1. UNIX: Concepts and techniques, S. Das, Tata McGraw-Hill,
2. Linux Administration: A Beginner's Guide, Fifth Edition, Wale Soyinka, Tata McGraw-Hill
3. Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical:

<ol style="list-style-type: none"> 1. Installation of Red HAT/Fedora Linux operating system. <ol style="list-style-type: none"> a. Partitioning drives b. Configuring boot loader (GRUB/LILO) c. Network configuration d. Setting time zones e. Creating password and user accounts f. Shutting down
2. Software selection and installation
3. Programming Shell scripts for Linux administration

<p>4. Linux system administration</p> <ul style="list-style-type: none"> a. Becoming super user b. Temporarily changing user identity with su command c. Using graphical administrative tools d. Administrative commands e. Administrative configuration files
<p>5. Connecting to the internet and configuring samba</p> <ul style="list-style-type: none"> a. Setting up dial-up PPP b. Creating a dial- up connection with the internet configuration wizard c. Launching PPP connection d. Setting up linux as a proxy server e. Configuring mozilla or firefox to use as a proxy
<p>6. Setting up local area network</p> <ul style="list-style-type: none"> a. LAN topologies b. LAN equipment c. Networking with TCP/IP d. Configuring TCP/IP e. Adding windows computer's to user LAN f. IP address classes
<p>7. Server setup and configuration</p> <ul style="list-style-type: none"> a. Setting up NFS file server b. Setting up Samba file server c. The Apache web server d. Setting up FTP server e. Setting up proxy server
<p>8. Understanding COMPUTER SECURITY: Firewall and security configurations</p> <ul style="list-style-type: none"> a. LINUX security checklist b. Securing linux with IP table firewalls c. Configuring an IP table firewall d. Securing Linux features
<p>9. Programming using C.</p>
<p>10. Implementing Socket programs.</p>
<p>11. Setting up hardware devices including sound card and printers and others(USB devices etc).</p>
<p>12. Working with X-windows</p> <ul style="list-style-type: none"> a. Switching between text and graphical consoles b. set up my video card, monitor and mouse for the X-server. c. Install KDE, change default desktop to KDE (or Gnome) d. Accessing X-window remotely. e. Installing TrueType fonts from my MS Windows partition. f. Display and Control a Remote Desktop using VNC.

CLASS: B. Sc (Information technology)		Semester – VI	
Paper I; SUBJECT: Internet Technologies			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	Introduction: OSI Model, TCP/IP Protocol Suite, Network Layer, IPV 4 and IPV6 Addresses and Protocol
Unit-II	Address Resolution Protocol (ARP), Internet Control Message Protocol Version 4 (ICMPv4), Mobile IP, Unicast Routing Protocols (RIP, OSPF and BGP)
Unit-III	Transport Layer, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transmission Protocol (SCTP)
Unit-IV	Host Configuration: DHCP, Domain Name System (DNS), Remote Login: TELNET and SSH, File Transfer: FTP and TFTP
Unit-V	World Wide Web and HTTP, Electronic Mail: SMTP, POP, IMAP and MIME, Network Management: SNMP, Multimedia
Unit-VI	Client Server Programming: Concurrent Connection Oriented (TCP) and Connectionless programming(UDP), Iterative connectionless(TCP) and connection oriented servers(UDP).

Books:

TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition , TMH (Unit I – V)

Internetworking with TCP/IP, Volume III, Second Edition, Douglas E. Comer, D.L. Stevens, PHI (Unit VI)

References:

Internetworking with TCP/IP, Volume I, Fifth Edition, Douglas E. Comer, PHI

Internetworking with TCP/IP, Volume II, Third Edition, Douglas E. Comer, D.L. Stevens, PHI

TCP/IP Illustrated, Eastern Economy Edition, N.P. Gopalan, B.Siva Selvan, PHI

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical:

1. Write a function in JAVA to simulate the cache control, input and output modules of ARP.
2. Write a JAVA code to implement the routing algorithm for RIP.
3. Write a JAVA code to find the shortest path between two points in the network.
4. Write a JAVA code to simulate the main module of TCP.
5. Write a JAVA code that calculates the checksum of UDP datagram.
6. Write a JAVA code for TCP echo Server application.
7. Write a JAVA client/server TCP code in which a client sends a number to server and server responds by returning its factorial.
8. Write a JAVA client/server TCP code to illustrate simple chat application.
9. Write a JAVA client/server UDP code in which a client greets the server and the server send date and time to the client.
10. Write JAVA client/server UDP code where client send series of numbers to server and server returns greatest among them.

CLASS: B. Sc (Information technology)		Semester – VI	
Paper II; SUBJECT: Digital Signals and Systems			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	<p>Classification of Signals and systems: Introduction, Continuous Time and discrete time signals, classification of signals, simple manipulations of discrete time signals, amplitude and phase spectra, classification of systems, analog to digital conversion of signals</p> <p>Fourier Analysis of Periodic and Aperiodic Continuous Time Signals and Systems: Introduction, trigonometric Fourier series, Complex or exponential form of Fourier series, Parsevals identity for Fourier series, Power spectrum of a periodic function. Fourier transform and its properties, Fourier transforms of some important signals, Fourier transforms of power and energy signals.</p>
Unit-II	<p>Applications of Laplace Transform to System Analysis Introduction, definition, region of convergence (ROC) LT of some important functions, Initial and final value theorems, convolution integral, Table of Laplace transforms, partial fraction expansions, network transfer function. S-plane Poles and zeros. LT of periodic functions. Application of LT in analysing networks.</p>

Unit-III	Z Transform: Introduction, definition of z-transform, properties of z-transform, evaluation of inverse z-transform.
Unit-IV	Linear Time Invariant Systems: Introduction, properties of DSP system, Discrete convolution, solution of linear constant coefficient difference equation. Frequency domain representation of discrete time signals and systems. Difference equation and its relationship with system function, impulse response and frequency response,
Unit-V	Discrete and Fast Fourier Transforms: Introduction, discrete Fourier series, Discrete time Fourier transform (DTFT), Fast Fourier transform (FFT), Computing an inverse DFT by doing direct DFT, Composite radix FFT, Fast (Sectioned) convolution, Correlation.
Unit-VI	Finite Impulse Response (FIR) Filters Introduction, magnitude response and phase response of digital filters, frequency response of linear phase FIR filters, Design techniques of FIR filters, design of optimal linear phase FIR filters. Infinite Impulse Response (IIR) Filters: Introduction, IIR filter design by approximation of derivatives, IIR filter design by impulse invariant method, IIR filter design by the bilinear transformation, Butterworth filters, Chebyshev filters, Elliptic filters, frequency transformation.

Books:

Digital Signal Processing by S. Salivahanan, C. Gnanapriya Second Edition, TMH

References:

Digital Signal Processing by Sanjit K. Mitra, Third Edition, TMH

Signals and systems by A Anand Kumar (PHI) 2011

Signals and Systems by Alan V. Oppenheim and Alan S. Willsky with S. Hamid Nawab, Second Edition, PHI (EEE)

Digital Signal Processing by Apte, Second Edition, Wiley India.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical : (To be conducted using Scilab / MATLAB)

1. Write a program to study and implement Discrete Time Signals and systems.
 - a. Unit Step Sequence
 - b. Unit Ramp Sequence
 - c. Exponential Sequence
 - d. Exponential Increasing Sequence
 - e. Exponential Decreasing Sequence
 - f. Even Signals
 - g. Odd Signals
2. Write a program to implement Z-Transforms.
 - a. Z-transform of Finite duration signals
 - b. Time shifting property of Z transform
3. Write a program to demonstrate convolution property.
4. Write a program to demonstrate correlation property.
5. Write a program to implement Frequency Response of First order Difference Equation.
6. Write program to
 - a. Determine N-Point DFT.
 - b. Find DFT and IDFT of the given sequence.
7. Write a program to implement circular convolution using DFT
8. Write a program to perform linear filtering (linear convolution using DFT).
9. Write a program to implement/Design of FIR Filter using Frequency Sampling Technique.
10. Write a program to implement low pass, high pass and band pass filters.

CLASS: B. Sc (Information technology)		Semester – VI	
Paper III; SUBJECT: Data warehousing			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	History of data warehousing: database management system, personal computers and 4GL technology, spider web environment, evolution from business perspective, data warehouse environment, what is datawarehouse? , integrating data, volumes of data, different development approach, evolution to DW 2.0 environment, business impact of the data warehouse, components of datawarehouse environment, evolution of data warehouse from the business perspective, other notions about data warehouse, federated data warehouse, star schema, data mart.
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	<p>Introduction: Lifecycle of data warehouse, reasons for different sectors, metadata, Access of data, structures data/ unstructured data, Textual analysis, blather, issue of terminology, specific text, metadata – a major component, local metadata, changing business requirements, flow of data within DW 2.0, volumes, useful applications, DW 2.0 and referential integrity, reporting in DW 2.0</p> <p>DW components: Interactive sector, integrated sector, Near Line sector, Archival sector.</p>
Unit-II	<p>Metadata in DW: Reusability of data analysis, Metadata, Active/ passive repository, enterprise metadata, metadata and the system record, Taxonomy, Internal and external taxonomy, metadata in archival sector, maintaining metadata, using metadata – an example, end user perspective.</p> <p>Methodology and Approach for DW: Spiral model methodology, seven streams approach, enterprise reference model, enterprise knowledge coordination stream, information factory development stream, Data correction stream, infrastructure stream, Total information quality management stream.</p> <p>Statistical processing and DW: Two types of transaction, statistical analysis, integrity of comparison, heuristic analysis, freezing data, exploration processing, frequency of analysis, exploration facility, sources for exploration processing, refreshing exploration data, project based data, Data marts and exploration facility, A backflow of data, using exploration data internally, perspective of business analyst.</p>
Unit-III	<p>Data models and DW: datamodel and business, scope of integration, making the distinction between granular and summarized data, levels of the data model, data models and interactive sector, corporate data model, transformation of models, data models and unstructured data, perspective of business user.</p> <p>Monitoring the DW environment: Monitoring DW environment, transaction monitor, monitoring data quality, datawarehouse monitor, transaction monitor, peak period processing, ETL data quality monitor, Dormant data.</p> <p>DW and security: Protecting access to data, encryption, drawbacks, firewall, moving data offline, limiting encryption, direct dump, datawarehouse monitor, sensing an attack, security for near line data.</p>
Unit-IV	<p>Time variant data: All data in DW, Time relativity in the interactive sector, data relativity elsewhere in DW, Transactions in integrated sector, discrete data, continuous time span data, a sequence of records, nonoverlapping records, beginning and ending a sequence of records, continuity of data, Time-collapsed data, time variance in the archival sector,</p> <p>Flow of data in DW: flow of data throughout the architecture, entering the interactive sector, role of ETL, data flow into integrated sector, near line, archival sector, falling probability of data access, exception flow of data.</p> <p>ETL processing and DW: changing states of data, Where ETL fits, application data to corporate data, ETL in online mode and batch mode, source and target, ETL mapping, more complex transformation, ETL and throughput, ETL and metadata, ETL and an audit trail, ETL and data quality, creating ETL, code creation or parametrically driven ETL, ETL and rejects, changed data capture, ETL and rejects, Changed data capture, ELT</p>

Unit-V	<p>DW and granularity manager: granularity manager, raising the level of granularity, filtering data, functions of the granularity manager, homegrown versus third party granularity manager, parallelizing the granularity manager.</p> <p>DW and performance: online response time, analytical response time, flow of data, Queues, heuristic processing, analytical productivity and response time, many facets to performance, indexing, removing dormant data, end user education, monitoring the environment, capacity planning, metadata, batch parallelization, parallelization for transaction processing, workload management, data marts, exploration facilities, separation of transactions into classes, service level agreements, protecting the interactive sector, partitioning data, choosing the proper hardware, separating farmers and explorers, physically group data.</p> <p>Migration: Migration in perfect world, adding components incrementally, adding archival sector, creating enterprise metadata, building the metadata infrastructure, swallowing source system, ETL as shock absorber, migration to the unstructured environment.</p>
Unit-VI	<p>Implementation And Maintenance: Physical design process, data warehouse deployment, growth and maintenance.</p>

DW2.0 The architecture for Next Generation of Datawarehousing W.H. Inmon, Derek Strauss, Genia Neushloss, ELSEVIER. (Unit I to V)

Paulraj Ponnian, “*Data Warehousing Fundamentals*”, John Wiley. (Unit VI)

References:

Building the data warehouse, W.H.Inmon, third Edition, Wiley.

Datawarehousing, S. Mohanty, TMH .

The Data Warehouse Lifecycle toolkit”, Ralph Kimball ,John Wiley.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Practical List:

1.	Create around 25 records and design the tabular view using Excel.
	Create around 25 records and design the Chart view using Excel.
2.	Extract the data from excel , access and sql and integrate it in SQL server.
3.	Perform the same process using DTS package
4.	Design the star schema and create a cube using OLAP services
5.	Perform the cube analysis on MOLAP
6.	Perform the cube analysis on ROLAP
7.	Perform the cube analysis on HOLAP

8.	<p>Consider a data warehouse storing data about sales, where the total items sold are stored, organised by customer order and product. Each customer order includes the name of the customer and the date of the order; each product includes a description of the product and its price.</p> <p>i. Devise the relational schema (specifying the relations, the attributes, the primary keys, and the foreign keys) of the above data warehouse using the star schema.</p> <p>ii. Write a SQL query to answer the following question: "Which customer(s) made an order containing at least five products with different descriptions?"</p> <p>iii. Write a SQL query for the following report: "Which customer(s) made the largest order (i.e., those that would result in the largest bill)?"</p> <p>iv. Consider to add a new level product categories to the product dimension. Devise the new relational star schema, and write a SQL query for the following report: "Select the total number of products sold per product category".</p>
9.	Design at least five queries for the created cube using MDX application.
10.	Retrieve the cube data into the excel sheet and present the information in tabular and graphical form.

Paper IV; Elective Subjects (ANY ONE) 1. IPR and Cyber Laws 2. Project Management 3. GIS	Semester – VI
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CLASS: B. Sc (Information technology)		Semester – VI	
SUBJECT: IPR AND CYBER LAWS			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	Basic Principles and Acquisition of Intellectual Property Rights: Focus on the: Philosophical Aspects of Intellectual Property Laws, Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark, Basic Principles of Design Rights, International Background of Intellectual Property
Unit II	Information Technology Related Intellectual Property Rights Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defences, Patent Protection. Database and Data Protection-Objective, Need for Protection, UK Data Protection Act, 1998,US Safe Harbor Principle, Enforcement. Protection of Semi-conductor Chips-Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, TRIPs, SCPA. Domain Name Protection-Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, and International Perspective.
Unit-III	Patents (Ownership and Enforcement of Intellectual Property) Patents-Objectives, Rights, Assignments, Defences in case of Infringement Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement Trademarks-Objectives, Rights, Protection of good will, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement

Unit-IV	Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures. Practical Aspects of Licencing – Benefits , Determinative factors, important clauses, licensing clauses.
Unit-V	Cyber Law: Basic Concepts of Technology and Law : Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence Law of Digital Contracts : The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography Intellectual Property Issues in Cyber Space: Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World. Rights of Netizens and E-Governance : Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws
Unit-VI	Information Technology Act 2000 : Information Technology Act-2000-1 (Sec 1 to 13), Information Technology Act-2000-2 (Sec 14 to 42 and Certifying authority Rules), Information Technology Act-2000-3 (Sec 43 to 45 and Sec 65 to 78), Information Technology Act-2000-4(Sec 46 to Sec 64 and CRAT Rules), Information Technology Act-2000-5 (Sec 79 to 90), Information Technology Act-2000-6 (Sec 91-94) Amendments in 2008. International Scenario in Cyber Laws : Data Protection Laws in EU and USA, Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach. Cyber Law Issues for Management : Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management, Cyber Law Compliancy Audit.

References:

1. Peter Weill , Jeanne Ross “IT Governance: How Top Performers Manage IT Decision Rights for Superior Results”
2. Jeanne W. Ross “Enterprise Architecture As Strategy: Creating a Foundation for Business Execution”
3. Peter Weill “IT Savvy: What Top Executives Must Know to Go from Pain to Gain
4. www.wipo.org
5. IT Act 2000 with amendments in 2008
6. How To Register Your Own Copyright by Marx Warda, Sphinx Publishing
7. Licensing Art & Design by Caryn R. Leland, Allworth Press
8. Managing Intellectual Property: The Strategic Importance, (2 ed.) V. V. Sopale (PHI)
Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

CLASS: B. Sc (Information technology)		Semester – VI	
SUBJECT: Project Management			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit-I	<p>Conventional Software Management : The waterfall model, conventional software Management performance.</p> <p>Evolution of Software Economics : Software Economics, pragmatic software cost estimation.</p> <p>Improving Software Economics : Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.</p>
Unit-II	<p>The old way and the new : The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.</p> <p>Life cycle phases : Engineering and production stages, inception, Elaboration, construction, transition phases.</p> <p>Artifacts of the process : The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.</p> <p>Model based software architectures : A Management perspective and technical perspective.</p>
Unit-III	<p>Work Flows of the process : Software process workflows, Iteration workflows, Checkpoints of the process : Major mile stones, Minor Milestones, Periodic status assessments.</p> <p>Iterative Process Planning : Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.</p>
Unit-IV	<p>Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.</p> <p>Process Automation: Automation Building blocks, The Project Environment.</p>
Unit-V	<p>Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.</p> <p>Tailoring the Process: Process discriminants.</p>
Unit-VI	<p>Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.</p>

Books:

1. Software Project Management, Walker Royce: Pearson Education, 2005.
2. Information Technology Project management (4th Edition) – Kathy Schwalbe (Centgage Learning – Indian Edition)

Reference Books:

1. Project Management Core Textbook – Mantel Jr., Meredith, Shafer, Sutton with Gopalan (Wiley India Edition)
2. Information Technology project Management, : a concise study, (3rd ed.) by S A Kelkar (PHI)
3. Project Management- A systems Approach to planning, scheduling and controlling - Harold Kerzner (John Wiley & Sons, Inc)
4. *A Guide to the Project Management Body of Knowledge (3rd Edition)*- Newtown Square, PA, Project Management Institute, 2005.

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

CLASS: B. Sc (Information Technology)		Semester – VI	
SUBJECT: Geographic Information Systems			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	TW/Tutorial/Practical	--	40

Unit I	Spatial Data Concepts: Introduction to GIS, Geographically referenced data, Geographic, projected and planer coordinate system, Map projections, Plane coordinate systems, Vector data model, Raster data model
Unit II	Data Input and Geometric transformation: Existing GIS data, Metadata, Conversion of existing data, Creating new data, Geometric transformation, RMS error and its interpretation, Resampling of pixel values.
Unit III	Attribute data input and data display : Attribute data in GIS, Relational model, Data entry, Manipulation of fields and attribute data, cartographic symbolization, types of maps, typography, map design, map production

Unit IV	Data exploration: Exploration, attribute data query, spatial data query, raster data query, geographic visualization
Unit V	Vector data analysis: Introduction, buffering, map overlay, Distance measurement and map manipulation. Raster data analysis: Data analysis environment, local operations, neighbourhood operations, zonal operations, Distance measure operations
Unit VI	Spatial Interpolation: Elements, Global methods, local methods, Kriging, Comparisons of different methods

Text Book

Introduction to Geographic Information Systems by Kang-Tsung Chang Published by Tata Mcgraw Hill

Reference Books and websites

Concepts and Techniques in Geographic Information Systems by Chor Pang Lo and Albert K. W. Yeung

<http://www.ncgia.ucsb.edu/giscc/>

Term Work:

Assignments: Should contain at least 6 assignments (one per unit) covering the Syllabus.

Tutorial: At least three tutorials based on above syllabus must be conducted.

CLASS: B. Sc (Information Technology)		Semester – VI	
SUBJECT: PROJECT			
Periods per week 1 Period is 50 minutes	Lecture	5	
	TW/Tutorial/Practical	3	
		Hours	Marks
Evaluation System	Final Examination	2	60
	Term Work	--	40

The project should be undertaken preferably individually or by the group of maximum 3 students who will jointly work and implement the project. The candidate/group will select a project with the approval of the Guide (staff member) and submit the name of the project with a synopsis of the proposed work of not more than 02 to 08 pages within one month of the starting of the semester. The candidate/ group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software,

implementation of a few modules of the proposed work during the semester VI as a part of the term work submission in the form of a joint report.

Candidate/group will submit the completed project work to the department at the end of semester VI as mentioned below.

1. The workable project.
2. The project report in the bound journal complete in all respect with the following : -
 - i) Problem specifications.
 - ii) System definition – requirement analysis.
 - iii) System design – dataflow diagrams, database design
 - iv) System implementation – algorithm, code documentation
 - v) Test results and test report.
 - vi) In case of object oriented approach – appropriate process be followed.

The project report should contain a full and coherent account of your work. Although there will be an opportunity to present the work verbally, and demonstrate the software, the major part of the assessment will be based on the written material in the project report. One can expect help and feedback from the project guide, but ultimately it's the candidates own responsibility. The suggestive structure of a project report should be guided by your guide in selecting the most appropriate format for your project.

The term work assessment will be done jointly by teachers appointed by Head of the Institution.

The oral examination will be conducted by an internal and external examiner as appointed by the University.

Note:

1. Project work should be continually evaluated based on the contributions of the candidate/group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.

General Instructions for all the courses in sem IV and V:

- a) Six assignments, one on each unit is expected to be completed in a semester for each subject.
- b) The subjects not having practicals should be supported by tutorials/case studies to be discussed in a class.
- c) Extensive problem solving exercises should be given in order to improve the interest in the subject.

UNIVERSITY OF MUMBAI



Syllabus for T.Y.B.Sc. (I.T.)

Semester V and VI

Programme: T. Y. B. Sc.

(Information Technology)

(with effect from Academic Year 2013 – 14)

Courses and Course Codes

Semester V

Course Code	Course Title	Course Code	Course Title
USIT501	Network Security	USIT5P1	Network Security Practical
USIT502	Asp.Net With C#	USIT5P2	Asp.Net With C# Practical
USIT503	Software Testing	USIT5P3	Software Testing Practical
USIT504	Advanced Java	USIT5P4	Advanced Java Practical
USIT505	Linux Administration	USIT5P5	Linux Administration Practical

Semester VI

Course Code	Course Title	Course Code	Course Title
USIT601	Internet Technology	USIT6P1	Internet Technology Practical
USIT602	Project Management	USIT6P2	Project Management Case Studies
USIT603	Data Warehousing	USIT6P3	Data Warehousing Practical
USIT607		Project Report	
USIT608		Project Viva Voce	
Elective			
USIT604	IPR and Cyber Laws	USIT6P4	IPR and Cyber Laws Case Studies
USIT605	Digital Signal And Systems	USIT6P5	Digital Signal And Systems Practical
USIT606	Geographic Information Systems	USIT6P6	Geographic Information Systems Practical

Semester V

PROGRAMME: B. Sc (Information Technology)		Semester – V	
COURSE: NETWORK SECURITY		COURSE CODE: USIT501	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
Evaluation System		Hours	Marks
	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit I	Computer Security : Introduction, Need for security, Principles of Security, Types of Attacks Cryptography : Plain text and Cipher Text, Substitution techniques, Caesar Cipher, Mono-alphabetic Cipher, Polygram, Polyalphabetic Substitution, Playfair, Hill Cipher, Transposition techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks	10 Lectures
Unit II :	Symmetric Key Algorithms and AES: Algorithms types and modes, Overview of Symmetric key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard (AES)	10 Lectures
Unit III	Asymmetric Key Algorithms, Digital Signatures and RSA: Brief history of Asymmetric Key Cryptography, Overview of Asymmetric Key Cryptography, RSA algorithm, Symmetric and Asymmetric key cryptography together, Digital Signatures, Knapsack Algorithm, Some other algorithms (Elliptic curve cryptography, ElGamal, problems with the public key exchange)	10 Lectures
Unit IV	Digital Certificates and Public Key Infrastructure (PKI): Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards (PKCS), XML, PKI and Security, Hash functions, Key Predistribution, Blom's Scheme, Diffie-Hellman Key Predistribution, Kerberos, Diffie-Hellman Key Exchange, The Station-to-station Protocol	10 Lectures
Unit V	Network Security, Firewalls and Virtual Private Networks: Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN), Intrusion Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL vs SET, 3-D Secure Protocol, Electronic Money, E-mail Security, Wireless Application Protocol (WAP) Security, Security in GSM, Security in 3G	10 Lectures
Unit VI	User Authentication and Kerberos: Authentication basics, Passwords, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Kerberos, Key Distribution Center (KDC) , Security Handshake Pitfalls, Single Sign On (SSO) Approaches	10 Lectures

Books:

Cryptography and Network Security by Atul Kahate, 2nd Edition, Tata McGrawHill

(Unit I: Chapter 1,2, Unit II: Chapter 3, Unit III: Chapter 4, Unit IV: Chapter 5, Unit V: Chapter 6, Unit VI: Chapter 7)

References:

Cryptography and Network Security by William Stallings, Fifth Edition, Pearson Education.
Cryptography: Theory and Practice by *Douglas Stinson*, CRC Press, CRC Press LLC.

Course Code : **USIT5P1**

Practicals:

1. Implementing Substitution Ciphers
 - a. Caesar Cipher
 - b. Modified Caesar Cipher
 - c. Mono-Alphabetic
 - d. Poly-Alphabetic
2. Implementing Transposition Ciphers
 - a. Rail fence Techniques
 - b. Simple Columnar
 - c. Multicolumnar
 - d. Vernam Cipher
3. Implementing Diffie Helman Key Exchange Algorithm
4. Implementing DES Algorithm
5. Implementing IDEA
6. Implementing AES
7. Implementing RSA Algorithm
8. Implementing RC4, RC5
9. Implementing Blowfish

PROGRAMME : B. Sc (Information Technology)		Semester – V	
COURSE: ASP.NET with C#		(COURSE CODE – USIT502)	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	Review of .NET frameworks, Introduction to C#, Variables and expressions, flow controls, functions, debugging and error handling, OOPs with C#, Defining classes and class members.	10 Lectures
Unit-II	Assembly, Components of Assembly, Private and Shared Assembly, Garbage Collector, JIT compiler. Namespaces Collections, Delegates and Events. Introduction to ASP.NET 4: Microsoft.NET framework, ASP.NET lifecycle. CSS: Need of CSS, Introduction to CSS, Working with CSS with visual developer.	10 Lectures
Unit-III	ASP.NET server controls: Introduction, How to work with button controls, Textboxes, Labels, checkboxes and radio buttons, list controls and other web server controls, web.config and global.asax files. Programming ASP.NET web pages: Introduction, data types and variables, statements, organizing code, object oriented basics.	10 Lectures
Unit-IV	Validation Control: Introduction, basic validation controls, validation techniques, using advanced validation controls. State Management: Using view state, using session state, using application state, using cookies and URL encoding. Master Pages: Creating master pages, content pages, nesting master pages, accessing master page controls from a content page. Navigation: Introduction to use the site navigation, using site navigation controls.	10 Lectures
Unit-V	Databases: Introduction, using SQL data sources, GridView Control, DetailsView and FormView Controls, ListView and DataPager controls, Using object datasources. ASP.NET Security: Authentication, Authorization, Impersonation, ASP.NET provider model	10 Lectures
Unit-VI	LINQ: Operators, implementations, LINQ to objects,XML,ADO.NET, Query Syntax. ASP.NET Ajax: Introducing AJAX, Working of AJAX, Using ASP.NET AJAX server controls. JQuery: Introduction to JQuery, JQuery UI Library, Working of JQuery	10 Lectures

Books:

Beginning Visual C# 2010, K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner, Wrox (Wiley) 2010. **(Unit I: Chapter 1 to 10, Unit II: Chapter 11, 13)**

Murach's ASP.NET 4 Web Programming with C# 2010, 4th Edition, Anne Boehm, Joel Murach, SPD.

(Unit III: Chapter 6 Unit IV: Chapter 7,8,9,10 Unit V: Chapter 12,13,14,15,16,17,19,20 Unit VI: Chapter 21)

Beginning ASP.NET 4 in C# and VB, I. Spanjaars, Reprint 2011. **(Unit II: Chapter 2 and 3 Unit III: Chapter 5 Unit VI: Chapter 14)**

References:

ASP.NET 4.0 programming, J. Kanjilal, Tata McGraw-Hill.

Programming ASP.NET, D.Esposito, Microsoft Press (Dreamtech), Reprint 2011.
ASP.NET.

Visual C#.NET, Vijay Nicoel, TMH

Course Code : USIT5P2**Practical:**

1. Simple Programs with C#:
 - a) Write a console application that obtains four int values from the user and displays the product. Hint: you may recall that the Convert.ToDouble() command was used to convert the input from the console to a double; the equivalent command to convert from a string to an int is Convert.ToInt32().
 - b) If you have two integers stored in variables var1 and var2, what Boolean test can you perform to see if one or the other (but not both) is greater than 10?
 - c) Write an application that includes the logic from Exercise 1, obtains two numbers from the user, and displays them, but rejects any input where both numbers are greater than 10 and asks for two new numbers.
 - d) Write a console application that places double quotation marks around each word in a string
 - e) Write an application that uses two command-line arguments to place values into a string and an integer variable, respectively. Then display these values.
 - f) Write an application that receives the following information from a set of students:
Student Id:
Student Name:
Course Name:
Date of Birth:
The application should also display the information of all the students once the data is entered. Implement this using an Array of Structs.
 - g) Write programs using conditional statements and loops:
 - i. Generate Fibonacci series.
 - ii. Generate various patterns (triangles, diamond and other patterns) with numbers.
 - iii. Test for prime numbers.
 - iv. Generate prime numbers.
 - v. Reverse a number and find sum of digits of a number.
 - vi. Test for vowels.
 - vii. Use of foreach loop with arrays.
2. Object oriented programs with C#
 - b) Program using classes.
 - c) Program with different features of C#
 - i. Function Overloading
 - ii. Inheritance (all types)
 - iii. Constructor overloading
 - iv. Interfaces
 - v. Using Delegates and events
 - vi. Exception handling
3. Programs using different controls.
4. Programs using CSS.
5. Programs using ASP.NET Server controls.
6. Database programs with ASP.NET and ADO.NET
7. Programs using Language Integrated query.
8. Programs securing web pages.

9. Implement the exercise on AJAX.

10. Implement the exercise on JQuery.

PROGRAMME: B. Sc (Information technology)		Semester – V	
COURSE: SOFTWARE TESTING		COURSE CODE : USIT503	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	Fundamentals of testing: Necessity of testing , what is it, Testing principles, Fundamental test process, The psychology of testing	10 Lectures
Unit-II	Testing throughout the software life cycle: Software development models, Test levels, Test types: the targets of testing, Maintenance testing	10 Lectures
Unit-III	Static techniques: Reviews and the test process, Review process, Static analysis by tools	10 Lectures
Unit-IV	Test design techniques: Identifying test conditions and designing test cases, Categories of test design techniques, Specification-based or black-box techniques, Structure-based or white-box techniques, Experience-based techniques	10 Lectures
Unit-V	Test management: Test organization, Test plans, estimates, and strategies, Test progress monitoring and control, Configuration management, Risk and testing, Incident management	10 Lectures
Unit-VI	Tool support for testing: Types of test tool, Effective use of tools: Potential benefits and risks, Introducing a tool into an organization	10 Lectures

Books:

B1: Software Testing Foundations, 2nd Edition By Hans Schaefer, Andreas Spillner, Tilo Linz, Shroff Publishers and Distributors

(Unit I: Chapter 1,2, Unit II: Chapter 3, Unit III: Chapter 4, Unit IV: Chapter 5, Unit V: Chapter 6, Unit VI: Chapter 7)

B2: FOUNDATIONS OF SOFTWARE TESTING by Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black

(Unit I: Chapter 1, Unit II: Chapter 2, Unit III: Chapter 3, Unit IV: Chapter 4, Unit V: Chapter 5, Unit VI: Chapter 6)

References:

Software Testing by Yogesh Singh, Cambridge University Press

Software Testing Principles, Techniques and Tools, M.G. Limaye, TMH,

Software Testing A Craftman’s Approach, Second Edition, Paul C. Jorgensen, CRC Press

Introduction to Software Testing, Paul Ammann, Jeff Offutt, Cambridge University Press.

Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing, Rex Black, Wiley.

Software Testing, Second Edition, Ron Patton, SAMS

Course Code : USIT5P3

Practicals:

1. You have got the brilliant idea of setting up a company that sells testing services to software houses. Make a strategic plan for your company, taking into account the following issues:
 - What is the testing process that will be followed in the company?
 - What is the focus of the testing services?
 - What kind of people are you going to hire as staff for the company?
 - How are you going to validate that a testing project carried out in the company has been beneficial to the customer?
 - What kind of automated tools will the company use?
2. Prepare a small project and submit SRS, design, coding and test plan.
3. The program reads an arbitrary number of temperatures (as integer numbers) within the range -60°C ... +60°C and prints their mean value. Design test cases for testing the program with the black-box strategy.
4. When getting a person's weight and height as input, the program prints the person's body weight index. The weight is given in kilograms (as a real number, for instance: 82,0) and the height in meters (as a real number, for instance: 1,86). The body weight index equals weight divided by height squared: $\text{weight} / (\text{height}^2)$. Design test cases for testing the program with the black-box strategy.
5. Let us study the following program:

```
x=0; read(y);  
while (y > 100) { x=x+y; read(y); }  
if (y < 200) print(x) else print(y);
```

 - a) Construct a control-flow graph for the program.
 - b) Design test cases for reaching complete branch coverage over the program. Use as few test cases as possible.
6. Design test cases for the following program with the "simple loop" strategy:

```
x=0; read(y);  
while ((y > 100) && (x < 10)) { x=x+1; read(y); }  
print(y);
```

 - a) Construct a data-flow graph for the program with respect to variable x .
 - b) Which execution paths have to be traversed during testing, in order to reach complete *all-definitions* coverage with respect to variable x ?
 - c) Minimize the number of paths and tests.
 - d) Which execution paths have to be traversed during testing, in order to reach complete *all-uses* coverage with respect to variable x ? Minimize the number of paths and tests.
 - e) Design test cases for reaching the (minimal) complete *all-uses* coverage with respect to variable x .
7. MANUAL TESTING for the project
 - a) Walkthrough
 - b) Whitebox Testing
 - c) Blackbox Testing
 - d) Unit Testing
 - e) Integration Testing
8. Functional Testing
 - a) Boundary value Testing
 - b) Equivalence class testing
 - c) Decision Table based testing
 - d) Cause-effect graphs
9. Regression Testing using automated testing for website.
10. AUTOMATED TESTING for websites

- a) Load Testing
b) Performance Testing

PROGRAMME: B. Sc (Information technology)		Semester – V	
COURSE: ADVANCED JAVA		COURSE CODE : USIT504	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	<p>Event Handling: The delegation event model, Events, Event classes, Event Listener Interfaces, Using the Delegation event model, Adapter classes, inner classes</p> <p>AWT : Windows fundamentals, Working with frame windows, Control fundamentals, - Labels, Buttons, CheckBox, Radio button TextField, Understanding Layout Manager</p>	10 Lectures
Unit-II	<p>Swing: JColorChooser, JComboBox, JFileChooser, JInternalFrame, JLabel, JMenuBar, JOptionPane, JLayeredPane, JDesktopPane, JPanel, JPopupMenu, JProgressBar, JRootPane, JScrollBar, JScrollPane, JSeparator, JSlider, JSplitPane, JTabbedPane, JTable, JTableHeader, JToolBar, JToolTip, JTree, JViewPort, JEditorPane, JTextPane, JTextArea, JTextField, JPasswordField, JButton, JMenuItem, JCheckBox-MenuItem, JRadioButton-MenuItem JCheckBox, JRadioButton, JMenu.</p>	10 Lectures
Unit-III	<p>Introduction to servlets: Need for dynamic content, java servlet technology, why servlets?</p> <p>Servlet API and Lifecycle: servlet API, servletConfig interface, ServletRequest and ServletResponse Interfaces, GenericServlet Class. ServletInputStream And ServletOutputStream Classes, RequestDispatcher Interface,HttpServlet Class, HttpServletRequest and HttpServletResponse Interfaces, HttpSession Interface, Servlet Lifecycle.</p> <p>Working with servlets: organization of a web application, creating a web application(using netbeans) , creating a servlet, compiling and building the web application</p>	10 Lectures
Unit-IV	<p>JDBC: Design of JDBC, JDBC configuration, Executing SQL statement, Query Execution, Scrollable and updatable result sets, row sets, metadata, Transaction.</p> <p>JSP: Introduction, disadvantages, JSP v/s Servlets, Lifecycle of JSP, Comments, JSP documents, JSP elements, Action elements, implicit objects, scope, characterquoting conventions, unified expression language.</p>	10 Lectures
Unit-V	<p>Java server Faces :</p> <p>Need of MVC , what is JSF?, components of JSF, JSF as an application, JSF lifecycle, JSF configuration, JSF web applications (login form, JSF pages)</p> <p>EJB: Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans , packaging beans, creating web applications, creating enterprise bean, creating web client, creating JSP file, building and running web application.</p>	10 Lectures
Unit-VI	<p>HIBERNATE: Introduction, Writing the application, application development approach, creating database and tables in MySQL, creating a web application, Adding the required library files, creating a java bean class, creating hibernate configuration and mapping file, adding a mapping resource, creating JSPs.</p> <p>STRUTS: Introduction, Struts framework core components, installing and setting up struts, getting started with struts.</p>	10 Lectures

Books:

B1 Java Complete Reference, Herbert Schildt, Seventh Edition, Tata McGraw Hill.
(Unit I Chapter 20,21,22)

B2 Core Java Vol. II – Advanced Features, Cay S. Horstmanns, Gary Coronell, Eight Edition,
Pearson Education (Unit II: Chapter 6, Unit IV: Chapter 4 and Oracle Java Documentation on
UISwing)

B3 Java EE 6 for Beginners, Sharanam Shah, Vaishali Shah, Shroff Publishers and Distributors
(Unit III: Chapter 5,6,7, Unit IV: Chapter 13,14,15,16, Unit V: Chapter 18, 1,9,24,25, Unit V:
Chapter 33,34,35,36,37,38)

References:

Java EE Project using EJB 3, JPA and struts 2 for beginners, Shah, SPD

Java Programming A practical Approach, C Xavier, McGraw Hill

Java Server Faces A practical Approach for beginners, B M Harwani, Eastern Economy
Edition (PHI).

Advanced Java Technology, Savaliya, Dreamtech.

Course Code : USIT5P4

Practicals:

1. Write a java program to present a set of choices for a user to select Stationary products and display the price of Product after Selection from the list.
2. Write a java program to demonstrate typical Editable Table, describing employee details for a software company.
3. Write a java program using Split pane to demonstrate a screen divided in two parts, one part contains the names of Planets and another Displays the image of planet.
When user selects the planet name form Left screen, appropriate image of planet displayed in right screen.
4. Develop Simple Servlet Question Answer Application to demonstrate use of HttpServletRequest and HttpServletResponse interfaces.
5. Develop Servlet Application of Basic Calculator (+,-,*,/, %) using ServletInputStream and ServletOutputStream.
6. Develop a JSP Application to accept Registration Details form user and Store it into the database table.
7. Develop a JSP Application to Authenticate User Login as per the registration details.
If login success the forward user to Index Page otherwise show login failure Message.
8. Develop a web application to add items in the inventory using JSF.
9. Develop a Room Reservation System Application Using Enterprise Java Beans.
10. Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
11. Develop a simple Struts Application to Demonstrate 3 page Website of Teaching Classes which passes values from every page to another.
12. Develop a simple Struts Application to Demonstrate E-mail Validator.

PROGRAMME : B. Sc (Information Technology)		Semester – V	
COURSE: LINUX ADMINISTRATION		(COURSE CODE – USIT505)	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	<p>Introduction: Introduction to UNIX, Linux, GNU and Linux distributions Duties of the System Administrator, The Linux System Administrator, Installing and Configuring Servers, Installing and Configuring Application Software, Creating and Maintaining User Accounts, Backing Up and Restoring Files, Monitoring and Tuning Performance, Configuring a Secure System, Using Tools to Monitor Security Booting and shutting down: Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services. The File System: Understanding the File System Structure, Working with Linux-Supported File Systems, Memory and Virtual File Systems, Linux Disk Management, Network Configuration Files</p>	10 Lectures
Unit-II	<p>System Configuration Files: System wide Shell Configuration Scripts, System Environmental Settings, Network Configuration Files, Managing the init Scripts, Configuration Tool, Editing Your Network Configuration TCP/IP Networking: Understanding Network Classes, Setting Up a Network Interface Card (NIC), Understanding Subnetting, Working with Gateways and Routers, Configuring Dynamic Host Configuration Protocol, Configuring the Network Using the Network The Network File System: NFS Overview, Planning an NFS Installation, Configuring an NFS Server, Configuring an NFS Client, Using Automount Services, Examining NFS Security</p>	10 Lectures
Unit-III	<p>Connecting to Microsoft Networks: Installing Samba, Configuring the Samba Server, Creating Samba Users 3, Starting the Samba Server, Connecting to a Samba Client, Connecting from a Windows PC to the Samba Server Additional Network Services: Configuring a Time Server, Providing a Caching Proxy Server</p>	10 Lectures
Unit-IV	<p>Internet Services: Secure Services, SSH, scp, sftp Less Secure Services (Telnet ,FTP, sync,rsh ,rlogin,finger,talk and ntalk, Linux Machine as a Server, Configuring the xinetd Server, Comparing xinetd and Standalone, Configuring Linux Firewall Packages, Domain Name System: Understanding DNS, Understanding Types of Domain Servers, Examining Server Configuration Files, Configuring a Caching DNS Server, Configuring a Secondary Master DNS Server, Configuring a Primary Master Server, Checking Configuration</p>	10 Lectures
Unit-V	<p>Configuring Mail Services: Tracing the Email Delivery Process, Mail User Agent (MUA), Introducing SMTP, Configuring Sendmail, Using the Postfix Mail Server, Serving Email with POP3 and IMAP, Maintaining Email Security Configuring FTP Services: Introducing vsftpd, Configuring vsftpd, Advanced FTP Server Configuration, Using SFTP</p>	10 Lectures
Unit-VI	<p>Configuring a Web Server: Introducing Apache, Configuring Apache, Implementing SSI, Enabling CGI, Enabling PHP, Creating a Secure Server with SSL System Administration: Administering Users and Groups Installing and Upgrading Software Packages</p>	10 Lectures

Books:

B1: Red hat Linux Networking and System Administration, 3rd Edition by Terry Collings and Kurt Wall, Wiley Publishing

(Unit I: Chapter 1,6,7,8, Unit II: Chapter 8,11,12, Unit III: Chapter 14, 17, Unit IV: Chapter 19, 20, Unit V: Chapter 21, 22, Unit VI: Chapter 23,29,30

References:

UNIX: Concepts and techniques, S. Das, Tata McGraw-Hill,

Linux Administration: A Beginner's Guide, Fifth Edition, Wale Soyinka,
Tata McGraw-Hill

Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

Beginning Linux by Neil Mathew 4th Edition

Course Code : USIT5P5

Practicals:

1. Installation of Red HAT/Fedora Linux operating system.
 - a. Partitioning drives
 - b. Configuring boot loader (GRUB/LILO)
 - c. Network configuration
 - d. Setting time zones
 - e. Creating password and user accounts
 - f. Shutting down
2. Software selection and installation
3. Linux system administration
 - a. Becoming super user
 - b. Temporarily changing user identity with su command
 - c. Using graphical administrative tools
 - d. Administrative commands
 - e. Administrative configuration files
4. Connecting to the internet and configuring samba
 - a. Setting up linux as a proxy server
 - b. Configuring mozilla or firefox to use as a proxy
 - c. Setting Up Samba Server
5. Setting up local area network
 - a. LAN topologies
 - b. LAN equipment
 - c. Networking with TCP/IP
 - d. Configuring TCP/IP
 - e. Adding windows computer's to user LAN
 - f. IP address classes
6. Server setup and configuration
 - a. Setting up NFS file server
 - b. The Apache web server
 - c. Setting up FTP server
7. Understanding COMPUTER SECURITY: Firewall and security configurations
 - a. LINUX security checklist
 - b. Securing linux with IP table firewalls
 - c. Configuring an IP table firewall
 - d. Securing Linux features
8. Using gcc compiler (Programming using C++).
9. Using javac compiler (Implementing Socket programs).
10. Setting up hardware devices including sound card and printers and others (USB devices etc).
11. Working with X-windows
 - a. Switching between text and graphical consoles
 - b. set up my video card, monitor and mouse for the X-server.
 - c. Install KDE, change default desktop to KDE (or Gnome)
 - d. Accessing X-window remotely.
 - e. Installing TrueType fonts from my MS Windows partition.
 - f. Display and Control a Remote Desktop using VNC.
12. Configuring Mail Server.

Semester VI

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: INTERNET TECHNOLOGY		COURSE CODE – USIT601	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	Introduction: OSI Model, TCP/IP Protocol Suite, IPV 4 Addresses and Protocol and IPV6 Addresses and Protocol	10 Lectures
Unit-II	Address Resolution Protocol (ARP), Internet Control Message Protocol Version 4 (ICMPv4), Mobile IP, Unicast Routing Protocols (RIP, OSPF and BGP)	10 Lectures
Unit-III	User Datagram Protocol (UDP), Transmission Control Protocol (TCP)	10 Lectures
Unit-IV	Stream Control Transmission Protocol (SCTP), Host Configuration: DHCP, Domain Name System (DNS)	10 Lectures
Unit-V	Remote Login: TELNET and SSH, File Transfer: FTP and TFTP ; World Wide Web and HTTP,	10 Lectures
Unit-VI	Electronic Mail: SMTP, POP, IMAP and MIME, Multimedia	10 Lectures

Books:

B1: TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGrawHill

(Unit I: Chapter 2, 5, 7, 26, 27, Unit II: Chapter 8, 9, 10, 11, Unit III: Chapter 14,15, Unit IV: Chapter 16, 18, 19, Unit V: Chapter 20, 21, 22, Unit VI: Chapter 23, 25)

References:

Internetworking with TCP/IP, Volume I, Fifth Edition, Douglas E. Comer, PHI.

Internetworking with TCP/IP, Volume II, Third Edition, Douglas E. Comer, D.L. Stevens, PHI

TCP/IP Illustrated, Eastern Economy Edition, N.P. Gopalan, B.Siva Selvan, PHI

Course Code : USIT6P1

Practicals:

1. IPv4 Addressing and Subnetting
 - a. Given an IP address and network mask, determine other information about the IP address such as:
 - Network address
 - Network broadcast address
 - Total number of host bits
 - Number of hosts
 - b. Given an IP address, network mask, and subnetwork mask, determine other information about the IP address such as:
 - The subnet address of this subnet
 - The broadcast address of this subnet
 - The range of host addresses for this subnet
 - The maximum number of subnets for this subnet mask
 - The number of hosts for each subnet
 - The number of subnet bits
 - The number of this subnet
2. Use of ping and tracert / traceroute and arp utilities.
3. Configure IP static routing.
4. Configure IP routing using RIP.
5. Configuring OSPF.
6. Configuring UDP and TCP
7. Run different STCP commands.
8. Configure DHCP and DNS.
9. Configure FTP and HTTP. Run Telnet and SSH.
10. Configure SMTP, POP3, IMAP and MIME.

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: DIGITAL SIGNALS AND SYSTEMS		COURSE CODE – USIT602	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	<p>Classification of Signals & systems: Introduction, Continuous Time and discrete time signals, classification of signals, simple manipulations of discrete time signals, amplitude and phase spectra, classification of systems, analog to digital conversion of signals</p> <p>Fourier Analysis of Periodic and Aperiodic Continuous Time Signals & Systems: Introduction, trigonometric Fourier series, Complex or exponential form of Fourier series, Parseval's identity for Fourier series, Power spectrum of a periodic function. Fourier transform and its properties, Fourier transforms of some important signals, Fourier transforms of power and energy signals</p>	10 Lectures
Unit-II	<p>Applications of Laplace Transform to System Analysis Introduction, definition, region of convergence (ROC) LT of some important functions, Initial and final value theorems, convolution integral, Table of Laplace transforms, partial fraction expansions, network transfer function. S-plane Poles and zeros. LT of periodic functions. Application of LT in analysing networks.</p>	10 Lectures
Unit-III	<p>Z Transform: Introduction, definition of z-transform, properties of z-transform, evaluation of inverse z-transform.</p>	10 Lectures
Unit-IV	<p>Linear Time Invariant Systems: Introduction, properties of DSP system, Discrete convolution, solution of linear constant coefficient difference equation. Frequency domain representation of discrete time signals and systems. Difference equation and its relationship with system function, impulse response and frequency response</p>	10 Lectures
Unit-V	<p>Discrete and Fast Fourier Transforms: Introduction, discrete Fourier series, Discrete time Fourier transform (DTFT), Fast Fourier transform (FFT), Computing an inverse DFT by doing direct DFT, Composite radix FFT, Fast (Sectioned) convolution, Correlation.</p>	10 Lectures
Unit-VI	<p>Finite Impulse Response (FIR) Filters Introduction, magnitude response and phase response of digital filters, frequency response of linear phase FIR filters, Design techniques of FIR filters, design of optimal linear phase FIR filters.</p> <p>Infinite Impulse Response (IIR) Filters: Introduction, IIR filter design by approximation of derivatives, IIR filter design by impulse invariant method, IIR filter design by the bilinear transformation, Butterworth filters, Chebyshev filters, Elliptic filters, frequency transformation.</p>	10 Lectures

Books:

B1: Digital Signal Processing by S. Salivahanan, C. Gnanapriya Second Edition, TataMcGrawHill

(Unit I: Chapter 1,2, Unit II: Chapter 3, Unit III: Chapter 4, Unit IV: Chapter 5, Unit V: Chapter 6, Unit VI: Chapter 7, 8)

References:

Digital Signal Processing by Sanjit K. Mitra, Third Edition, Tata McGrawHill

Signals and Systems by Alan V. Oppenheim and Alan S. Willsky with S. Hamid Nawab, Second Edition, PHI (EEE)

Signals and Systems by A. Anand Kumar, EEE, PHI.

Course Code : USIT6P2

Practicals:

1. Write a Scilab program to study and implement Discrete Time Signals and systems.
 - a. Unit Step Sequence
 - b. Unit Ramp Sequence
 - c. Exponential Sequence
 - d. Exponential Increasing Sequence
 - e. Exponential Decreasing Sequence
 - f. Even Signals
 - g. Odd Signals
2. Write a Scilab program to implement Z-Transforms.
 - a. Z-transform of Finite duration signals
 - b. Time shifting property of Z transform
3. Write a Scilab program to demonstrate convolution property.
4. Write a Scilab program to demonstrate correlation property.
5. Write a Scilab program to implement Frequency Response of First order Difference Equation.
6. Write Scilab program to
 - a. Determine N-Point DFT.
 - b. Find DFT and IDFT of the given sequence.
7. Write a Scilab program to implement circular convolution using DFT
8. Write Scilab program to perform linear filtering (linear convolution using DFT).
9. Write Scilab program to implement/Design of FIR Filter using Frequency Sampling Technique.
10. Write Scilab program to implement low pass, high pass and band pass filters.

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: DATA WAREHOUSING		COURSE CODE – USIT603	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	<p>Introduction to Data Warehousing: Introduction, Necessity, Framework of the datawarehouse, options, developing datawarehouses, end points.</p> <p>Data Warehousing Design Consideration and Dimensional Modeling: Defining Dimensional Model, Granularity of Facts, Additivity of Facts, Functional dependency of the Data, Helper Tables, Implementation many-to-many relationships between fact and dimensional modelling.</p>	10 Lectures
Unit-II	<p>An Introduction to Oracle Warehouse Builder: Installation of the database and OWB, About hardware and operating systems, Installing Oracle database software, Configuring the listener, Creating the database, Installing the OWB standalone software, OWB components and architecture, Configuring the repository and workspaces.</p> <p>Defining and Importing Source Data Structures: An overview of Warehouse Builder Design Center, Importing/defining source metadata, Creating a project, Creating a module, Creating an Oracle Database module, Creating a SQL Server database module, Importing source metadata from a database, Defining source metadata manually with the Data Object Editor, Importing source metadata from files.</p>	10 Lectures
Unit-III	<p>Designing the Target Structure: Data warehouse design, Dimensional design, Cube and dimensions, Implementation of a dimensional model in a database, Relational implementation (star schema), Multidimensional implementation (OLAP), Designing the ACME data warehouse, Identifying the dimensions, Designing the cube, Data warehouse design in OWB, Creating a target user and module, Create a target user, Create a target module, OWB design objects.</p> <p>Creating the Target Structure in OWB: Creating dimensions in OWB, The Time dimension, Creating a Time dimension with the Time Dimension Wizard, The Product dimension, Product Attributes (attribute type), Product Levels, Product Hierarchy (highest to lowest), Creating the Product dimension with the New Dimension Wizard, The Store dimension, Store Attributes (attribute type), data type and size, and (Identifier), Store Levels, Store Hierarchy (highest to lowest), Creating the Store dimension with the New Dimension Wizard, Creating a cube in OWB, Creating a cube with the wizard, Using the Data Object Editor</p>	10 Lectures
Unit-IV	<p>Extract, Transform, and Load Basics: ETL, Manual ETL processes, Staging, To stage or not to stage, Configuration of a staging area, Mappings and operators in OWB, The canvas layout, OWB operators, Source and target operators, Data flow operators, Pre/post-processing operators.</p> <p>Designing and building an ETL mapping: Designing our staging area, Designing the staging area contents, Building the staging area table with the</p>	10 Lectures

	Data Object Editor, Designing our mapping, Review of the Mapping Editor, Creating a mapping.	
Unit-V	<p>ETL: Transformations and Other Operators: STORE mapping, Adding source and target operators, Adding Transformation Operators, Using a Key Lookup operator, Creating an external table, Creating and loading a lookup table, Retrieving the key to use for a Lookup Operator, Adding a Key Lookup operator, PRODUCT mapping, SALES cube mapping, Dimension attributes in the cube, Measures and other attributes in the cube, Mapping values to cube attributes, Mapping measures' values to a cube, Mapping PRODUCT and STORE dimension values to the cube, Mapping DATE_DIM values to the cube, Features and benefits of OWB.</p> <p>Validating, Generating, Deploying, and Executing Objects: Validating, Validating in the Design Center, Validating from the editors, Validating in the Data Object Editor, Validating in the Mapping, Editor, Generating, Generating in the Design Center, Generating from the editors, Generating in the Data Object Editor, Generating in the Mapping Editor, Deploying, The Control Center Service, Deploying in the Design Center and Data Object Editor, The Control Center Manager, The Control Center Manager window overview, Deploying in the Control Center ,Manager, Executing, Deploying and executing remaining objects, Deployment Order, Execution order.</p>	10 Lectures
Unit-VI	<p>Extra Features: Additional editing features, Metadata change management, Recycle Bin, Cut, copy, and paste, Snapshots, Metadata Loader (MDL) exports and imports, Synchronizing objects, Changes to tables, Changes to dimensional objects and auto-binding, Warehouse Builder online resources.</p> <p>Datawarehousing and OLAP: Defining OLAP, The Value of Multidimensional data, OLAP terminologies, Multidimensional architectures, Multidimensional views of relational data, Physical Multidimensional databases, Data Explosion, Integrated relational OLAP, Data sparsity and data explosion.</p>	10 Lectures

Books:

Data Warehousing by Soumendra Mohanty, Tata McGrawHill

(Unit I: Chapter 1, 2 Unit VI: 14).

Oracle Warehouse Builder 11g, Getting Started by Bob Griesemer, PACKT Publishing, SPD.

(Unit II: Chapter 1,3 Unit III: Chapter 3,4 Unit IV: Chapter 5,6 Unit V: Chapter 7,8 Unit VI: Chapter 9)

References:

DW2.0 The architecture for Next Generation of Datawarehousing by W.H. Inmon, Derek Strauss, Genia Neushloss, ELSEVIER.

Data Warehousing Fundamentals by Paulraj Ponnian, John Wiley.

Building the data warehouse by, W.H.Inmon, third Edition, John Wiley.

The Data Warehouse Lifecycle toolkit by Ralph Kimball, John Wiley.

Course Code : USIT6P3

Practicals:

1. Importing the source data structures in Oracle.
2. Design the target data structure using Oracle
3. Create the target structure in OWB (Oracle Web Builder)
4. Designed and build the ETL mapping
5. Perform the ETL process and transform it to data marts.
6. Create the cube and process it in OWB.
7. Generate the different types of reports in using Oracle.
8. Perform the deployment of Warehouse

9. Create the Pivot table and Pivot chart using some existing data or create the new data.

10. Import the cube in access and create Pivot table and chart.

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: IPR and CYBER LAWS		COURSE CODE – USIT604	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Case Study	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Case Study		50

Unit-I	Intellectual Property: Introduction, Protection of Intellectual Property Copyright, Related Rights, Patents, Industrial Designs, Trademark, Unfair Competition	10 Lectures
Unit-II	Information Technology Related Intellectual Property Rights Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defences, Patent Protection. Database and Data Protection-Objective, Need for Protection, UK Data Protection Act, 1998, US Safe Harbor Principle, Enforcement. Protection of Semi-conductor Chips-Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, TRIPs, SCPA. Domain Name Protection-Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, and International Perspective.	10 Lectures
Unit-III	Patents (Ownership and Enforcement of Intellectual Property) Patents-Objectives, Rights, Assignments, Defences in case of Infringement Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement Trademarks-Objectives, Rights, Protection of good will, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement	10 Lectures
Unit-IV	Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures. Practical Aspects of Licencing – Benefits, Determinative factors, important clauses, licensing clauses.	10 Lectures
Unit-V	Cyber Law: Basic Concepts of Technology and Law : Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence Law of Digital Contracts : The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography Intellectual Property Issues in Cyber Space: Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World. Rights of Netizens and E-Governance : Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws	10 Lectures
Unit-VI	Information Technology Act 2000 : Information Technology Act-2000-1 (Sec 1 to 13), Information Technology Act-2000-2 (Sec 14 to 42 and Certifying authority Rules), Information Technology Act-2000-3 (Sec 43 to 45 and Sec 65 to 78), Information Technology Act-2000-4(Sec 46 to Sec 64 and CRAT Rules), Information Technology Act-2000-5 (Sec 79 to 90), Information Technology Act-2000-6 (Sec 91-94) Amendments in 2008.	10 Lectures

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Books:

B1: http://www.dcmsme.gov.in/emerge/website_material_on_IPR.pdf (**Unit I**)

B2: Cyber Law Simplified by Vivek Sood, Tata McGrawHill (**Unit V: Chapter 7**)

B3: Guide to Cyber Laws by Rodney Ryder, Wadhwa Publications, Nagpur.

(**Unit II: Chapter 4, 5, Unit V: Chapter 1, 4**)

B4: Licensing Art & Design by Caryn R. Leland, Allworth Press (**Unit IV**)

B5: Patents, Trademarks, Copyright, Industrial Designs and Geographical Indications by Dr. B. L. Wadhwa (**Unit I, II, III, IV**)

B6: www.cyberlawtimes.com/itact2008.pdf (**Unit VI**)

Course Code : USIT6P4

Case Studies:

At least 8 case studies should be presented on various topics covering the entire syllabus.

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: PROJECT MANAGEMENT		COURSE CODE – USIT605	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Case Study	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Case Study		50

Unit-I	Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.	10 Lectures
Unit-II	The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.	10 Lectures
Unit-III	Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.	10 Lectures
Unit-IV	Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building blocks, The Project Environment.	10 Lectures
Unit-V	Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminants.	10 Lectures
Unit-VI	Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.	10 Lectures

Books:

B1: Software Project Management by Walker Royce: Pearson Education, 2005.

(Unit I: Chapter 1,2,3, Unit II: Chapter 4,5,6,7, Unit III: Chapter 8,9,10 Unit IV: Chapter 11,12, Unit V: Chapter 13,14, Unit VI: Chapter 15,16,17)

Course Code : **USIT6P5**

Case Study:

At least 8 case studies should be presented on various topics covering the entire syllabus.

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: GEOGRAPHIC INFORMATION SYSTEMS		COURSE CODE – USIT606	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Theory Internal	--	40
	Practical		50

Unit-I	Spatial Data Concepts: Introduction to GIS, Geographically referenced data, Geographic, projected and planer coordinate system, Map projections, Plane coordinate systems, Vector data model, Raster data model	10 Lectures
Unit-II	Data Input and Geometric transformation: Existing GIS data, Metadata, Conversion of existing data, Creating new data, Geometric transformation, RMS error and its interpretation, Resampling of pixel values.	10 Lectures
Unit-III	Attribute data input and data display : Attribute data in GIS, Relational model, Data entry, Manipulation of fields and attribute data, cartographic symbolization, types of maps, typography, map design, map production	10 Lectures
Unit-IV	Data exploration: Exploration, attribute data query, spatial data query, raster data query, geographic visualization	10 Lectures
Unit-V	Vector data analysis: Introduction, buffering, map overlay, Distance measurement and map manipulation. Raster data analysis: Data analysis environment, local operations, neighbourhood operations, zonal operations, Distance measure operations.	10 Lectures
Unit-VI	Spatial Interpolation: Elements, Global methods, local methods, Kriging, Comparisons of different methods	10 Lectures

Books:

B1: Introduction to Geographic Information Systems by Kang-tsung Chang, 5th Edition, Tata McGrawHill.

(Unit I: Chapter 1,2,3,4, Unit II: Chapter 5,6, Unit III: Chapter 4, Unit IV: Chapter 5, Unit V: Chapter 6, Unit VI: Chapter 7, 8)

References:

Concepts and Techniques in Geographic Information Systems by Chor Pang Lo and Albert K. W. Yeung
<http://www.ncgia.ucsb.edu/giscc/>

Course Code : USIT6P6

Practicals:

1. Implement data in import and generation coordinate system basics.
2. Generate data (points, line, polygons) and topology.
3. Geo-referencing and image registration
4. Implement 3D layers (DEM, Contours, TIN, 3D models)
5. Querying GIS data

6. Distance and decisions analysis (spatial, geo-statistics, network, hydrology, topology, 3D analysis, extract overlay)
7. 3D visualizations
8. Cartography

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: PROJECT REPORT		COURSE CODE – USIT607	
Periods per week 1 Period is 50 minutes	Lecture	5	
	Practical	3	
		Hours	Marks
Evaluation System	Project Report (External)	--	60
	Project Report (Internal)	--	40

PROGRAMME : B. Sc (Information Technology)		Semester – VI	
COURSE: PROJECT VIVA VOCE		COURSE CODE – USIT608	
Periods per week 1 Period is 50 minutes	Lecture	--	
	Practical	--	
		Hours	Marks
Evaluation System	Viva Voce (External)	--	60
	Viva Voce (Internal)	--	40

The project should be undertaken preferably individually or by the group of maximum 4 students who will jointly work and implement the project. The candidate/group will select a project with the approval of the Guide (staff member) and submit the name of the project with a synopsis of the proposed work of not more than 02 to 08 pages within one month of the starting of the semester. The candidate/ group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software, implementation of a few modules of the proposed work during the semester VI as a part of the term work submission in the form of a joint report.

Candidate/group will submit the completed project work to the department at the end of semester VI as mentioned below.

1. The workable project.
2. The project report in the bound journal complete in all respect with the following : -
 - a. Problem specifications.
 - b. System definition – requirement analysis.
 - c. System design – dataflow diagrams, database design
 - d. System implementation – algorithm, code documentation
 - e. Test results and test report.
 - f. In case of object oriented approach – appropriate process be followed.

The project report should contain a full and coherent account of your work. Although there will be an opportunity to present the work verbally, and demonstrate the software, the major part of the assessment will be based on the written material in the project report. One can expect help and feedback from the project guide, but ultimately it's the candidates own responsibility. The

suggestive structure of a project report should be guided by your guide in selecting the most appropriate format for your project.

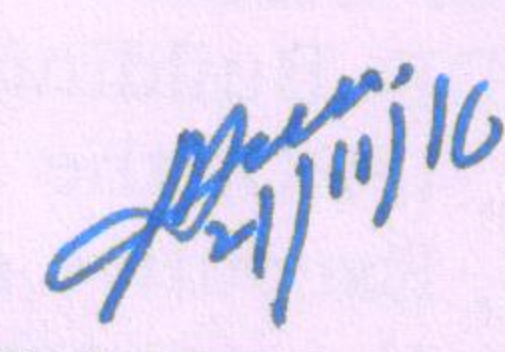
The oral examination will be conducted by an internal and external examiner as appointed by the University.

UNIVERSITY OF MUMBAI
No. UG/176 of 2016-17

CIRCULAR:-

A reference is invited to the Syllabi relating to the B.Sc. degree course, **vide** this office Circular No. UG/177 of 2011, dated 20th June, 2011 and the Principals of affiliated Colleges in Arts, Science and Commerce are hereby informed that the recommendation made by the Ad-hoc Board of Studies in Information Technology at its meeting held on 4th July, 2016 has been accepted by the Academic Council at its meeting held on 14th July, 2016 **vide** item No. 4.76 and that in accordance therewith, the revised syllabus as per the Choice Based Credit System for F.Y. B.Sc. programme in Information Technology (Sem. I & II), which is available on the University's web site (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

MUMBAI – 400 032
22 November, 2016


(Dr.M.A.Khan)
REGISTRAR

To,

The Principals of the affiliated Colleges in Arts, Science and Commerce.
A.C/4.76/14.07.2016

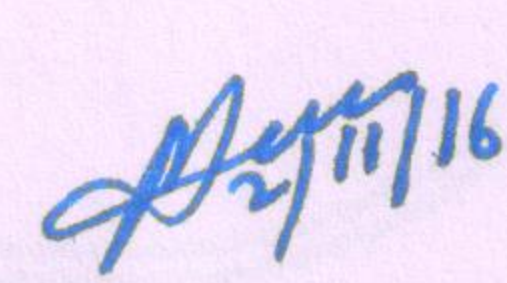
No. UG/176 -A of 2016

MUMBAI-400 032

22 November, 2016

Copy forwarded with Compliments for information to:-

- 1) The Co-ordinator, Faculty of Science,
- 2) The Chairman, Board of Studies in Information Technology,
- 3) The Professor-cum-Director, Institute of Distance & Open Learning (IDOL)
- 4) The Director, Board of College and University Development,
- 5) The Co-Ordinator, University Computerization Centre,
- 6) The Controller of Examinations.


(Dr.M.A.Khan)
REGISTRAR

PTO..

UNIVERSITY OF MUMBAI



Syllabus for F.Y.B.Sc.

Programme: B.Sc.

Course: Information Technology

with effect from the academic year

2016 – 2017

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Semester – 1			
Course Code	Course Type	Course Title	Credits
USIT101	Core Subject	Imperative Programming	2
USIT102	Core Subject	Digital Electronics	2
USIT103	Core Subject	Operating Systems	2
USIT104	Core Subject	Discrete Mathematics	2
USIT105	Ability Enhancement Skill Course	Communication Skills	2
USIT1P1	Core Subject Practical	Imperative Programming Practical	2
USIT1P2	Core Subject Practical	Digital Electronics Practical	2
USIT1P3	Core Subject Practical	Operating Systems Practical	2
USIT1P4	Core Subject Practical	Discrete Mathematics Practical	2
USIT1P5	Ability Enhancement Skill Course Practical	Communication Skills Practical	2
Total Credits			20

Semester – 2			
Course Code	Course Type	Course Title	Credits
USIT201	Core Subject	Object oriented Programming	2
USIT202	Core Subject	Microprocessor Architecture	2
USIT203	Core Subject	Web Programming	2
USIT204	Core Subject	Numerical and Statistical Methods	2
USIT205	Ability Enhancement Skill Course	Green Computing	2
USIT2P1	Core Subject Practical	Object Oriented Programming Practical	2
USIT2P2	Core Subject Practical	Microprocessor Architecture Practical	2
USIT2P3	Core Subject Practical	Web Programming Practical	2
USIT2P4	Core Subject Practical	Numerical and Statistical Methods Practical	2
USIT2P5	Ability Enhancement Skill Course Practical	Green Computing Practical	2
Total Credits			20

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Preamble

The B.Sc. Information Technology programme was started in 2001 with an aim to make the students 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.

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

And many others

The students will also be trained in communication skills and green computing.

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SEMESTER I

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B. Sc (Information Technology)		Semester – I	
Course Name: Imperative Programming		Course Code: USIT101	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction: Types of Programming languages, History, features and application. Simple program logic, program development cycle, pseudocode statements and flowchart symbols, sentinel value to end a program, programming and user environments, evolution of programming models., desirable program characteristics.</p> <p>Fundamentals: Structure of a program. Compilation and Execution of a Program, Character Set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Variable definition, symbolic constants.</p>	12
II	<p>Operators and Expressions: Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions.</p> <p>Data Input and output: Single character input and output, entering input data, scanf function, printf function, gets and puts functions, interactive programming.</p>	12
III	<p>Conditional Statements and Loops: Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement</p> <p>Functions: Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: foo11al parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value.</p>	12
IV	<p>Program structure: Storage classes, automatic variables, external variables, static variables, multifile programs, more library functions,</p> <p>Preprocessor: Features, #define and #include, Directives and Macros</p> <p>Arrays: Definition, processing, passing arrays to functions, multidimensional arrays, arrays and strings.</p>	12
V	<p>Pointers: Fundamentals, declarations, Pointers Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays And Pointers, Pointer Arrays, passing functions to other functions</p>	12

	Structures and Unions: Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers.	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Programming with C	Byron Gottfried	Tata McGRAW-Hill	2 nd	1996
2.	Programming Logic and Design	Joyce Farell	Cengage Learning	8 th	2014
3.	“C” Programming”	Brian W. Kernighan and Denis M. Ritchie.	PHI	2 nd	
4.	Let us C	Yashwant P. Kanetkar,	BPB publication		
5.	C for beginners	Madhusudan Mothe	X-Team Series	1 st	2008
6.	21 st Century C	Ben Klemens	OReilly	1 st	2012

B. Sc (Information Technology)		Semester – I	
Course Name: Imperative Programming Practical		Course Code: USIT1P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical: (Can be done in any imperative language)	
1.	Basic Programs:
a.	Write a program to display the message HELLO WORLD.
b.	Write a program to declare some variables of type int, float and double. Assign some values to these variables and display these values.
c.	Write a program to find the addition, subtraction, multiplication and division of two numbers.
2.	Programs on variables:
a.	Write a program to swap two numbers without using third variable.
b.	Write a program to find the area of rectangle, square and circle.
c.	Write a program to find the volume of a cube, sphere, and cylinder.
3.	Conditional statements and loops(basic)
a.	Write a program to enter a number from the user and display the month name. If number >13 then display invalid input using switch case.
b.	Write a program to check whether the number is even or odd.
c.	Write a program to check whether the number is positive, negative or zero.
d.	Write a program to find the factorial of a number.
e.	Write a program to check whether the entered number is prime or not.
f.	Write a program to find the largest of three numbers.
4.	Conditional statements and loops(advanced)
a.	Write a program to find the sum of squares of digits of a number.
b.	Write a program to reverse the digits of an integer.
c.	Write a program to find the sum of numbers from 1 to 100.
d.	Write a programs to print the Fibonacci series.
e.	Write a program to find the reverse of a number.
f.	Write a program to find whether a given number is palindrome or not.
g.	Write a program that solve the quadratic equation $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
h.	Write a program to check whether the entered number is Armstrong or not.
i.	Write a program to count the digit in a number
5.	Programs on patterns:
a.	Programs on different patterns.

6.	Functions:
a.	Programs on Functions.
7.	Recursive functions
a.	Write a program to find the factorial of a number using recursive function.
b.	Write a program to find the sum of natural number using recursive function.
8.	Arrays
a.	Write a program to find the largest value that is stored in the array.
b.	Write a program using pointers to compute the sum of all elements stored in an array.
c.	Write a program to arrange the 'n' numbers stored in the array in ascending and descending order.
d.	Write a program that performs addition and subtraction of matrices.
e.	Write a program that performs multiplication of matrices.
9.	Pointers
a.	Write a program to demonstrate the use of pointers.
b.	Write a program to perform addition and subtraction of two pointer variables.
10.	Structures and Unions
a.	Programs on structures.
b.	Programs on unions.

B. Sc (Information Technology)		Semester – I	
Course Name: Digital Electronics		Course Code: USIT102	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Number System: Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes – ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection and correction, Universal Product Code, Code conversion.</p> <p>Binary Arithmetic: Binary addition, Binary subtraction, Negative number representation, Subtraction using 1’s complement and 2’s complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic.</p>	12
II	<p>Boolean Algebra and Logic Gates: Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan’s Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.</p> <p>Minterm, Maxterm and Karnaugh Maps: Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method.</p>	12
III	<p>Combinational Logic Circuits: Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations</p> <p>Arithmetic Circuits: Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.</p>	12
IV	<p>Multiplexer, Demultiplexer, ALU, Encoder and Decoder: Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.</p> <p>Sequential Circuits: Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop,</p>	12

	conversion from one type of flip-flop to another, Application of flip-flops.	
V	<p>Counters: Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presetable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.</p> <p>Shift Register: Introduction, parallel and shift registers, serial shifting, serial-in serial-out, serial-in parallel-out, parallel-in parallel-out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Digital Electronics and Logic Design	N. G. Palan	Technova		
2.	Make Electronics	Charles Platt	O'Reilly	1 st	2010
3.	Modern Digital Electronics	R. P. Jain	Tata McGraw Hill	3 rd	
4.	Digital Principles and Applications	Malvino and Leach	Tata McGraw Hill		
5.	Digital Electronics: Principles, Devices and Applications,	Anil K. Maini	Wiley		2007

B. Sc (Information Technology)		Semester – I	
Course Name: Digital Electronics Practical		Course Code: USIT1P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Study of Logic gates and their ICs and universal gates:
a.	Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates
b.	IC 7400, 7402, 7404, 7408, 7432, 7486, 74266
c.	Implement AND, OR, NOT, XOR, XNOR using NAND gates.
d.	Implement AND, OR, NOT, XOR, XNOR using NOR gates.
2.	Implement the given Boolean expressions using minimum number of gates.
a.	Verifying De Morgan's laws.
b.	Implement other given expressions using minimum number of gates.
c.	Implement other given expressions using minimum number of ICs.
3.	Implement combinational circuits.
a.	Design and implement combinational circuit based on the problem given and minimizing using K-maps.
4.	Implement code converters.
a.	Design and implement Binary – to – Gray code converter.
b.	Design and implement Gray – to – Binary code converter.
c.	Design and implement Binary – to – BCD code converter
d.	Design and implement Binary – to – XS-3 code converter
5.	Implement Adder and Subtractor Arithmetic circuits.
a.	Design and implement Half adder and Full adder.
b.	Design and implement BCD adder.
c.	Design and implement XS – 3 adder.
d.	Design and implement binary subtractor.
e.	Design and implement BCD subtractor.
f.	Design and implement XS – 3 subtractor.
6.	Implement Arithmetic circuits.
a.	Design and implement a 2-bit by 2-bit multiplier.
b.	Design and implement a 2-bit comparator.
7.	Implement Encode and Decoder and Multiplexer and Demultiplexers.
a.	Design and implement 8:3 encoder.
b.	Design and implement 3:8 decoder.
c.	Design and implement 4:1 multiplexer. Study of IC 74153, 74157
d.	Design and implement 1:4 demultiplexer. Study of IC 74139
e.	Implement the given expression using IC 74151 8:1 multiplexer.
f.	Implement the given expression using IC 74138 3:8 decoder.

8.	Study of flip-flops and counters.
a.	Study of IC 7473.
b.	Study of IC 7474.
c.	Study of IC 7476.
d.	Conversion of Flip-flops.
e.	Design of 3-bit synchronous counter using 7473 and required gates.
f.	Design of 3-bit ripple counter using IC 7473.
9.	Study of counter ICs and designing Mod-N counters.
a.	Study of IC 7490, 7492, 7493 and designing mod-n counters using these.
b.	Designing mod-n counters using IC 7473 and 7400 (NAND gates)
10.	Design of shift registers and shift register counters.
a.	Design serial – in serial – out, serial – in parallel – out, parallel – in serial – out, parallel – in parallel – out and bidirectional shift registers using IC 7474.
b.	Study of ID 7495.
c.	Implementation of digits using seven segment displays.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Digital Electronics and Logic Design	N. G. Palan	Technova		
2.	Digital Principles and Applications	Malvino and Leach	Tata McGraw Hill		

B. Sc (Information Technology)		Semester – I	
Course Name: Operating Systems		Course Code: USIT103	
Periods per week 1 Period is 50 minutes		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction: What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.</p> <p>Processes and Threads: Processes, threads, interprocess communication, scheduling, IPC problems.</p>	12
II	<p>Memory Management: No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation.</p> <p>File Systems: Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system.</p>	12
III	<p>Input-Output: Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management,</p> <p>Deadlocks: Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues.</p>	12
IV	<p>Virtualization and Cloud: History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds.</p> <p>Multiple Processor Systems Multiprocessors, multicomputers, distributed systems.</p>	12
V	<p>Case Study on LINUX and ANDROID: History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, I/O in Linux, Linux file system, security in Linux. Android</p> <p>Case Study on Windows: History of windows through Windows 10, programming windows, system structure, processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Modern Operating Systems	Andrew S. Tanenbaum, Herbert Bos	Pearson	4 th	2014
2.	Operating Systems – Internals and Design Principles	Willaim Stallings	Pearson	8 th	2009
3.	Operating System Concepts	Abraham Silberschatz, Peter B. Galvineg Gagne	Wiley	8 th	
4.	Operating Systems	Godbole and Kahate	McGraw Hill	3 rd	

B. Sc (Information Technology)		Semester – II	
Course Name: Operating Systems Practical		Course Code: USIT1P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Installation of virtual machine software.
2.	Installation of Linux operating system (RedHat / Ubuntu) on virtual machine.
3.	Installation of Windows operating system on virtual machine.
4.	Linux commands: Working with Directories:
a.	pwd, cd, absolute and relative paths, ls, mkdir, rmdir,
b.	file, touch, rm, cp, mv, rename, head, tail, cat, tac, more, less, strings, chmod
5.	Linux commands: Working with files:
a.	ps, top, kill, pkill, bg, fg,
b.	grep, locate, find, locate.
c.	date, cal, uptime, w, whoami, finger, uname, man, df, du, free, whereis, which.
d.	Compression: tar, gzip.
6.	Windows (DOS) Commands – 1
a.	Date, time, prompt, md, cd, rd, path.
b.	Chkdsk, copy, xcopy, format, fidsk, cls, defrag, del, move.
7.	Windows (DOS) Commands – 2
a.	Diskcomp, diskcopy, diskpart, doskey, echo
b.	Edit, fc, find, rename, set, type, ver
8.	Working with Windows Desktop and utilities
a.	Notepad
b.	Wordpad
c.	Paint
d.	Taskbar
e.	Adjusting display resolution
f.	Using the browsers
g.	Configuring simple networking
h.	Creating users and shares
9.	Working with Linux Desktop and utilities
a.	The vi editor.
b.	Graphics
c.	Terminal

d.	Adjusting display resolution
e.	Using the browsers
f.	Configuring simple networking
g.	Creating users and shares
10.	Installing utility software on Linux and Windows

B. Sc. (Information Technology)		Semester – I	
Course Name: Discrete Mathematics		Course Code: USIT104	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction: Variables, The Language of Sets, The Language of Relations and Function</p> <p>Set Theory: Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell’s Paradox and the Halting Problem.</p> <p>The Logic of Compound Statements: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments</p>	12
II	<p>Quantified Statements: Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements</p> <p>Elementary Number Theory and Methods of Proof: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms.</p>	12
III	<p>Sequences, Mathematical Induction, and Recursion: Sequences, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by iteration, Second order linear homogenous recurrence relations with constant coefficients. general recursive definitions and structural induction.</p> <p>Functions: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions, Cardinality with Applications to Computability</p>	12
IV	<p>Relations: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations</p> <p>Graphs and Trees: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism’s of Graphs, Trees, Rooted Trees, Isomorphism’s of Graphs, Spanning trees and shortest paths.</p>	12
V	<p>Counting and Probability: Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule, Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r-Combinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes’ Formula, and Independent Events.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Discrete Mathematics with Applications	Sussana S. Epp	Cengage Learning	4 th	2010
2.	Discrete Mathematics, Schaum's Outlines Series	Seymour Lipschutz, Marc Lipson	Tata MCGraw Hill		2007
3.	Discrete Mathematics and its Applications	Kenneth H. Rosen	Tata MCGraw Hill		
4.	Discrete mathematical structures	B Kolman RC Busby, S Ross	PHI		
5.	Discrete structures	Liu	Tata MCGraw Hill		

B. Sc. (Information Technology)		Semester – I	
Course Name: Discrete Mathematics Practical		Course Code: USIT1P4	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical: Write the programs for the following using SCILAB	
1.	Set Theory
a.	Inclusion Exclusion principle.
b.	Power Sets
c.	Mathematical Induction
2.	Functions and Algorithms
a.	Recursively defined functions
b.	Cardinality
c.	Polynomial evaluation
d.	Greatest Common Divisor
3.	Counting
a.	Sum rule principle
b.	Product rule principle
c.	Factorial
d.	Binomial coefficients
e.	Permutations
f.	Permutations with repetitions
g.	Combinations
h.	Combinations with repetitions
i.	Ordered partitions
j.	Unordered partitions
4.	Probability Theory
a.	Sample space and events
b.	Finite probability spaces
c.	Equiprobable spaces
d.	Addition Principle
e.	Conditional Probability
f.	Multiplication theorem for conditional probability
g.	Independent events
h.	Repeated trials with two outcomes
5.	Graph Theory
a.	Paths and connectivity
b.	Minimum spanning tree
c.	Isomorphism

6.	Directed Graphs
a.	Adjacency matrix
b.	Path matrix
7.	Properties of integers
a.	Division algorithm
b.	Primes
c.	Euclidean algorithm
d.	Fundamental theorem of arithmetic
e.	Congruence relation
f.	Linear congruence equation
8.	Algebraic Systems
a.	Properties of operations
b.	Roots of polynomials
9.	Boolean Algebra
a.	Basic definitions in Boolean Algebra
b.	Boolean algebra as lattices
10.	Recurrence relations
a.	Linear homogeneous recurrence relations with constant coefficients
b.	Solving linear homogeneous recurrence relations with constant coefficients
c.	Solving general homogeneous linear recurrence relations

B. Sc (Information Technology)		Semester – I	
Course Name: Communication Skills		Course Code: USIT105	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>The Seven Cs of Effective Communication: Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness</p> <p>Understanding Business Communication: Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication</p>	12
II	<p>Writing Business Messages and Documents: Business writing, Business Correspondence, Instructions Business Reports and Proposals, Career building and Resume writing.</p> <p>Developing Oral Communication Skills for Business: Effective Listening, Business Presentations and Public Speaking, Conversations, Interviews</p>	12
III	<p>Developing Oral Communication Skills for Business: Meetings and Conferences, Group Discussions and Team Presentations, Team Briefing,</p> <p>Understanding Specific Communication Needs: Communication across Functional Areas</p>	12
IV	<p>Understanding Specific Communication Needs: Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids</p>	12
V	<p>Presentation Process: Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates. Adding graphics to your presentation: Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Communication	Edited by Meenakshi Raman and Prakash Singh	Oxford University Press	Second	
2.	Professional Communication	Aruna Koneru	Tata McGraw Hill		

3.	Strategies for improving your business communication	Prof. M. S. Rao	Shroff publishers and distributors		2016
4.	Business Communication	Dr. Rishipal and Dr. Jyoti Sheoran	SPD		2014
5.	Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials	Ruth C. Clark, Chopeta Lyons,	Pfeiffer, Wiley		2011
6.	Basic Business Communication: Skills for Empowering the Internet Generation	Lesikar Raymond V and Marie E. Flatley.	Tata McGraw-Hill	10 th	2005
7.	Nonverbal Communication: Notes on the Visual Perception of Human Relations	Ruesh, Jurgen and Weldon Kees	University of California Press		1966
8.	Business Communication Today	Bovee, Courtland L.; Thill, John V.	Pearson Education Ltd.		2015
9.	Communication Skills	Dr. Nageshwar Rao Dr. Rajendra P. Das	Himalaya Publishing House		

B. Sc (Information Technology)		Semester – I	
Course Name: Communication Skills Practical		Course Code: USIT1P5	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical Questions:	
1.	Communication Origami, Guessing Game, Guessing the emotion
2.	Body Language, Follow All Instructions, Effective Feedback Skills
3.	The Name Game, Square Talk (Effective Communication), Room 101 (Influential and persuasive skills)
4.	Back to Back Communication, Paper Shapes (Importance of two-way communication), Memory Test(Presentation Skills)
5.	Exercises on Communication Principles
6.	Exercises on communication icebreakers
7.	Communication exercises
	For the following practicals, Microsoft Office, Open Office, Libre Office or any other software suite can be used.
8.	Use of word processing tools for communication
9.	Use of spreadsheet tools for communication
10.	Use of presentation tools for communication

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SEMESTER II

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B. Sc. (Information Technology)		Semester – II	
Course Name: Object Oriented Programming		Course Code: USIT201	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	Object Oriented Methodology: Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS. Principles of OOPS: OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing	12
II	Classes and Objects: Simple classes (Class specification, class members accessing), Defining member functions, passing object as an argument, Returning object from functions, friend classes, Pointer to object, Array of pointer to object. Constructors and Destructors: Introduction, Default Constructor, Parameterized Constructor and examples, Destructors	12
III	Polymorphism: Concept of function overloading, overloaded operators, overloading unary and binary operators, overloading comparison operator, overloading arithmetic assignment operator, Data Conversion between objects and basic types, Virtual Functions: Introduction and need, Pure Virtual Functions, Static Functions, this Pointer, abstract classes, virtual destructors.	12
IV	Program development using Inheritance: Introduction, understanding inheritance, Advantages provided by inheritance, choosing the access specifier, Derived class declaration, derived class constructors, class hierarchies, multiple inheritance, multilevel inheritance, containership, hybrid inheritance. Exception Handling: Introduction, Exception Handling Mechanism, Concept of throw & catch with example	12
V	Templates: Introduction, Function Template and examples, Class Template and examples. Working with Files: Introduction, File Operations, Various File Modes, File Pointer and their Manipulation	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Object Oriented Analysis and Design	Timothy Budd	TMH	3 rd	2012
2.	Mastering C++	K R Venugopal, Rajkumar Buyya, T Ravishankar	Tata McGraw Hill	2 nd Edition	2011

3.	C++ for beginners	B. M. Hirwani	SPD		2013
4.	Effective Modern C++	Scott Meyers	SPD		
5.	Object Oriented Programming with C++	E. Balagurusamy	Tata McGraw Hill	4 th	
6.	Learning Python	Mark Lutz	O' Reilly	5 th	2013
7.	Mastering Object Oriented Python	Steven F. Lott	Pact Publishing		2014

B. Sc. (Information Technology)		Semester – II	
Course Name: Object Oriented Programming Practical		Course Code: USIT2P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical: To be implemented using object oriented language	
1.	Classes and methods
a.	Design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used respectively. Where getInfo() will be private method
b.	Design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively. Where getData() will be private method.
c.	Design the class Demo which will contain the following methods: readNo(), factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, isPalindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is armStrong or not. Where readNo() will be private method.
d.	Write a program to demonstrate function definition outside class and accessing class members in function definition.
2.	Using friend functions.
a.	Write a friend function for adding the two complex numbers, using a single class
b.	Write a friend function for adding the two different distances and display its sum, using two classes.
c.	Write a friend function for adding the two matrix from two different classes and display its sum.
3.	Constructors and method overloading.
a.	Design a class Complex for adding the two complex numbers and also show the use of constructor.
b.	Design a class Geometry containing the methods area() and volume() and also overload the area() function .
c.	Design a class StaticDemo to show the implementation of static variable and static function.
4.	Operator Overloading
a.	Overload the operator unary(-) for demonstrating operator overloading.
b.	Overload the operator + for adding the timings of two clocks, And also pass objects as an argument.
c.	Overload the + for concatenating the two strings. For e.g “Py” + “thon” = Python
5.	Inheritance
a.	Design a class for single level inheritance using public and private type derivation.
b.	Design a class for multiple inheritance.
c.	Implement the hierarchical inheritance.

6.	Virtual functions and abstract classes
a.	Implement the concept of method overriding.
b.	Show the use of virtual function
c.	Show the implementation of abstract class.
7.	String handling
a.	String operations for string length , string concatenation
b.	String operations for string reverse, string comparison,
c.	Console formatting functions.
8.	Exception handling
a.	Show the implementation of exception handling
b.	Show the implementation for exception handling for strings
c.	Show the implementation of exception handling for using the pointers.
9.	File handling
a.	Design a class FileDemo open a file in read mode and display the total number of words and lines in the file.
b.	Design a class to handle multiple files and file operations
c.	Design a editor for appending and editing the files
10.	Templates
a.	Show the implementation for the following
b.	Show the implementation of template class library for swap function.
c.	Design the template class library for sorting ascending to descending and vice-versa

B. Sc. (Information Technology)		Semester – II	
Course Name: Microprocessor Architecture		Course Code: USIT202	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Microprocessor, microcomputers, and Assembly Language: Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications.</p> <p>Microprocessor Architecture and Microcomputer System: Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing, Microprocessor-Based System Application.</p> <p>8085 Microprocessor Architecture and Memory Interface: Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer, Memory Interfacing, Interfacing the 8155 Memory Segment, Illustrative Example: Designing Memory for the MCTS Project, Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer.</p>	12
II	<p>Interfacing of I/O Devices Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.</p> <p>Introduction to 8085 Assembly Language Programming: The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program.</p> <p>Introduction to 8085 Instructions: Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.</p>	12
III	<p>Programming Techniques With Additional Instructions: Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Instruction Related to Memory, Logic Operations: Rotate, Logics Operations: Compare, Dynamic Debugging.</p> <p>Counters and Time Delays: Counters and Time Delays, Illustrative Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.</p> <p>Stacks and Sub-Routines: Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts.</p>	12

IV	<p>Code Conversion, BCD Arithmetic, and 16-Bit Data Operations: BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-to-Seven-Segment-LED Code Conversion, Binary-to-ASCII and ASCII-to-Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction To Advanced Instructions and Applications, Multiplication, Subtraction With Carry.</p> <p>Software Development System and Assemblers: Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers.</p> <p>Interrupts: The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.</p>	12
V	<p>The Pentium and Pentium Pro microprocessors: Introduction, Special Pentium registers, Memory management, Pentium instructions, Pentium Pro microprocessor, Special Pentium Pro features.</p> <p>Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, i3, i5 and i7.</p> <p>SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Microprocessors Architecture, Programming and Applications with the 8085.	Ramesh Gaonkar	PENRAM	Fifth	2012
2.	Computer System Architecture	M. Morris Mano	PHI		1998
3.	Structured Computer Organization	Andrew C. Tanenbaum	PHI		

B. Sc. (Information Technology)		Semester – II	
Course Name: Microprocessor Architecture Practical		Course Code: USIT2P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Perform the following Operations related to memory locations.
a.	Store the data byte 32H into memory location 4000H.
b.	Exchange the contents of memory locations 2000H and 4000H
2.	Simple assembly language programs.
a.	Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.
b.	Subtract two 8-bit numbers.
c.	Add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.
d.	Add the contents of memory locations 40001H and 4001H and place the result in the memory locations 4002H and 4003H.
e.	Subtract the 16-bit number in memory locations 4002H and 4003H from the 16-bit number in memory locations 4000H and 4001H. The most significant eight bits of the two numbers are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.
f.	Find the 1's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.
g.	Find the 2's complement of the number stored at memory location 4200H and store the complemented number at memory location 4300H.
3.	Packing and unpacking operations.
a.	Pack the two unpacked BCD numbers stored in memory locations 4200H and 4201H and store result in memory location 4300H. Assume the least significant digit is stored at 4200H.
b.	Two digit BCD number is stored in memory location 4200H. Unpack the BCD number and store the two digits in memory locations 4300H and 4301H such that memory location 4300H will have lower BCD digit.
4.	Register Operations.
a.	Write a program to shift an eight bit data four bits right. Assume that data is in register C.
b.	Program to shift a 16-bit data 1 bit left. Assume data is in the HL register pair
c.	Write a set of instructions to alter the contents of flag register in 8085.
d.	Write a program to count number of 1's in the contents of D register and store the count in the B register.

5.	Multiple memory locations.
a.	Calculate the sum of series of numbers. The length of the series is in memory location 4200H and the series begins from memory location 4201H. a. Consider the sum to be 8 bit number. So, ignore carries. Store the sum at memory location 4300H. b. Consider the sum to be 16 bit number. Store the sum at memory locations 4300H and 4301H
b.	Multiply two 8-bit numbers stored in memory locations 2200H and 2201H by repetitive addition and store the result in memory locations 2300H and 2301H.
c.	Divide 16 bit number stored in memory locations 2200H and 2201H by the 8 bit number stored at memory location 2202H. Store the quotient in memory locations 2300H and 2301H and remainder in memory locations 2302H and 2303H.
d.	Find the number of negative elements (most significant bit 1) in a block of data. The length of the block is in memory location 2200H and the block itself begins in memory location 2201H. Store the number of negative elements in memory location 2300H
e.	Find the largest number in a block of data. The length of the block is in memory location 2200H and the block itself starts from memory location 2201H. Store the maximum number in memory location 2300H. Assume that the numbers in the block are all 8 bit unsigned binary numbers.
6.	Calculations with respect to memory locations.
a.	Write a program to sort given 10 numbers from memory location 2200H in the ascending order.
b.	Calculate the sum of series of even numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 8 bit number so you can ignore carries and store the sum at memory location 2300H. Sample problem:
c.	Calculate the sum of series of odd numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 16-bit. Store the sum at memory locations 2300H and 2301H.
d.	Find the square of the given numbers from memory location 6100H and store the result from memory location 7000H
e.	Search the given byte in the list of 50 numbers stored in the consecutive memory locations and store the address of memory location in the memory locations 2200H and 2201H. Assume byte is in the C register and starting address of the list is 2000H. If byte is not found store 00 at 2200H and 2201H
f.	Two decimal numbers six digits each, are stored in BCD package form. Each number occupies a sequence of byte in the memory. The starting address of first number is 6000H Write an assembly language program that adds these two numbers and stores the sum in the same format starting from memory location 6200H
g.	Add 2 arrays having ten 8-bit numbers each and generate a third array of result. It is necessary to add the first element of array 1 with the first element of array-2 and so on. The starting addresses of array 1, array2 and array3 are 2200H, 2300H and 2400H, respectively

7.	Assembly programs on memory locations.
a.	Write an assembly language program to separate even numbers from the given list of 50 numbers and store them in the another list starting from 2300H. Assume starting address of 50 number list is 2200H
b.	Write assembly language program with proper comments for the following: A block of data consisting of 256 bytes is stored in memory starting at 3000H. This block is to be shifted (relocated) in memory from 3050H onwards. Do not shift the block or part of the block anywhere else in the memory.
c.	Add even parity to a string of 7-bit ASCII characters. The length of the string is in memory location 2040H and the string itself begins in memory location 2041H. Place even parity in the most significant bit of each character.
d.	A list of 50 numbers is stored in memory, starting at 6000H. Find number of negative, zero and positive numbers from this list and store these results in memory locations 7000H, 7001H, and 7002H respectively
e.	Write an assembly language program to generate fibonacci number.
f.	Program to calculate the factorial of a number between 0 to 8.
8.	String operations in assembly programs.
a.	Write an 8085 assembly language program to insert a string of four characters from the tenth location in the given array of 50 characters
b.	Write an 8085 assembly language program to delete a string of 4 characters from the tenth location in the given array of 50 characters.
c.	Multiply the 8-bit unsigned number in memory location 2200H by the 8-bit unsigned number in memory location 2201H. Store the 8 least significant bits of the result in memory location 2300H and the 8 most significant bits in memory location 2301H.
d.	Divide the 16-bit unsigned number in memory locations 2200H and 2201H (most significant bits in 2201H) by the B-bit unsigned number in memory location 2300H store the quotient in memory location 2400H and remainder in 2401H
e.	DAA instruction is not present. Write a sub routine which will perform the same task as DAA.
9.	Calculations on memory locations.
a.	To test RAM by writing '1' and reading it back and later writing '0' (zero) and reading it back. RAM addresses to be checked are 40FFH to 40FFH. In case of any error, it is indicated by writing 01H at port 10
b.	Arrange an array of 8 bit unsigned no in descending order
c.	Transfer ten bytes of data from one memory to another memory block. Source memory block starts from memory location 2200H where as destination memory block starts from memory location 2300H
d.	Write a program to find the Square Root of an 8 bit binary number. The binary number is stored in memory location 4200H and store the square root in 4201H.
e.	Write a simple program to Split a HEX data into two nibbles and store it in memory
10.	Operations on BCD numbers.
a.	Add two 4 digit BCD numbers in HL and DE register pairs and store result in memory locations, 2300H and 2301H. Ignore carry after 16 bit.
b.	Subtract the BCD number stored in E register from the number stored in the D register
c.	Write an assembly language program to multiply 2 BCD numbers

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Microprocessors Architecture, Programming and Applications with the 8085.	Ramesh Gaonkar	PENRAM	Fifth	2012
2.	8080A/8085 Assembly Language Programming	Lance A. Leventhel	Osborne		1978

B. Sc (Information Technology)		Semester – II	
Course Name: Web Programming		Course Code: USIT203	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Internet and the World Wide Web: What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol</p> <p>HTML5: Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets.</p>	12
II	<p>HTML5 Page layout and navigation: Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.</p> <p>HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.</p>	12
III	<p>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security,</p> <p>Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void</p> <p>Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with,</p>	12

	<p>Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, RegExp</p> <p>Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer</p> <p>Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload</p>	
IV	<p>PHP:</p> <p>Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems</p>	12
V	<p>Advanced PHP and MySQL : PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Web Design The Complete Reference	Thomas Powell	Tata McGraw Hill		-
2.	HTML5 Step by Step	Faithe Wempen	Microsoft Press		2011
3.	PHP 5.1 for Beginners	Ivan Bayross Sharanam Shah,	SPD		2013
4.	PHP Project for Beginners	SharanamShah, Vaishali Shah	SPD		2015
5.					
6.	PHP 6 and MySQL Bible	Steve Suehring, Tim Converse, Joyce Park	Wiley		2009
7.	Head First HTML 5 programming	Eric Freeman	O'Reilly		2013
8.	JavaScript 2.0: The Complete Reference	Thomas Powell and Fritz Schneider	Tata McGraw Hill	2 nd	

B. Sc. (Information Technology)		Semester – II	
Course Name: Web Programming Practical		Course Code: USIT2P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Use of Basic Tags
a.	Design a web page using different text formatting tags.
b.	Design a web page with links to different pages and allow navigation between web pages.
c.	Design a web page demonstrating all Style sheet types
2.	Image maps, Tables, Forms and Media
a.	Design a web page with Imagemaps.
b.	Design a web page demonstrating different semantics
c.	Design a web page with different tables. Design a webpages using table so that the content appears well placed.
d.	Design a web page with a form that uses all types of controls.
e.	Design a web page embedding with multimedia features.
3.	Java Script
a.	Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.
b.	Design a form and validate all the controls placed on the form using Java Script.
c.	Write a JavaScript program to display all the prime numbers between 1 and 100.
a.	Write a JavaScript program to accept a number from the user and display the sum of its digits.
d.	Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
e.	Write a java script program to design simple calculator.
4.	Control and looping statements and Java Script references
a.	Design a web page demonstrating different conditional statements.
b.	Design a web page demonstrating different looping statements.
c.	Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp).
5.	Basic PHP I
a.	Write a PHP Program to accept a number from the user and print it factorial.
b.	Write a PHP program to accept a number from the user and print whether it is prime or not.
6.	Basic PHP II
a.	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.

b.	Write a PHP program to display the following Binary Pyramid: <pre> 1 0 1 1 0 1 0 1 0 1 </pre>
7. String Functions and arrays	
a.	Write a PHP program to demonstrate different string functions.
b.	Write a PHP program to create one dimensional array.
8. PHP and Database	
a.	Write a PHP code to create: <ul style="list-style-type: none"> • Create a database College • Create a table Department (Dname, Dno, Number_Of_faculty)
b.	Write a PHP program to create a database named “College”. Create a table named “Student” with following fields (sno, sname, percentage). Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.
c.	Design a PHP page for authenticating a user.
9. Email	
a.	Write a program to send email with attachment.
10. Sessions and Cookies	
a.	Write a program to demonstrate use of sessions and cookies.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	HTML5 Step by Step	Faithe Wempen	Microsoft Press		2011
2.	JavaScript 2.0: The Complete Reference	Thomas Powell and Fritz Schneider	Tata McGraw Hill	2 nd	
3.	PHP 6 and MySQL Bible	Steve Suehring, Tim Converse, Joyce Park	Wiley		2009
4.	PHP 5.1 for Beginners	Ivan Bayross Sharanam Shah,	SPD		2013
5.	PHP Project for Beginners	SharanamShah, Vaishali Shah	SPD		2015
6.	Murach’s PHP and MySQL	Joel Murach Ray Harris	SPD		2011

B. Sc. (Information Technology)		Semester – II	
Course Name: Numerical and Statistical Methods		Course Code: USIT204	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation Laws and Engineering Problems</p> <p>Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors</p> <p>Truncation Errors and the Taylor Series: The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty</p>	12
II	<p>Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method.</p> <p>Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.</p>	12
III	<p>Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method.</p> <p>Numerical differentiation and Integration: Numerical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules.</p> <p>Numerical solution of 1st and 2nd order differential equations: Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2nd Order Differential Equations.</p>	12
IV	<p>Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression</p> <p>Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution.</p>	12
V	<p>Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance.</p> <p>Distributions: Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Introductory Methods of Numerical Methods	S. S. Shastri	PHI	Vol – 2	
2.	Numerical Methods for Engineers	Steven C. Chapra, Raymond P. Canale	Tata Mc Graw Hill	6 th	2010
3.	Numerical Analysis	Richard L. Burden, J. Douglas Faires	Cengage Learning	9 th	2011
4.	Fundamentals of Mathematical Statistics	S. C. Gupta, V. K. Kapoor			
5.	Elements of Applied Mathematics	P.N.Wartikar and J.N.Wartikar	A. V. Griha, Pune	Volume 1 and 2	

B. Sc. (Information Technology)		Semester – II	
Course Name: Numerical and Statistical Methods Practical		Course Code: USIT2P4	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Iterative Calculation
a.	Program for iterative calculation.
b.	Program to calculate the roots of a quadratic equation using the formula.
c.	Program to evaluate e^x using infinite series.
2.	Solution of algebraic and transcendental equations:
a.	Program to solve algebraic and transcendental equation by bisection method.
b.	Program to solve algebraic and transcendental equation by false position method.
c.	Program to solve algebraic and transcendental equation by Secant method.
d.	Program to solve algebraic and transcendental equation by Newton Raphson method.
3.	Interpolation
a.	Program for Newton's forward interpolation.
b.	Program for Newton's backward interpolation.
c.	Program for Lagrange's interpolation.
4.	Solving linear system of equations by iterative methods
a.	Program for solving linear system of equations using Gauss Jordan method.
b.	Program for solving linear system of equations using Gauss Seidel method.
5.	Numerical Differentiation
a.	Programing to obtain derivatives numerically.
6.	Numerical Integration
a.	Program for numerical integration using Trapezoidal rule.
b.	Program for numerical integration using Simpson's 1/3 rd rule.
c.	Program for numerical integration using Simpson's 3/8 th rule.
7.	Solution of differential equations
a.	Program to solve differential equation using Euler's method
b.	Program to solve differential equation using modified Euler's method.
c.	Program to solve differential equation using Runge-kutta 2 nd order and 4 th order methods.
8.	Regression
a.	Program for Linear regression.
b.	Program for Polynomial Regression.

c.	Program for multiple linear regression.
d.	Program for non-linear regression.
9.	Random variables and distributions
a.	Program to generate random variables.
b.	Program to fit binomial distribution.
c.	Program to fit Poisson distribution.
10.	Distributions
a.	Program for Uniform distribution.
b.	Program for Bernoulli distribution
c.	Program for Negative binomial distribution.

B. Sc. (Information Technology)		Semester – II	
Course Name: Green Computing		Course Code: USIT205	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Overview and Issues: 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>Initiatives and Standards: 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>	12
II	<p>Minimizing Power Usage: Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, Low-Power Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.</p> <p>Cooling: Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together.</p>	12
III	<p>Changing the Way of Work: Old Behaviours, starting at the Top, Process Reengineering with Green in Mind, Analysing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.</p> <p>Going Paperless: Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.</p>	12

IV	<p>Recycling: Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online</p> <p>Hardware Considerations: Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice</p>	12
V	<p>Greening Your Information Systems: Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.</p> <p>Staying Green: Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Green IT	Toby Velte, Anthony Velte, Robert Elsenpeter	McGraw Hill		2008
2.	Green Data Center: Steps for the Journey	Alvin Galea, Michael Schaefer, Mike Ebbers	Shroff Publishers and Distributers		2011
3.	Green Computing and Green IT Best Practice	Jason Harris	Emereo		
4.	Green Computing Tools and Techniques for Saving Energy, Money and Resources	Bud E. Smith	CRC Press		2014

B. Sc. (Information Technology)		Semester – II	
Course Name: Green Computing Practical		Course Code: USIT2P5	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Project and Viva Voce	
1.	A project should be done based on the objectives of Green Computing. A report of minimum 50 pages should be prepared. The report should have a font size of 12, Times new roman and 1.5 line spacing. The headings should have font size 14. The report should be hard bound.
2.	The project can be done individually or a group of two students.
3.	The students will have to present the project during the examination.
4.	A certified copy of the project report is essential to appear for the examination.

Evaluation Scheme:**1. Internal Evaluation (25 Marks).****i. Test: 1 Class test of 20 marks. (Can be taken online)**

Q	Attempt <i>any four</i> of the following:	20
a.		
b.		
c.		
d.		
e.		
f.		

ii. 5 marks: Active participation in the class, overall conduct, attendance.**2. External Examination: (75 marks)**

	All questions are compulsory	
Q1	(Based on Unit 1) Attempt <i>any three</i> of the following:	15
a.		
b.		
c.		
d.		
e.		
f.		
Q2	(Based on Unit 2) Attempt <i>any three</i> of the following:	15
Q3	(Based on Unit 3) Attempt <i>any three</i> of the following:	15
Q4	(Based on Unit 4) Attempt <i>any three</i> of the following:	15
Q5	(Based on Unit 5) Attempt <i>any three</i> of the following:	15

3. Practical Exam: 50 marks

A Certified copy journal is essential to appear for the practical examination.

1.	Practical Question 1	20
2.	Practical Question 2	20
3.	Journal	5
4.	Viva Voce	5

OR

1.	Practical Question	40
2.	Journal	5
3.	Viva Voce	5

Academic Council 11/05/2017

Item No:

UNIVERSITY OF MUMBAI



Syllabus for S.Y.B.Sc.

Programme: B.Sc.

Course: Information Technology

with effect from the academic year

2017 – 2018

Semester – 3			
Course Code	Course Type	Course Title	Credits
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
Total Credits			20

Semester – 4			
Course Code	Course Type	Course Title	Credits
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
Total Credits			20

SEMESTER III

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

Unit	Details	Lectures
I	<p>Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,</p> <p>Variables and Expressions Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p>Conditional Statements: if, if-else, nested if –else</p> <p>Looping: for, while, nested loops</p> <p>Control statements: Terminating loops, skipping specific conditions</p>	12
II	<p>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types</p> <p>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.</p>	12
III	<p>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods</p> <p>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions</p> <p>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods</p> <p>Files: Text Files, The File Object Attributes, Directories</p> <p>Exceptions: Built-in Exceptions, Handling Exceptions, Exception</p>	12

	with Arguments, User-defined Exceptions	
IV	<p>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.</p> <p>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding</p> <p>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue</p> <p>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module</p>	12
V	<p>Creating the GUI Form and Adding Widgets:</p> <p>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessageBox. Handling Standard attributes and Properties of Widgets.</p> <p>Layout Management: Designing GUI applications with proper Layout Management features.</p> <p>Look and Feel Customization: Enhancing Look and Feel of GUI using different appearances of widgets.</p> <p>Storing Data in Our MySQL Database via Our GUI : Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.</p>	12

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

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

Unit	Details	Lectures
I	<p>Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation.</p> <p>Array: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General Multi-Dimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.</p>	12
II	<p>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.</p>	12
III	<p>Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.</p> <p>Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues.</p>	12
IV	<p>Sorting and Searching Techniques Bubble, Selection, Insertion, Merge Sort. Searching: Sequential,</p>	12

	<p>Binary, Indexed Sequential Searches, Binary Search.</p> <p>Tree:Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort.</p> <p>Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.</p>	
V	<p>Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Buckethashing, Deletion and rehashing</p> <p>Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.</p>	12

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

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

Unit	Details	Lectures
I	<p>Introduction: Data communications, networks, network types, Internet history, standards and administration.</p> <p>Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p>Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p>Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.</p>	12
II	<p>Bandwidth Utilization: Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum</p> <p>Transmission media: Guided Media, Unguided Media</p> <p>Switching: Introduction, circuit switched networks, packet switching, structure of a switch.</p> <p>Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.</p>	12
III	<p>Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.</p> <p>Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet,</p> <p>Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.</p> <p>Connecting devices and Virtual LANs.</p>	12
IV	<p>Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP</p> <p>Unicast Routing: Introduction, routing algorithms, unicast routing protocols.</p> <p>Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.</p>	12
V	<p>Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport</p>	12

	layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols: World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
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. Sc. (Information Technology)	Semester – III
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Course Name: Database Management Systems		Course Code: USIT304	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction to Databases and Transactions What is database system, purpose of database system, view of data, relationaldatabases, database architecture, transaction management</p> <p>Data Models The importance of data models, Basic building blocks, Business rules, The evolutionof data models, Degrees of data abstraction.</p> <p>Database Design,ER Diagram and Unified Modeling Language Database design and ER Model:overview, ERModel, Constraints, ERDiagrams, ERDIssues, weak entity sets, Codd’s rules, Relational Schemas, Introduction to UML</p>	12
II	<p>Relational database model: Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).</p> <p>Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relationalcomparison.</p> <p>Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities</p>	12
III	<p>Constraints, Views and SQL 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>	12
IV	<p>Transaction management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management.</p>	12
V	<p>PL-SQL: Beginning with PL / SQL,Identifiers and Keywords, Operators, Expressions, Sequences,Control Structures, Cursors and Transaction,Collections and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw- Hill	Fifth Edition	
2.	Database Systems	RobCoronel	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. Sc. (Information Technology)		Semester – III	
Course Name: Applied Mathematics		Course Code: USIT305	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, Caley-Hamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.</p> <p>Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of $x+iy$ for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, $j(=i)$ as an operator(Electrical circuits)</p>	12
II	<p>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.</p> <p>Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution.</p> <p>Linear Differential Equations with Constant Coefficients:Introduction, The Differential Operator, Linear Differential Equation $f(D) y = 0$, Different cases depending on the nature of the root of the equation $f(D) = 0$, Linear differential equation $f(D) y = X$, The complimentary Function, The inverse operator $1/f(D)$ and the symbolic expiration for the particular integral $1/f(D) X$; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.</p>	12
III	<p>The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on</p>	12

	Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	
IV	Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. Applications of integration: Areas, Volumes of solids.	12
V	Beta and Gamma Functions – Definitions, Properties and Problems. Duplication formula. Differentiation Under the Integral Sign Error Functions	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
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. Sc. (Information Technology)		Semester – III	
Course Name: Python Programming Practical		Course Code: USIT3P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Write the program for the following:
a.	Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
b.	Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
c.	Write a program to generate the Fibonacci series.
d.	Write a function that reverses the user defined value.
e.	Write a function to check the input value is Armstrong and also write the function for Palindrome.
f.	Write a recursive function to print the factorial for a given number.
2.	Write the program for the following:
a.	Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.
b.	Define a function that computes the <i>length</i> of a given list or string.
c.	Define a <i>procedure</i> histogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following: <pre>**** ***** *****</pre>
3.	Write the program for the following:
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.

4.	Write the program for the following:
a.	Write a program that takes two lists and returns True if they have at least one common member.
b.	Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
c.	Write a Python program to clone or copy a list
5.	Write the program for the following:
a.	Write a Python script to sort (ascending and descending) a dictionary by value.
b.	Write a Python script to concatenate following dictionaries to create a new one. Sample Dictionary : dic1={ 1:10, 2:20} dic2={ 3:30, 4:40} dic3={ 5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
c.	Write a Python program to sum all the items in a dictionary.
6.	Write the program for the following:
a.	Write a Python program to read an entire text file.
b.	Write a Python program to append text to a file and display the text.
c.	Write a Python program to read last n lines of a file.
7.	Write the program for the following:
a.	Design a class that store the information of student and display the same
b.	Implement the concept of inheritance using python
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> .
8.	Write the program for the following:
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

	<p>to import your own module like this:</p> <pre>import geometry</pre> <p>Try and add <code>print dir(geometry)</code> to the file and run it.</p> <p>Now write a function <code>pointyShapeVolume(x, y, squareBase)</code> that calculates the volume of a square pyramid if <code>squareBase</code> is <code>True</code> and of a right circular cone if <code>squareBase</code> is <code>False</code>. <code>x</code> is the length of an edge on a square if <code>squareBase</code> is <code>True</code> and the radius of a circle when <code>squareBase</code> is <code>False</code>. <code>y</code> is the height of the object. First use <code>squareBase</code> to distinguish the cases. Use the <code>circleArea</code> and <code>squareArea</code> from the <code>geometry</code> module to calculate the base areas.</p>
b.	Write a program to implement exception handling.
9.	Write the program for the following:
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.
10.	Design the database applications for the following:
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.

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

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

List of Practical	
1.	Implement the following:
a.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]
b.	Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven]
c.	Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
2.	Implement the following for Linked List:
a.	Write a program to create a single linked list and display the node elements in reverse order.
b.	Write a program to search the elements in the linked list and display the same
c.	Write a program to create double linked list and sort the elements in the linked list.
3.	Implement the following for Stack:
a.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
b.	Write a program to convert an infix expression to postfix and prefix conversion.
c.	Write a program to implement Tower of Hanoi problem.
4.	Implement the following for Queue:
a.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
b.	Write a program to implement the concept of Circular Queue
c.	Write a program to implement the concept of Deque.
5.	Implement the following sorting techniques:
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
c.	Write a program to implement insertion sort.
6.	Implement the following data structure techniques:
a.	Write a program to implement merge sort.
b.	Write a program to search the element using sequential search.

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

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

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

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

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

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

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

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	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. Sc. (Information Technology)		Semester – III	
Course Name: Mobile Programming		Course Code: USIT3P5	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

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

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

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

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Apache Cordova 4 Programming	John M. Wargo	Addison-Wesley Professional	1 st	2015
2.	Apache Cordova in Action	Raymond Camden	Manning Publications	1 st	2015
3.	PhoneGap By Example	Andrey Kovalenko	PACKT Publishing	1 st	2015

SEMESTER IV

B. Sc. (Information Technology)		Semester – IV	
Course Name: Core Java		Course Code: USIT401	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name</p> <p>Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.</p>	12
II	<p>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement</p> <p>Iterations: The While Loop, The Do ... While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement</p> <p>Classes: 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>	12
III	<p>Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. 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</p>	12

	Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package.	
IV	Enumerations, Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector. Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file	12
V	Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: 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 Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.	12

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

B. Sc. (Information Technology)		Semester – IV	
Course Name: Introduction to Embedded Systems		Course Code: USIT402	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction: Embedded Systems and general purpose computersystems, history, classifications, applications and purpose of embedded systems</p> <p>Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.</p> <p>Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p>	12
II	<p>Embedded Systems – Application and Domain Specific: Application specific – washing machine, domain specific - automotive.</p> <p>Embedded Hardware: 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>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.</p>	12
III	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family. 8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p>8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.</p>	12
IV	<p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p> <p>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging.</p>	12
V	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p>Design and Development: Embedded system development Environment – IDE, types of file generated on cross</p>	12

	compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Programming Embedded Systems in C and C++	Michael Barr	O'Reilly	First	1999
2.	Introduction to embedded systems	Shibu K V	Tata Mcgraw-Hill	First	2012
3.	The 8051 Microcontroller and Embedded Systems	Muhammad Ali Mazidi	Pearson	Second	2011
4.	Embedded Systems	Rajkamal	Tata Mcgraw-Hill		

B. Sc. (Information Technology)		Semester – IV	
Course Name: Computer Oriented Statistical Techniques		Course Code: USIT403	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

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

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

Sampling Theory of Regression.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	STATISTICS	Murray R. Spiegel, Larry J. Stephens.	McGRAW – HILL INTERNATIONAL	FOURTH	
2.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1 st	2017
3.	FUNDAMENTAL OF MATHEMATICAL STATISTICS	S.C. GUPTA and V.K. KAPOOR	SULTAN CHAND and SONS	ELEVENTH REVISED	2011
4.	MATHEMATICAL STATISTICS	J.N. KAPUR and H.C. SAXENA	S. CHAND	TWENTIETH REVISED	2005

B. Sc. (Information Technology)		Semester – IV	
Course Name: Software Engineering		Course Code: USIT404	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction: 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>Software Processes: Process and Project, Component Software Processes.</p> <p>Software Development Process Models.</p> <ul style="list-style-type: none"> • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process. • The RAD Model • Time boxing Model. <p>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>	12
II	<p>Socio-technical system: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>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p>Requirements Engineering Processes: Feasibility study, Requirementselicitation and analysis, Requirements Validations, Requirements Management.</p>	12

	System Models: Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.	
III	<p>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p>Project Management Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.</p> <p>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p>	12
IV	<p>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.</p> <p>Software Measurement: Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics</p> <p>Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p>	12
V	<p>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.</p> <p>Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.</p> <p>Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p> <p>Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service</p>	12

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

4.	Software Engineering principles and practice	WS Jawadekar	Tata Mcgraw-hill		
5.	Software Engineering- A Concise Study	S.A Kelkar	PHI India.		
6.	Software Engineering Concept and Applications	SubhajitDatta	Oxford Higher Education		
7.	Software Design	D.Budgen	Pearson education	2nd	
8.	Software Engineering	KL James	PHI	EEE	2009

B. Sc. (Information Technology)		Semester – IV	
Course Name: Computer Graphics and Animation		Course Code: USIT405	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, 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>Scan conversion – Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm, Bresenham's 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.</p>	12
II	<p>Two-Dimensional Transformations: 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>Three-Dimensional Transformations: 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</p>	12

	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.	
III	<p>Viewing in 3D 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>Light:Radiometry,Transport,Equation,Photometry Color:Colorimetry,ColorSpaces,ChromaticAdaptation, Color Appearance</p>	12
IV	<p>Visible-Surface Determination: 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>Plane Curves and Surfaces: 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, 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.</p>	12
V	<p>Computer Animation: Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects.</p> <p>Image Manipulation and Storage: What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson	2 nd	
2.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	4 th	2016
3.	Computer Graphics	Hearn, Baker	Pearson	2 nd	

4.	Principles of Interactive Computer Graphics	William M. Newman and Robert F. Sproull	TMH	2 nd	
5.	Mathematical Elements for CG	D. F. Rogers, J. A. Adams	TMH	2 nd	

B. Sc. (Information Technology)		Semester –IV	
Course Name: Core Java Practical		Course Code: USIT4P1	
Periods per week 1 Period is 50 minutes	Lectures per week	3	
		Hours	Marks
Evaluation System	Practical Examination	2½	50

List of Practical	
1.	Java Basics
a.	Write a Java program that takes a number as input and prints its multiplication table upto 10.
b.	Write a Java program to display the following pattern. ***** **** *** ** *
c.	Write a Java program to print the area and perimeter of a circle.
2. Use of Operators	
a.	Write a Java program to add two binary numbers.
b.	Write a Java program to convert a decimal number to binary number and vice versa.
c.	Write a Java program to reverse a string.
3. Java Data Types	
a.	Write a Java program to count the letters, spaces, numbers and other characters of an input string.
b.	Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value.
c.	Find the smallest and largest element from the array
4. Methods and Constructors	
a.	Designed a class SortData that contains the method asc() and desc().
b.	Designed a class that demonstrates the use of constructor and destructor.
c.	Write a java program to demonstrate the implementation of abstract class.

5.	Inheritance
a.	Write a java program to implement single level inheritance.
b.	Write a java program to implement method overriding
c.	Write a java program to implement multiple inheritance.
6.	Packages and Arrays
a.	Create a package, Add the necessary classes and import the package in java class.
b.	Write a java program to add two matrices and print the resultant matrix.
c.	Write a java program for multiplying two matrices and print the product for the same.
7.	Vectors and Multithreading
a.	Write a java program to implement the vectors.
b.	Write a java program to implement thread life cycle.
c.	Write a java program to implement multithreading.
8.	File Handling
a.	Write a java program to open a file and display the contents in the console window.
b.	Write a java program to copy the contents from one file to other file.
c.	Write a java program to read the student data from user and store it in the file.
9.	GUI and Exception Handling
a.	Design a AWT program to print the factorial for an input value.
b.	Design an AWT program to perform various string operations like reverse string, string concatenation etc.
c.	Write a java program to implement exception handling.
10.	GUI Programming.
a.	Design an AWT application that contains the interface to add student information and display the same.
b.	Design a calculator based on AWT application.
c.	Design an AWT application to generate result marks sheet.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1st	2015
2.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9th	2014
3.	Murach's beginning Java with Net Beans	Joel Murach , Michael Urban	SPD	1st	2016

4.	Core Java, Volume I: Fundamentals	Hortsman	Pearson	9th	2013
5.	Core Java, Volume II: Advanced Features	Gary Cornell and Hortsman	Pearson	8th	2008
6.	Core Java: An Integrated Approach	R. Nageswara Rao	DreamTech	1st	2008

B. Sc. (Information Technology)		Semester – IV	
Course Name: Introduction to Embedded Systems Practical		Course Code: USIT4P2	
Periods per week 1 Period is 50 minutes	Lectures per week	3	
		Hours	Marks
Evaluation System	Practical Examination	2½	50

List of Practical	
1.	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming b. Execution c. Debugging
2. 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.
3. A	Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's
B	To interface 8 LEDs at Input-output port and create different patterns.
C	To demonstrate timer working in timer mode and blink LED without using any loop delay routine.
4. A	Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.
B	To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.
C	Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
5. A	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.

B	Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
6.	Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction.
7.	Generate traffic signal.
8.	Implement Temperature controller.
9.	Implement Elevator control.
10.	Using FlashMagic
A	To demonstrate the procedure for flash programming for reprogrammable embedded system board using FlashMagic
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.

B. Sc. (Information Technology)		Semester – IV	
Course Name: Computer Oriented Statistical Techniques Practical		Course Code: USIT4P3	
Periods per week 1 Period is 50 minutes	Lectures per week	3	
		Hours	Marks
Evaluation System	Practical Examination	2½	50

List of Practical	
1.	Using R execute the basic commands, array, list and frames.
2.	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
3.	Using R Execute the statistical functions:mean, median, mode, quartiles, range, inter quartile range histogram
4.	Using R import the data from Excel / .CSV file and Perform the above functions.
5.	Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance.
6.	Using R import the data from Excel / .CSV file and draw the skewness.
7.	Import the data from Excel / .CSV and perform the hypothetical testing.
8.	Import the data from Excel / .CSV and perform the Chi-squared Test.
9.	Using R perform the binomial and normal distribution on the data.
10.	Perform the Linear Regression using R.
11.	Compute the Least squares means using R.
12.	Compute the Linear Least Square Regression

Books and References:

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

B. Sc. (Information Technology)		Semester – IV	
Course Name: Software Engineering		Course Code: USIT4P4	
Periods per week 1 Period is 50 minutes	Lectures per week	3	
		Hours	Marks
Evaluation System	Practical Examination	2½	50

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

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
3.	Object - Oriented Modeling and Design	Michael Blaha, James Rumbaugh	Pearson		2011

4.	Learning UML 2. 0	Kim Hamilton, Russ Miles	O'Reilly Media		2006
5.	The unified modeling language user guide	Grady Booch, James Rumbaugh, Ivar Jacobson	Addison-Wesley		2005
6.	UML A Beginners Guide	Jason T. Roff	McGraw Hill Professional		2003

B. Sc. (Information Technology)		Semester – IV	
Course Name: Computer Graphics and Animation		Course Code: USIT4P5	
Periods per week 1 Period is 50 minutes	Lectures per week	3	
		Hours	Marks
Evaluation System	Practical Examination	2½	50

List of Practical	
1.	Solve the following:
a.	Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them.
b.	Draw a co-ordinate axis at the center of the screen.
2.	Solve the following:
a.	Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message.
b.	Draw a simple hut on the screen.
3.	Draw the following basic shapes in the center of the screen :
	i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line
4.	Solve the following:
a.	Develop the program for DDA Line drawing algorithm.
b.	Develop the program for Bresenham's Line drawing algorithm.
5.	Solve the following:
a.	Develop the program for the mid-point circle drawing algorithm.
b.	Develop the program for the mid-point ellipse drawing algorithm.
6.	Solve the following:
a.	Write a program to implement 2D scaling.
b.	Write a program to perform 2D translation

7.	Solve the following:
a.	Perform 2D Rotation on a given object.
b.	Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. iii. Reflect about the line $y = mx + c$.
8.	Solve the following:
a.	Write a program to implement Cohen-Sutherland clipping.
b.	Write a program to implement Liang - Barsky Line Clipping Algorithm
9.	Solve the following:
a.	Write a program to fill a circle using Flood Fill Algorithm.
b.	Write a program to fill a circle using Boundary Fill Algorithm.
10.	Solve the following:
a.	Develop a simple text screen saver using graphics functions.
b.	Perform smiling face animation using graphic functions.
c.	Draw the moving car on the screen.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson Education	Second Edition	
2.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	Fourth Edition	2016
3.	Computer Graphics	Hearn, Baker	Pearson Education	Second	
4.	Principles of Interactive Computer Graphics	William M. Newman and Robert F. Sproull	Tata McGraw Hill	Second	

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UNIVERSITY OF MUMBAI



Syllabus for T.Y.B.Sc.

Programme: B.Sc.

Subject: Information Technology

with effect from the academic year

2018 – 2019

Semester – 5			
Course Code	Course Type	Course Title	Credits
USIT501	Skill Enhancement Course	Software Project Management	2
USIT502	Skill Enhancement Course	Internet of Things	2
USIT503	Skill Enhancement Course	Advanced Web Programming	2
USIT504	Discipline Specific Elective (Any One)	Artificial Intelligence	2
USIT505		Linux System Administration	
USIT506	Discipline Specific Elective (Any One)	Enterprise Java	2
USIT507		Next Generation Technologies	
USIT5P1	Skill Enhancement Course Practical	Project Dissertation	2
USIT5P2	Skill Enhancement Course Practical	Internet of Things Practical	2
USIT5P3	Skill Enhancement Course Practical	Advanced Web Programming Practical	2
USIT5P4	Discipline Specific Elective Practical (Any One)*	Artificial Intelligence Practical	2
USIT5P5		Linux Administration Practical	
USIT5P6	Discipline Specific Elective Practical (Any One)*	Enterprise Java Practical	2
USIT5P7		Next Generation Technologies Practical	
Total Credits			20

(All the practical mentioned in the syllabi are compulsory as per the courses chosen)

Semester – 6			
Course Code	Course Type	Course Title	Credits
USIT601	Skill Enhancement Course	Software Quality Assurance	2
USIT602	Skill Enhancement Course	Security in Computing	2
USIT603	Skill Enhancement Course	Business Intelligence	2
USIT604	Discipline Specific Elective (Any One)	Principles of Geographic Information Systems	2
USIT605		Enterprise Networking	
USIT606	Discipline Specific Elective (Any One)	IT Service Management	2
USIT607		Cyber Laws	
USIT6P1	Skill Enhancement Course Practical	Project Implementation	2
USIT6P2	Skill Enhancement Course Practical	Security in Computing Practical	2
USIT6P3	Skill Enhancement Course Practical	Business Intelligence Practical	2
USIT6P4	Discipline Specific Elective Practical (Any One)*	Principles of Geographic Information Systems Practical	2
USIT6P5		Enterprise Networking Practical	
USIT6P6	Skill Enhancement Course Practical	Advanced Mobile Programming	2
Total Credits			20

***The choice of Practical course is based on the theory Course. For Semester V, USIT504, USIT505, USIT506 and USIT507, the practical courses are USIT5P4, USIT5P5, USIT5P6, USIT5P7. For Semester VI, USIT604, USIT605 the practical courses are USIT6P4, USIT6P5 respectively. Practical Course USIT6P6 is compulsory.**

SEMESTER V

B. Sc. (Information Technology)		Semester – V	
Course Name: Software Project Management		Course Code: USIT501	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction to Software Project Management: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.</p> <p>Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.</p> <p>An Overview of Project Planning: Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning</p>	12
II	<p>Selection of an Appropriate Project Approach: Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.</p> <p>Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point</p>	12

	Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	
III	<p>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.</p> <p>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.</p> <p>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.</p>	12
IV	<p>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM).</p> <p>Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.</p> <p>Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.</p>	12
V	<p>Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.</p> <p>Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.</p>	12

	Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	TMH	6 th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1st	2017
3.	Software Project Management	Walker Royce	Pearson		2005

B. Sc. (Information Technology)		Semester – V	
Course Name: Internet of Things		Course Code: USIT502	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>The Internet of Things: An Overview: The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?</p> <p>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances.</p> <p>Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.</p>	12
II	<p>Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community.</p> <p>Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.</p>	12
III	<p>Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.</p> <p>Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.</p>	12

IV	<p>Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging.</p> <p>Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.</p>	12
V	<p>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.</p> <p>Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	First	2014
2.	Internet of Things – Architecture and Design	Raj Kamal	McGraw Hill	First	2017
3.	Getting Started with the Internet of Things	Cuno Pfister	O'Reilly	Sixth	2018
4.	Getting Started with Raspberry Pi	Matt Richardson and Shawn Wallace	SPD	Third	2016

B. Sc. (Information Technology)		Semester – V	
Course Name: Advanced Web Programming		Course Code: USIT503	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.</p> <p>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.</p> <p>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.</p>	12
II	<p>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.</p> <p>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.</p>	12
III	<p>Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing</p> <p>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options</p> <p>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages,</p>	12
IV	<p>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p> <p>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,</p>	12

	The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView	
V	<p>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.</p> <p>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p> <p>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015	Anne Bohem and Joel Murach	Murach	Third	2016
3.	Murach's ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
4.	ASP.NET 4.0 programming	J. Kanjilal	Tata McGraw-Hill		2011
5.	Programming ASP.NET	D.Esposito	Microsoft Press (Dreamtech)		2011
6.	Beginning Visual C# 2010	K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner	Wrox (Wiley)		2010

B. Sc. (Information Technology)		Semester – V	
Course Name: Artificial Intelligence		Course Code: USIT504 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	Introduction: What is Artificial Intelligence? Foundations of AI, history, the state of art AI today. Intelligent Agents: agents and environment, good behavior, nature of environment, the structure of agents.	12
II	Solving Problems by Searching: Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions. Beyond Classical Search: local search algorithms, searching with non-deterministic action, searching with partial observations, online search agents and unknown environments.	12
III	Adversarial Search: Games, optimal decisions in games, alpha-beta pruning, stochastic games, partially observable games, state-of-the-art game programs. Logical Agents: Knowledge base agents, The Wumpus world, logic, propositional logic, propositional theorem proving, effective propositional model checking, agents based on propositional logic.	12
IV	First Order Logic: Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic. Inference in First Order Logic: propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.	12
V	Planning: Definition of Classical Planning, Algorithms for planning as state space search, planning graphs, other classical planning approaches, analysis of planning approaches, Time, Schedules and resources, hierarchical planning, Planning and Acting in Nondeterministic Domains, multiagent planning, Knowledge Representation: Categories and Objects, events, mental events and objects, reasoning systems for categories, reasoning with default information, Internet shopping world	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	3 rd	2015

2.	A First Course in Artificial Intelligence	Deepak Khemani	TMH	First	2017
3.	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff publishers	1 st	2018
4.	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar Nair	TMH	3 rd	2009
5.	Artificial Intelligence & Soft Computing for Beginners	Anandita Das Bhattacharjee	SPD	1 st	2013

B. Sc. (Information Technology)		Semester – V	
Course Name: Linux System Administration		Course Code: USIT505 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.</p> <p>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files</p> <p>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate</p> <p>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages</p>	12
II	<p>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes</p> <p>Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access</p>	12

	<p>Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes</p>	
III	<p>Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT</p> <p>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files</p> <p>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.</p>	12
IV	<p>Configuring DNS and DHCP: Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server</p> <p>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP</p> <p>Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL</p>	12

V	<p>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.</p> <p>High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems</p> <p>Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File</p>	12
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Red Hat Enterprise Linux 6 Administration	Sander van Vugt	John Wiley and Sons		2013
2.	Red hat Linux Networking and System Administration	Terry Collings and Kurt Wall	Wiley	3 rd	
3.	Linux Administration: A Beginner's Guide	Wale Soyinka	TMH	Fifth Edition	

B. Sc. (Information Technology)		Semester – V	
Course Name: Enterprise Java		Course Code: USIT506 (Elective II)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Understanding Java EE: What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server</p> <p>Java EE Architecture, Server and Containers: Types of System Architecture, Java EE Server, Java EE Containers.</p> <p>Introduction to Java Servlets: The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do?</p> <p>Servlet API and Lifecycle: Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet</p> <p>Working with Servlets: Getting Started, Using Annotations Instead of Deployment Descriptor.</p> <p>Working with Databases: What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.</p>	12
II	<p>Request Dispatcher: RequestDispatcher Interface, Methods of RequestDispatcher, RequestDispatcher Application.</p> <p>COOKIES: Kinds of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing the Colors of A Page</p> <p>SESSION: What Are Sessions? Lifecycle of Http Session, Session Tracking With Servlet API, A Servlet Session Example</p> <p>Working with Files: Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application.</p> <p>Working with Non-Blocking I/O: Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp</p>	12
III	<p>Introduction To Java Server Pages: Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages</p> <p>Getting Started With Java Server Pages: Comments, JSP Document, JSP Elements, JSP GUI Example.</p> <p>Action Elements: Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabeen.</p> <p>Implicit Objects, Scope and El Expressions: Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language.</p>	12

	Java Server Pages Standard Tag Libraries: What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.	
IV	<p>Introduction To Enterprise Javabeans: Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans</p> <p>Working with Session Beans: When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.</p> <p>Working with Message Driven Beans: Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.</p> <p>Interceptors: Request and Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.</p> <p>Java Naming and Directory Interface: What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE.</p>	12
V	<p>Persistence, Object/Relational Mapping And JPA: What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping,</p> <p>Introduction to Java Persistence API: The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications.</p> <p>Writing JPA Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running the JPA Application.</p> <p>Introduction to Hibernate: What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?</p> <p>Writing Hibernate Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Java EE 7 For Beginners	Sharanam Shah, Vaishali Shah	SPD	First	2017
2.	Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development	Elder Moraes	Packt	First	2018
3.	Advanced Java Programming	Uttam Kumar Roy	Oxford Press		2015

B. Sc. (Information Technology)		Semester – V	
Course Name: Next Generation Technologies		Course Code: USIT507 (Elective II)	
Periods per week (1 Period is 50 minutes),		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Big Data: Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies</p> <p>NoSQL: SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer’s Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases</p> <p>Introducing MongoDB: History, MongoDB Design Philosophy, Speed, Scalability, and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison</p>	12
II	<p>The MongoDB Data Model: The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object-Oriented Programming, Schema Evolution</p> <p>Using MongoDB Shell: Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application’s Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach</p> <p>MongoDB Architecture: Core Processes, mongod, mongo, mongos, MongoDB Tools, Standalone Deployment, Replication, Master/Slave Replication, Replica Set, Implementing Advanced Clustering with Replica Sets, Sharding, Sharding Components, Data Distribution Process, Data Balancing Process, Operations, Implementing Sharding, Controlling Collection Distribution (Tag-Based Sharding), Points to</p>	12

	Remember When Importing Data in a Sharded Environment, Monitoring for Sharding, Monitoring the Config Servers, Production Cluster Architecture, Scenario 1, Scenario 2, Scenario 3, Scenario 4	
III	<p>MongoDB Storage Engine: Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS, GridFS under the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations</p> <p>MongoDB Use Cases: Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding</p> <p>MongoDB Limitations: MongoDB Space Is Too Large (Applicable for MMAPv1), Memory Issues (Applicable for Storage Engine MMAPv1), 32-bit vs. 64-bit, BSON Documents, Namespaces Limits, Indexes Limit, Capped Collections Limit - Maximum Number of Documents in a Capped Collection, Sharding Limitations, Shard Early to Avoid Any Issues, Shard Key Can't Be Updated, Shard Collection Limit, Select the Correct Shard Key, Security Limitations, No Authentication by Default, Traffic to and from MongoDB Isn't Encrypted, Write and Read Limitations, Case-Sensitive Queries, Type-Sensitive Fields, No JOIN, Transactions, MongoDB Not Applicable Range</p> <p>MongoDB Best Practices: Deployment, Hardware Suggestions from the MongoDB Site, Few Points to be Noted, Coding, Application Response Time Optimization, Data Safety, Administration, Replication Lag, Sharding, Monitoring</p>	12
IV	<p>The End of Disk? SSD and In-Memory Databases: The End of Disk?, Solid State Disk, The Economics of Disk, SSD-Enabled Databases, In-Memory Databases, TimesTen, Redis, SAP HANA, VoltDB, Oracle 12c “in-Memory Database, Berkeley Analytics Data Stack and Spark, Spark Architecture</p> <p>jQuery: Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider</p>	12
V	<p>JSON: Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange, JSON PHP, JSON HTML, JSONP</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Practical MongoDB	Shakuntala Gupta Edward Navin Sabharwal	Apress		
2.	Beginning jQuery	Jack Franklin Russ Ferguson	Apress	Second	
3.	Next Generation Databases	Guy Harrison	Apress		
4.	Beginning JSON	Ben Smith	Apress		

B. Sc. (Information Technology)		Semester – V	
Course Name: Project Dissertation		Course Code: USIT5P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

The details are given in Appendix – I

B. Sc. (Information Technology)		Semester – V	
Course Name: Internet of Things Practical		Course Code: USIT5P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
1	Displaying different LED patterns with Raspberry Pi.
2	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
3	Raspberry Pi Based Oscilloscope
4	Controlling Raspberry Pi with WhatsApp.
5	Setting up Wireless Access Point using Raspberry Pi
6	Fingerprint Sensor interfacing with Raspberry Pi
7	Raspberry Pi GPS Module Interfacing
8	IoT based Web Controlled Home Automation using Raspberry Pi
9	Visitor Monitoring with Raspberry Pi and Pi Camera
10	Interfacing Raspberry Pi with RFID.
11	Building Google Assistant with Raspberry Pi.
12	Installing Windows 10 IoT Core on Raspberry Pi

Raspberry Pi Kits and components should be made available in the ratio of 1 kit : 3 students minimum.

B. Sc. (Information Technology)		Semester – V	
Course Name: Advanced Web Programming Practical		Course Code: USIT5P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Working with basic C# and ASP .NET
a.	Create an application that obtains four int values from the user and displays the product.
b.	Create an application to demonstrate string operations.
c.	Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.
d.	Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number.
2.	Working with Object Oriented C# and ASP .NET
a.	Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion
b.	Create simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces
c.	Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling
3.	Working with Web Forms and Controls
a.	Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example : AutoPostBack)
b.	Demonstrate the use of Calendar control to perform following operations. a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendar dates
c.	Demonstrate the use of Treeview control perform following operations. a) Treeview control and datalist b) Treeview operations
4.	Working with Form Controls
a.	Create a Registration form to demonstrate use of various Validation controls.
b.	Create Web Form to demonstrate use of Adrotator Control.
c.	Create Web Form to demonstrate use User Controls.

5.	Working with Navigation, Beautification and Master page.
a.	Create Web Form to demonstrate use of Website Navigation controls and Site Map.
b.	Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.
c.	Create a web application to demonstrate various states of ASP.NET Pages.
6.	Working with Database
a.	Create a web application bind data in a multiline textbox by querying in another textbox.
b.	Create a web application to display records by using database.
c.	Demonstrate the use of Datalist link control.
7.	Working with Database
a.	Create a web application to display Databinding using dropdownlist control.
b.	Create a web application for to display the phone no of an author using database.
c.	Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).
8.	Working with data controls
a.	Create a web application to demonstrate various uses and properties of SqlDataSource.
b.	Create a web application to demonstrate data binding using DetailsView and FormView Control.
c.	Create a web application to display Using Disconnected Data Access and Databinding using GridView.
9.	Working with GridView control
a.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
b.	Create a web application to demonstrate use of GridView button column and GridView events.
c.	Create a web application to demonstrate GridView paging and Creating own table format using GridView.
10.	Working with AJAX and XML
a.	Create a web application to demonstrate reading and writing operation with XML.
b.	Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.
c.	Create a web application to demonstrate use of various Ajax controls.
11.	Programs to create and use DLL

B. Sc. (Information Technology)		Semester – V	
Course Name: Artificial Intelligence Practical		Course Code: USIT5P4 (Elective I)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details	
1	a	Write a program to implement depth first search algorithm.
	b	Write a program to implement breadth first search algorithm.
2	a	Write a program to simulate 4-Queen / N-Queen problem.
	b	Write a program to solve tower of Hanoi problem.
3	a	Write a program to implement alpha beta search.
	b	Write a program for Hill climbing problem.
4	a	Write a program to implement A* algorithm.
	b	Write a program to implement AO* algorithm.
5	a	Write a program to solve water jug problem.
	b	Design the simulation of tic – tac – toe game using min-max algorithm.
6	a	Write a program to solve Missionaries and Cannibals problem.
	b	Design an application to simulate number puzzle problem.
7	a	Write a program to shuffle Deck of cards.
	b	Solve traveling salesman problem using artificial intelligence technique.
8	a	Solve the block of World problem.
	b	Solve constraint satisfaction problem
9	a	Derive the expressions based on Associative law
	b	Derive the expressions based on Distributive law
10	a	Write a program to derive the predicate. (for e.g.: Sachin is batsman , batsman is cricketer) - > Sachin is Cricketer.
	b	Write a program which contains three predicates: male, female, parent. Make rules for following family relations: father, mother, grandfather, grandmother, brother, sister, uncle, aunt, nephew and niece, cousin. Question: i. Draw Family Tree. ii. Define: Clauses, Facts, Predicates and Rules with conjunction and disjunction

The practicals can be implemented in C / C++ / Java/ Python / R /Prolog / LISP or any other language.

B. Sc. (Information Technology)		Semester – V	
Course Name: Linux System Administration		Course Code: USIT5P5 (Elective I)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
0	Installation of RHEL 6.X
1	Graphical User Interface and Command Line Interface and Processes
a	Exploring the Graphical Desktop
b	The Command Line Interface
c	Managing Processes
2	Storage Devices and Links, Backup and Repository
b	Working with Storage Devices and Links
a	Making a Backup
b	Creating a Repository
3	Working with RPMsm Storage and Networking
a	Using Query Options
b	Extracting Files From RPMs
c	Configuring and Managing Storage
d	Connecting to the Network
4	Working with Users, Groups, and Permissions
5	Firewall and Cryptographic services
a	Securing Server with iptables
b	Setting Up Cryptographic Services
6	Configuring Server for File Sharing
a	Configuring NFS Server and Client
b	Configuring Samba
c	Configuring FTP
7	DNS, DHCP and Mail Server
a	Configuring DNS
b	Configuring DHCP
c	Setting Up a Mail Server
8	Web Server
a	Configuring Apache on Red Hat Enterprise Linux

b	Writing a Script to Monitor Activity on the Apache Web Server
c	Using the select Command
9	Shell Scripts and High-Availability Clustering
a	Writing Shell Scripts
b	Configuring Booting with GRUB
c	Configuring High Availability Clustering
10	Setting Up an Installation Server
a	Configuring Network Server as an Installation Server
b	Setting Up a TFTP and DHCP Server for PXE Boot

B. Sc. (Information Technology)		Semester – V	
Course Name: Enterprise Java		Course Code: USIT5P6 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	Implement the following Simple Servlet applications.
a.	Create a simple calculator application using servlet.
b.	Create a servlet for a login page. If the username and password are correct then it says message “Hello <username>” else a message “login failed”
c.	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
2. Implement the following Servlet applications with Cookies and Sessions.	
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
b.	Create a servlet that uses Cookies to store the number of times a user has visited servlet.
c.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.
3. Implement the Servlet IO and File applications.	
a.	Create a Servlet application to upload and download a file.
b.	Develop Simple Servlet Question Answer Application using Database.
c.	Create simple Servlet application to demonstrate Non-Blocking Read Operation.
4. Implement the following JSP applications.	
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
b.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
c.	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
5. Implement the following JSP JSTL and EL Applications.	
a.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
b.	Create a JSP page to demonstrate the use of Expression language.
c.	Create a JSP application to demonstrate the use of JSTL.

6.	Implement the following EJB Applications.
a.	Create a Currency Converter application using EJB.
b.	Develop a Simple Room Reservation System Application Using EJB.
c.	Develop simple shopping cart application using EJB [Stateful Session Bean].
7.	Implement the following EJB applications with different types of Beans.
a.	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
b.	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
c.	Develop simple Marks Entry Application to demonstrate accessing Database using EJB.
8.	Implement the following JPA applications.
a.	Develop a simple Inventory Application Using JPA.
b.	Develop a Guestbook Application Using JPA.
c.	Create simple JPA application to store and retrieve Book details.
9.	Implement the following JPA applications with ORM and Hibernate.
a.	Develop a JPA Application to demonstrate use of ORM associations.
b.	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
c.	Develop a Hibernate application to store and retrieve employee details in MySQL Database.
10.	Implement the following Hibernate applications.
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.
b.	Develop Hibernate application to enter and retrieve course details with ORM Mapping.
c.	Develop a five page web application site using any two or three Java EE Technologies.

B. Sc. (Information Technology)		Semester – V	
Course Name: Next Generation Technologies Practical		Course Code: USIT5P7 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
1	MongoDB Basics
a	Write a MongoDB query to create and drop database.
b	Write a MongoDB query to create, display and drop collection
c	Write a MongoDB query to insert, query, update and delete a document.
2	Simple Queries with MongoDB
3	Implementing Aggregation
a	Write a MongoDB query to use sum, avg, min and max expression.
b	Write a MongoDB query to use push and addToSet expression.
c	Write a MongoDB query to use first and last expression.
4	Replication, Backup and Restore
a	Write a MongoDB query to create Replica of existing database.
b	Write a MongoDB query to create a backup of existing database.
c	Write a MongoDB query to restore database from the backup.
5	Java and MongoDB
a	Connecting Java with MongoDB and inserting, retrieving, updating and deleting.
6	PHP and MongoDB
a	Connecting PHP with MongoDB and inserting, retrieving, updating and deleting.
7	Python and MongoDB
a	Connecting Python with MongoDB and inserting, retrieving, updating and deleting.
8	Programs on Basic jQuery
a	jQuery Basic, jQuery Events
b	jQuery Selectors, jQuery Hide and Show effects
c	jQuery fading effects, jQuery Sliding effects

9	jQuery Advanced
a	jQuery Animation effects, jQuery Chaining
b	jQuery Callback, jQuery Get and Set Contents
c	jQuery Insert Content, jQuery Remove Elements and Attribute
10	JSON
a	Creating JSON
b	Parsing JSON
c	Persisting JSON
11	Create a JSON file and import it to MongoDB
a	Export MongoDB to JSON.
b	Write a MongoDB query to delete JSON object from MongoDB

SEMESTER VI

B. Sc. (Information Technology)		Semester – VI	
Course Name: Software Quality Assurance		Course Code: USIT601	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.</p> <p>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.</p>	12
II	<p>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester,</p>	12

	Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	
III	Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	12
IV	Software Verification and Validation: Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. V-test Model: Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.	12
V	Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages. Special Tests: Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Testing and Continuous Quality Improvement	William E. Lewis	CRC Press	Third	2016
2	Software Testing: Principles, Techniques and Tools	M. G. Limaye	TMH		2017
3.	Foundations of Software Testing	Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black	Cengage Learning	3 rd	
4.	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4 th	2017

B. Sc. (Information Technology)		Semester – VI	
Course Name: Security in Computing		Course Code: USIT602	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.</p> <p>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.</p> <p>Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p>	12
II	<p>Authentication and Authorization: Authentication, Authorization</p> <p>Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p> <p>Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.</p> <p>Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.</p>	12
III	<p>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.</p> <p>Network Device Security: Switch and Router Basics, Network Hardening.</p> <p>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p>Wireless Network Security: Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.</p>	12
IV	<p>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).</p> <p>Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.</p> <p>Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.</p>	12

V	<p>Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.</p> <p>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.</p> <p>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.</p>	12
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Complete Reference: Information Security	Mark Rhodes-Ousley	McGraw-Hill	2 nd	2013
2.	Essential Cybersecurity Science	Josiah Dykstra	O'Reilly	Fifth	2017
3.	Principles of Computer Security: CompTIA Security+ and Beyond	Wm.Arthur Conklin, Greg White	McGraw Hill	Second	2010

B. Sc. (Information Technology)		Semester – VI	
Course Name: Business Intelligence		Course Code: USIT603	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence</p> <p>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system</p>	12
II	<p>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models</p> <p>Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies</p> <p>Data preparation: Data validation, Data transformation, Data reduction</p>	12
III	<p>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines</p> <p>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models</p>	12
IV	<p>Business intelligence applications:</p> <p>Marketing models: Relational marketing, Sales force management,</p> <p>Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.</p> <p>Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices</p>	12
V	<p>Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management</p> <p>Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Verzellis	Wiley	First	2009
2.	Decision support and Business Intelligence Systems	Efrain Turban, Ramesh Sharda, Dursun Delen	Pearson	Ninth	2011
3.	Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	First	2015

B. Sc. (Information Technology)		Semester – VI	
Course Name: Principles of Geographic Information Systems		Course Code: USIT604 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis</p> <p>Geographic Information and Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects Organizing and Managing Spatial Data The Temporal Dimension</p>	12
II	<p>Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.</p>	12
III	<p>Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations</p>	12

	<p>Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology</p> <p>Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data</p>	
IV	<p>Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay operators, Raster overlay operators Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis Analysis: Network analysis, interpolation, terrain modeling GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation</p>	12
V	<p>Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox: What kind of data do I have? How can I map my data? How to map? How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Principles of Geographic Information Systems- An Introductory Text Book	Editors: Otto Huisman and Rolf A.	The International Institute of Geoinformation Science and Earth Observation	Fourth	2009

2.	Principles of Geographic Information Systems	P.A Burrough and R.A.McDonnell	Oxford University Press	Third	1999
3.	Fundamentals of Spatial Information Systems,	R.Laurini and D. Thompson,	Academic Press		1994
4.	Fundamentals of Geographic Information Systems	Michael N.Demers	Wiley Publications	Fourth	2009
5.	Introduction to Geographic Information Systems	Chang Kang-tsung (Karl),	McGrawHill	Any above 3 rd Edition	2013 7 th Edition
6.	GIS Fundamentals: A First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5 th Edition	

B. Sc. (Information Technology)		Semester – VI	
Course Name: Enterprise Networking		Course Code: USIT605 (Elective II)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>General Network Design: Network Design Methodology, Architectures for the Enterprise, Borderless Networks Architecture, Collaboration and Video Architecture, Data Center and Virtualization Architecture, Design Lifecycle: Plan, Build, Manage Plan Phase Build Phase Manage Phase Prepare, Plan, Design, Implement, Operate, and Optimize Phases Prepare Phase Plan Phase Design Phase Implement Phase Operate Phase Optimize Phase Summary of PPDIOO Phases Project Deliverables Design Methodology Identifying Customer Design Requirements Characterizing the Existing Network Steps in Gathering Information Network Audit Tools Network Checklist Designing the Network Topology and Solutions Top-Down Approach Pilot and Prototype Tests Design Document</p> <p>Network Design Models: Hierarchical Network Models Benefits of the Hierarchical Model, Hierarchical Network Design, Core Layer, Distribution Layer, Access Layer, Hierarchical Model Examples, Hub-and-Spoke, Design Collapsed Core, Design Enterprise Architecture Model, Enterprise Campus Module, Enterprise Edge Area, E-Commerce Module, Internet Connectivity Module, VPN/Remote Access, Enterprise WAN, Service Provider Edge Module, Remote Modules, Enterprise Branch Module, Enterprise Data Center Module, Enterprise Teleworker Module, High Availability Network Services, Workstation-to-Router Redundancy and LAN, High Availability Protocols, ARP Explicit Configuration, RDP, RIP, HSRP, VRRP, GLBP, Server Redundancy, Route Redundancy, Load Balancing, Increasing Availability, Link Media Redundancy</p>	12
II	<p>Enterprise LAN Design: LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules, 1000BASE-LX Long-Wavelength Gigabit Ethernet, 1000BASE-SX Short-Wavelength Gigabit Ethernet, 1000BASE-CX Gigabit Ethernet over Coaxial Cable, 1000BASE-T Gigabit Ethernet over UTP 86, 10 Gigabit Ethernet Design Rules, 10GE Media Types, EtherChannel, Comparison of Campus Media LAN Hardware, Repeaters, Hubs, Bridges, Switches, Routers, Layer 3 Switches, Campus LAN Design and Best Practices Best Practices for Hierarchical Layers, Access Layer Best Practices, Distribution Layer Best Practices, Core Layer Best Practices, STP Design Considerations, STP Toolkit, PortFast,</p>	12

	<p>UplinkFast, BackboneFast, Loop Guard, Root Guard, BPDU Guard, BPDU Filter, VLAN and Trunk Considerations, Unidirectional Link Detection (UDLD) Protocol, Large-Building LANs, Enterprise Campus LANs, Edge Distribution, Medium-Size LANs, Small and Remote Site LANs, Server Farm Module, Server Connectivity Options, Enterprise Data Center Infrastructure, Campus LAN QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping.</p> <p>Data Center Design: Enterprise DC Architecture, Data Center Foundation Components, Data Center Topology Components, Data Center Network Programmability, SDN, Controllers, APIs, ACI, Challenges in the DC, Data Center Facility Aspects, Data Center Space, Data Center Power, Data Center Cooling, Data Center Heat, Data Center Cabling, Enterprise DC Infrastructure, Data Center Storage, Data Center Reference Architecture, Defining the DC Access Layer, Defining the DC Aggregation Layer, Defining the DC Core Layer, Security in the DC, Fabric Extenders, Virtualization Overview, Challenges, Defining Virtualization and Benefits, Virtualization Risks, Types of Virtualization, Virtualization Technologies, VSS, VRF, vPC, Device Contexts, Server Virtualization, Server Scaling, Virtual Switching, Network Virtualization Design Considerations, Access Control, Path Isolation, Services Edge, Data Center Interconnect, DCI Use Cases, DCI Transport Options, DCI L2 Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.</p>	
<p>III</p>	<p>Wireless LAN Design: Wireless LAN Technologies, WLAN Standards, ISM and UNII Frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X-2001 Port-Based Authentication, Dynamic WEP Keys and LEAP, Controlling WLAN Access to Servers, WLAN Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intracontroller Roaming, Layer 2 Intercontroller Roaming, Layer 3 Intercontroller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh Design Recommendations, Campus Design Considerations, Power over Ethernet (PoE), Wireless and Quality of Service (QoS), Branch Design Considerations, Local MAC, REAP, Hybrid REAP, Branch Office Controller Options.</p> <p>WAN Technologies and the Enterprise Edge: WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise</p>	<p>12</p>

	<p>Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Frame Relay, Time-Division Multiplexing, Metro Ethernet, SONET/SDH, Multiprotocol Label Switching (MPLS), Dark Fiber, Dense Wavelength-Division Multiplexing, Ordering WAN Technology and Contracts, WAN and Edge Design Methodologies, Response Time, Throughput, Reliability, Bandwidth Considerations, WAN Link Categories, Optimizing Bandwidth Using QoS, Queuing, Traffic Shaping and Policing, Classification, Congestion Management, Priority Queuing, Custom Queuing, Weighted Fair Queuing, Class-Based Weighted Fair Queuing, Low-Latency Queuing, Traffic Shaping and Policing, Link Efficiency, Window Size, DMZ Connectivity, Segmenting DMZs, DMZ Services, Internet Connectivity, Centralized Internet (Branch) vs. Direct Internet (Branch), High Availability for the Internet Edge, VPN Network Design.</p> <p>WAN Design Traditional WAN Technologies Hub-and-Spoke Topology Full-Mesh Topology Partial-Mesh Topology Point-to-Point Topology Remote Site Connectivity Enterprise VPN vs. Service Provider VPN Enterprise Managed VPN: IPsec IPsec Direct Encapsulation Generic Routing Encapsulation IPsec DMVPN IPsec Virtual Tunnel Interface Design GETVPN Service Provider-Managed Offerings ,Metro Ethernet Service Provider VPNs: L2 vs. L3 ,Virtual Private Wire Services VPWS L2 VPN Considerations ,Virtual Private LAN Services VPLS L2 VPN Considerations ,MPLS, MPLS Layer 3 Design Overview MPLS L3 VPN Considerations ,VPN Benefits WAN Backup Design WAN Backup over the Internet Enterprise WAN Architecture Cisco Enterprise MAN/WAN Enterprise WAN/MAN Architecture Comparison ,Enterprise WAN Components Comparing Hardware and Software Enterprise Branch Architecture Branch Design Branch Connectivity Redundancy for Branches Single WAN Carrier vs. Dual WAN Carriers Single MPLS Carrier Site ,Dual MPLS Carriers Hybrid WAN: L3 VPN with IPsec VPN ,Internet for Branches Flat Layer 2 vs. Collapsed Core ,Enterprise Branch Profiles Small Branch Design Medium Branch Design Large Branch Design Enterprise Teleworker Design ,ISRs for Teleworkers</p>	
<p>IV</p>	<p>Internet Protocol Version 4 Design,IPv4 Header ToS IPv4 Fragmentation IPv4 Addressing ,IPv4 Address Classes Class A Addresses Class B Addresses ,Class C Addresses Class D Addresses Class E Addresses ,IPv4 Address Types IPv4 Private Addresses NAT ,IPv4 Address Subnets Mask Nomenclature IP Address Subnet Design Example Determining the Network Portion of an IP Address Variable- Length Subnet Masks, Loopback Addresses IP Telephony Networks ,IPv4 Addressing Design Goal of IPv4 Address Design , Plan for Future Use of IPv4 Addresses , Performing Route Summarization , Plan for a</p>	<p>12</p>

	<p>Hierarchical IP Address Network , Private and Public IP Address and NAT Guidelines , Steps for Creating an IPv4 Address Plan</p> <p>Case Study: IP Address Subnet Allocation , Address Assignment and Name Resolution , Recommended Practices of IP Address Assignment , BOOTP DHCP DNS , Internet Protocol Version 6 Design, IPv6 Header IPv6 Address Representation IPv4-Compatible IPv6 Addresses IPv6 Prefix Representation IPv6 Address Scope Types and Address Allocations IPv6 Address Allocations IPv6 Unicast Address Global Unicast Addresses Link-Local Addresses , Unique Local IPv6 Address Global Aggregatable IPv6 Address , IPv4-Compatible IPv6 Address IPv6 Anycast Addresses , IPv6 Multicast Addresses IPv6 Mechanisms ICMPv6 , IPv6 Neighbor Discovery Protocol IPv6 Name Resolution , Path MTU Discovery IPv6 Address-Assignment Strategies , Manual Configuration SLAAC of Link-Local Address , SLAAC of Globally Unique IPv6 Address DHCPv6 , DHCPv6 Lite IPv6 Security IPv6 Routing Protocols</p> <p>RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) for IPv6 , IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing</p> <p>IPv6 for the Enterprise IPv6 Address Allocation , Partly Linked IPv4 Address into IPv6, Whole IPv4 Address Linked into IPv6</p> <p>IPv6 Addresses Allocated Per Location and/or Type , IPv4-to-IPv6 Transition Mechanisms and Deployment Models , Dual-Stack Mechanism IPv6 over IPv4 Tunnels , Protocol Translation Mechanisms IPv6 Deployment Models , Dual-Stack Model Hybrid Model Service Block Model ,IPv6 Deployment Model Comparison IPv6 Comparison with IPv4 ,OSPF, BGP, Route Manipulation, and IP Multicast,OSPFv2 OSPFv2 Metric OSPFv2 Adjacencies and Hello Timers , OSPFv2 Areas OSPF Area Design Considerations OSPF Router Types OSPF DRs LSA Types Autonomous System External Path Types OSPF Stub Area Types Stub Areas Totally Stubby Areas , NSSAs Virtual Links OSPFv2 Router Authentication , OSPFv2 Summary OSPFv3 OSPFv3 Changes from OSPFv2, OSPFv3 Areas and Router Types OSPFv3 LSAs OSPFv3 Summary</p> <p>BGP BGP Neighbors eBGP iBGP Route Reflectors Confederations BGP Administrative Distance, BGP Attributes, Weight, and the BGP Decision Process</p> <p>BGP Path Attributes Next-Hop Attribute Local Preference Attribute Origin Attribute Autonomous System Path Attribute</p> <p>MED Attribute Community Attribute Atomic Aggregate and Aggregator Attributes Weight BGP Decision Process, BGP Summary, Route Manipulation PBR Route Summarization</p> <p>Route Redistribution Default Metric OSPF Redistribution Route Filtering Transit Traffic Routing Protocols on the Hierarchical Network Infrastructure IP Multicast Review, Multicast Addresses Layer 3 to Layer 2 Mapping IGMP, IGMPv1 IGMPv2 IGMPv3 CGMP IGMP Snooping, Sparse Versus Dense Multicast Multicast Source and Shared</p>	
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	Trees PIM PIM-SM PIM DR Auto-RP PIMv2 Bootstrap Router, DVMRP IPv6 Multicast Addresses	
V	<p>Managing Security</p> <p>Network Security Overview Security Legislation Security Threats Reconnaissance and Port Scanning Vulnerability Scanners Unauthorized Access Security Risks Targets Loss of Availability Integrity Violations and Confidentiality Breaches , Security Policy and Process Security Policy Defined , Basic Approach of a Security Policy Purpose of Security Policies, Security Policy Components Risk Assessment , Risk Index Continuous Security Integrating Security Mechanisms into Network Design Trust and Identity Management , Trust Domains of Trust Identity Passwords Tokens Certificates , Network Access Control Secure Services Encryption Fundamentals Encryption Keys VPN Protocols , Transmission Confidentiality Data Integrity Threat Defense , Physical Security Infrastructure Protection Security Management Solutions Security Solution Network Security Platforms , Trust and Identity Technologies Firewall Fundamentals , Types of Firewalls Next-Gen Firewalls NAT Placement , Firewall Guidelines Firewall ACLs , Identity and Access Control Deployments Detecting and Mitigating Threats IPS/IDS Fundamentals IPS/IDS Guidelines , Threat Detection and Mitigation Technologies , Threat-Detection and Threat-Mitigation Solutions , FirePOWER IPS Security Management Applications , Security Platform Solutions Security Management Network</p> <p>Integrating Security into Network Devices IOS Security, ISR G2 Security Hardware Options Securing the Enterprise, Implementing Security in the Campus Implementing Security in the Data Center Implementing Security in the Enterprise Edge</p> <p>Network Management Protocols, Simple Network Management Protocol SNMP Components, MIB SNMP Message Versions SNMPv1 SNMPv2 SNMPv3, Other Network Management Technologies RMON, RMON2 NetFlow Compared to RMON and SNMP, CDP LLDP Syslog</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	CCDA200-310 Official Cert Guide	ANTHONY BRUNO, CCIE No. 2738 STEVE JORDAN, CCIE No. 11293	Cisco Press		
2.	Network Warrior	Gary A Donabue	O Reilly	2 nd	2011

B. Sc. (Information Technology)		Semester – VI	
Course Name: IT Services Management		Course Code: USIT606 (Elective I)	
Periods per week (1 Period is 50 minutes),		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle.</p> <p>Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles.</p> <p>Service Strategy: Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution.</p> <p>Challenges, Critical Success factors and risks: Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.</p>	12
II	<p>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models</p> <p>Service Design Processes: Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management</p> <p>Challenges, Critical Success factors and risks: Challenges, Risks</p>	12
III	<p>Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition</p> <p>Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.</p>	12
IV	<p>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, a chieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation</p>	12

	<p>Service Operation Processes: Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks</p>	
V	<p>Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.</p> <p>CSI Process: The seven-step improvement process. CSI Methods nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, Organising for CSI: Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training.</p> <p>Technology considerations: Tools to support CSI activities.</p> <p>Implementing CSI: Critical Considerations for implementing CSI, The start, Governance, CSI and organisational change, Communication Strategy and Plan</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	ITIL v3 Foundation Complete Certification Kit				2009
2.	ITIL v3 Service Strategy		OGC/TSO		
3.	ITIL v3 Service Transition		OGC/TSO		
4.	ITIL v3 Service Operation		OGC/TSO		
5.	ITIL Continual Service Improvement		TSO	2011	2011

B. Sc. (Information Technology)		Semester – VI	
Course Name: Cyber Laws		Course Code: USIT607 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	<p>Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for “About to Commit” an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment!</p> <p>Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of “Cyber Crime “ and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.</p>	12
II	<p>Contracts in the Infotech World: Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts.</p> <p>Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.</p>	12
III	<p>Battling Cyber Squatters and Copyright Protection in the Cyber World: Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright</p>	12

	Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	
IV	<p>E-Commerce Taxation: Real Problems in the Virtual World: A Tug of War on the Concept of ‘Permanent Establishment’, Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act, 1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance.</p> <p>Digital Signature, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!</p>	12
V	<p>The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934.</p> <p>Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India.</p> <p>Amendments in Indian IT Act 2000</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH Education		2001
2.	Cybersecurity Law	Jeff Kosseff	Wiley		2017

B. Sc. (Information Technology)		Semester – VI	
Course Name: Project Implementation		Course Code: USIT6P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	150
	Internal	--	-

The details are given in Appendix – I

B. Sc. (Information Technology)		Semester – VI	
Course Name: Security in Computing Practical		Course Code: USIT6P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
1	Configure Routers
a	OSPF MD5 authentication.
b	NTP.
c	to log messages to the syslog server.
d	to support SSH connections.
2	Configure AAA Authentication
a	Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA
b	Verify local AAA authentication from the Router console and the PC-A client
3	Configuring Extended ACLs
a	Configure, Apply and Verify an Extended Numbered ACL
4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs
a	Verify connectivity among devices before firewall configuration.
b	Use ACLs to ensure remote access to the routers is available only from management station PC-C.
c	Configure ACLs on to mitigate attacks.
d	Configuring IPv6 ACLs
5	Configuring a Zone-Based Policy Firewall
6	Configure IOS Intrusion Prevention System (IPS) Using the CLI
a	Enable IOS IPS.
b	Modify an IPS signature.
7	Layer 2 Security
a	Assign the Central switch as the root bridge.
b	Secure spanning-tree parameters to prevent STP manipulation attacks.
c	Enable port security to prevent CAM table overflow attacks.
8	Layer 2 VLAN Security
9	Configure and Verify a Site-to-Site IPsec VPN Using CLI

10	Configuring ASA Basic Settings and Firewall Using CLI
a	Configure basic ASA settings and interface security levels using CLI
b	Configure routing, address translation, and inspection policy using CLI
c	Configure DHCP, AAA, and SSH
d	Configure a DMZ, Static NAT, and ACLs

B. Sc. (Information Technology)		Semester – VI	
Course Name: Business Intelligence Practical		Course Code: USIT6P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
1	Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.
4	a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.
5	a. Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7	Perform the data classification using classification algorithm.
8	Perform the data clustering using clustering algorithm.
9	Perform the Linear regression on the given data warehouse data.
10	Perform the logistic regression on the given data warehouse data.

The BI tools such as Tableau / Power BI / BIRT / R / Excel or any other can be used.

B. Sc. (Information Technology)		Semester – VI	
Course Name: Principles of Geographical Information System Practical		Course Code: USIT6P4 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
0	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data
4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
8	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
9	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas
10	Validating Map data

B. Sc. (Information Technology)		Semester – VI	
Course Name: Advanced Networking Practical		Course Code: USIT6P5 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
1	Configuring OSPF – I
a	Single-Area OSPF Link Costs and Interface Priorities
b	Multi-Area OSPF with Stub Areas and Authentication
2	Configuring OSPF – II
a	OSPF Virtual Links and Area Summarization
b	OSPF over Frame Relay
3	Redistribution and Administrative Distances
a	Redistribution Between RIP and OSPF
b	Manipulating Administrative Distances
4	BGP
a	Configuring BGP with Default Routing
b	Using the AS_PATH Attribute
c	BGP Route Reflectors and Route Filters
5	IPv6
a	Configuring OSPF for IPv6
b	Configuring 6to4 Tunnels
6	VLANs and EtherChannel
a	Static VLANs, VLAN Trunking, and VTP Domains and Modes
b	Configuring EtherChannel
7	Spanning Tree Protocol
a	Spanning Tree Protocol (STP) Default Behavior
b	Modifying Default Spanning Tree Behavior
8	VLAN and Spanning Tree
a	Per-VLAN Spanning Tree Behavior
b	Multiple Spanning Tree

9	Internal VLAN Routing
a	Inter-VLAN Routing with an External Router
b	Inter-VLAN Routing with an Internal Route Processor
10	Configure NAT Services

B. Sc. (Information Technology)		Semester – VI	
Course Name: Advanced Mobile Programming Practical		Course Code: USIT6P6	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

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

APPENDIX – 1

Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.

I. OBJECTIVES

- Describe the Systems Development Life Cycle (SDLC).
- Evaluate systems requirements.
- Complete a problem definition.
- Evaluate a problem definition.
- Determine how to collect information to determine requirements.
- Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.
- Work on data collection methods for fact finding.
- Construct and evaluate data flow diagrams.
- Construct and evaluate data dictionaries.
- Evaluate methods of process description to include structured English, decision tables and decision trees.
- Evaluate alternative tools for the analysis process.
- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
- Decide the S/W requirement specifications and H/W requirement specifications.
- Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- Design and evaluate system outputs.
- Design and evaluate systems inputs.
- Design and evaluate validity checks for input data.

- Design and evaluate user interfaces for input.
- Design and evaluate file structures to include the use of indexes.
- Estimate storage requirements.
- Explain the various file update processes based on the standard file organizations.
- Decide various data structures.
- Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.
- Perform normalization for the unnormalized tables for RDBMS related projects
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.

- Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.
- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
- Develop of the ability to assess the implications of work performed.
- Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles
- Develop of the ability to communicate effectively.

II. Type of the Project

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. Students are encouraged to work in the areas listed below. However, it is **not mandatory** for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

III. SOFTWARE AND BROAD AREAS OF APPLICATION

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), Tcl/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket programming
NETWORK/WIRELESS TECHNOLOGIES	-

REALTIME OPERATING SYSTEM/ EMBEDDED SKILLS	LINUX, Raspberry Pi, Arduino, 8051
APPLICATION AREAS	Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E-Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming.

IV. Introduction

The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

1.1 PROJECT REPORT:

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

Table of Contents

Table of Figures

CHAPTER 1: INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability

1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organisation of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

4.1 Basic Modules

4.2 Data Design

4.2.1 Schema Design

4.2.2 Data Integrity and Constraints

4.3 Procedural Design

4.3.1 Logic Diagrams

4.3.2 Data Structures

4.3.3 Algorithms Design

4.4 User interface design

4.5 Security Issues

4.6 Test Cases Design

The documentation should use tools like star UML, Visuo for windows, Rational Rose for design as part of Software Project Management Practical Course. The documentation should be spiral bound for semester V and the entire documentation should be hard bound during semester VI.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

5.2 Coding Details and Code Efficiency

- 5.2.1 Code Efficiency
- 5.3 Testing Approach
 - 5.3.1 Unit Testing
 - 5.3.2 Integrated Testing
 - 5.3.3 Beta Testing
- 5.4 Modifications and Improvements
- 5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

- 6.1 Test Reports
- 6.2 User Documentation

CHAPTER 7: CONCLUSIONS

- 7.1 Conclusion
 - 7.1.1 Significance of the System
- 7.2 Limitations of the System
- 7.3 Future Scope of the Project

REFERENCES

GLOSSARY

APPENDIX A

APPENDIX B

V. EXPLANATION OF CONTENTS

Title Page

Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format.

Original Copy of the Approved Proforma of the Project Proposal

Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format.

Certificate of Authenticated work

Sample format of Certificate of Authenticated work is given in Appendix 3 of this block. Students should follow the given format.

Role and Responsibility Form

Sample format for Role and Responsibility Form is given in Appendix 4 of this block.

Students should follow the given format.

Abstract

This should be one/two short paragraphs (100-150 words total), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.

Acknowledgements

This should express student's gratitude to those who have helped in the preparation of project.

Table of Contents: The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below.

Table of Figures: List of all Figures, Tables, Graphs, Charts etc. along with their page numbers in a table of figures.

Chapter 1: Introduction

The introduction has several parts as given below:

Background: A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with the project work.

Objectives: Concise statement of the aims and objectives of the project. Define exactly what is going to be done in the project; the objectives should be about 30 /40 words.

Purpose, Scope and Applicability: The description of Purpose, Scope, and Applicability are given below:

- **Purpose:** Description of the topic of the project that answers questions on why this project is being done. How the project could improve the system its significance and theoretical framework.
- **Scope:** A brief overview of the methodology, assumptions and limitations. The students should answer the question: What are the main issues being covered in the project? What are the main functions of the project?
- **Applicability:** The student should explain the direct and indirect applications of their work. Briefly discuss how this project will serve the computer world and people.

Achievements: Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? Goals achieved - describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.

Organisation of Report: Summarising the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

Chapter 2: Survey of Technologies

In this chapter Survey of Technologies should demonstrate the students awareness and understanding of Available Technologies related to the topic of the project. The student should give the detail of all the related technologies that are necessary to complete the project. The should describe the technologies available in the chosen area and present a comparative study of all those Available Technologies. Explain why the student selected the one technology for the completion of the objectives of the project.

Chapter 3: Requirements and Analysis

Problem Definition: Define the problem on which the students are working in the project.

Provide details of the overall problem and then divide the problem in to sub-problems. Define each sub-problem clearly.

Requirements Specification: In this phase the student should define the requirements of the system, independent of how these requirements will be accomplished. The Requirements Specification describes the things in the system and the actions that can be done on these things. Identify the operation and problems of the existing system.

Planning and Scheduling: Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules, known as constraints, which, control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry out the plan. The student should show the Gantt chart and Program Evaluation Review Technique (PERT).

Software and Hardware Requirements: Define the details of all the software and hardware needed for the development and implementation of the project.

- **Hardware Requirement:** In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.
- **Software Requirements:** In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed.

Preliminary Product Description: Identify the requirements and objectives of the new system. Define the functions and operation of the application/system the students are developing as project.

Conceptual Models: The student should understand the problem domain and produce a model of the system, which describes operations that can be performed on the system, and the allowable sequences of those operations. Conceptual Models could consist of complete Data Flow Diagrams, ER diagrams, Object-oriented diagrams, System Flowcharts etc.

Chapter 4: System Design

Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudocode and other documentation.

Basic Modules: The students should follow the divide and conquer theory, so divide the overall problem into more manageable parts and develop each part or module separately. When all modules are ready, the student should integrate all the modules into one system. In this phase, the student should briefly describe all the modules and the functionality of these modules.

Data Design: Data design will consist of how data is organised, managed and manipulated.

- **Schema Design:** Define the structure and explanation of schemas used in the project.
- **Data Integrity and Constraints:** Define and explain all the validity checks and constraints provided to maintain data integrity.

Procedural Design: Procedural design is a systematic way for developing algorithms or procedurals.

- **Logic Diagrams:** Define the systematical flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.
- **Data Structures:** Create and define the data structure used in procedures.
- **Algorithms Design:** With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

User Interface Design: Define user, task, environment analysis and how to map those requirements in order to develop a “User Interface”. Describe the external and internal components and the architecture of user interface. Show some rough pictorial views of the user interface and its components.

Security Issues: Discuss Real-time considerations and Security issues related to the project and explain how the student intends avoiding those security problems. What are the security policy plans and architecture?

Test Cases Design: Define test cases, which will provide easy detection of errors and mistakes with in a minimum period of time and with the least effort. Explain the different conditions in which the students wish to ensure the correct working of the project.

Chapter 5: Implementation and Testing

Implementation Approaches: Define the plan of implementation, and the standards the students have used in the implementation.

Coding Details and Code Efficiency: Students not need include full source code, instead, include only the important codes (algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way.

The student can explain the function of the code with a shot of the output screen of that program code.

- Code Efficiency: The student should explain how the code is efficient and how the students have handled code optimisation.

Testing Approach: Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain the approach of testing.

- Unit Testing: Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but, do confine the test within one module.

- Integrated Testing: Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.

Modifications and Improvements: Once the students finish the testing they are bound to be faced with bugs, errors and they will need to modify your source code to improve the system. Define what modification are implemented in the system and how it improved the system.

Chapter 6: Results and Discussion

Test Reports: Explain the test results and reports based on the test cases, which should show that the project is capable of facing any problematic situation and that it works fine in different conditions. Take the different sample inputs and show the outputs.

User Documentation: Define the working of the software; explain its different functions, components with screen shots. The user document should provide all the details of the product in such a way that any user reading the manual, is able to understand the working and functionality of the document.

Chapter 7: Conclusions

Conclusion: The conclusions can be summarised in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that would have made in the other chapters.

Limitations of the System: Explain the limitations encountered during the testing of the project that the students were not able to modify. List the criticisms accepted during the demonstrations of the project.

Future Scope of the Project describes two things: firstly, new areas of investigation prompted by developments in this project, and secondly, parts of the current work that was not completed due to time constraints and/or problems encountered.

REFERENCES

It is very important that the students acknowledge the work of others that they have used or adapted in their own work, or that provides the essential background or context to the project. The use of references is the standard way to do this. Please follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports.

E.g:

Linhares, A., & Brum, P. (2007). Understanding our understanding of strategic scenarios: What role do chunks play? *Cognitive Science*, 31(6), 989-1007.
<https://doi.org/doi:10.1080/03640210701703725>

Lipson, Charles (2011). Cite right : A quick guide to citation styles; MLA, APA, Chicago, the sciences, professions, and more (2nd ed.). Chicago [u.a.]: University of Chicago Press. p. 187. ISBN 9780226484648.

Elaine Ritchie, J Knite. (2001). *Artificial Intelligence, Chapter 2 , p.p 23 - 44.* Tata McGrawHill.

GLOSSARY

If you the students any acronyms, abbreviations, symbols, or uncommon terms in the project report then their meaning should be explained where they first occur. If they go on to use any of them extensively then it is helpful to list them in this section and define the meaning.

APPENDICES

These may be provided to include further details of results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

In particular, if there are technical details of the work done that might be useful to others who wish to build on this work, but that are not sufficiently important to the project as a whole to justify being discussed in the main body of the project, then they should be included as appendices.

VI. SUMMARY

Project development usually involves an engineering approach to the design and development of a software system that fulfils a practical need. Projects also often form an important focus for discussion at interviews with future employers as they provide a detailed example of what the students are capable of achieving. In this course the students can choose your project topic from the lists given in Unit 4: Category-wise Problem Definition.

VII. FURTHER READINGS

1. Modern Systems Analysis and Design; Jeffrey A. Hoffer, Joey F. George, Joseph, S. Valacich; Pearson Education; Third Edition; 2002.
2. ISO/IEC 12207: Software Life Cycle Process
(<http://www.software.org/quagmire/descriptions/iso-iec12207.asp>).
3. IEEE 1063: Software User Documentation (<http://ieeexplore.ieee.org>).
4. ISO/IEC: 18019: Guidelines for the Design and Preparation of User Documentation for Application Software.
5. <http://www.sce.carleton.ca/squall>.
6. <http://en.tldp.org/HOWTO/Software-Release-Practice-HOWTO/documentation.html>.
7. <http://www.sei.cmu.edu/cmm/>



PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be summarily rejected.)

PNR No.:

no Roll: _____

1. Name of the Student

2. Title of the Project

3. Name of the Guide

4. Teaching experience of the Guide _____

5. Is this your first submission?

Yes

No

Signature of the Student

Signature of the Guide

Date:

Date:

Signature of the Coordinator

Date:

(All the text in the report should be in times new roman)

TITLE OF THE PROJECT
(NOT EXCEEDING 2 LINES, 24 BOLD,
ALL CAPS)

A Project Report (12 Bold)
Submitted in partial fulfillment of the
Requirements for the award of the Degree of (size-12)

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)(14 BOLD,
CAPS)

By(12 Bold)

Name of The Student (size-15, title case)
Seat Number (size-15)

Under the esteemed guidance of (13 bold)
Mr./Mrs. Name of The Guide (15 bold, title case)
Designation (14 Bold, title case)

COLLEGE LOGO

DEPARTMENT OF INFORMATION TECHNOLOGY(12 BOLD, CAPS)
COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (12, Title case, bold, italic)
CITY, PIN CODE(12 bold, CAPS)
MAHARASHTRA (12 bold, CAPS)
YEAR (12 bold)

COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (13, bold, italic)
CITY-MAHARASHTRA-PINCODE(13 bold, CAPS)

DEPARTMENT OF INFORMATION TECHNOLOGY (14 BOLD, CAPS)

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, "**Title of The Project** ", is bonafied work of **NAME OF THE STUDENT** bearing Seat.No: **(NUMBER)** submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai. (12, times new roman, justified)

Internal Guide (12 bold)

Coordinator

(Don't write names of lecturers or HOD)

External Examiner

Date:

College Seal

COMPANY CERTIFICATE (if applicable)

(Project Abstract page format)

Abstract (20bold, caps, centered)

Content (12, justified)

**Note: Entire document should be with 1.5
line spacing and all paragraphs should start with 1 tab space.**

ACKNOWLEDGEMENT

(20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, justified.

(Declaration page format)

DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, “**Title of the Project**” done at **place where the project is done**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

Name and Signature of the Student

TABLE OF CONTENTS (20bold, caps, centered)

Should be generated automatically using word processing software.

Chapter 1: Introduction	01(no bold)
1.1 Background	02(no bold)
1.2 Objectives
1.3 Purpose and Scope
1.2.1 Purpose
1.2.2 Scope	

.....
.....

Chapter 2: System Analysis	
2.1 Existing System	
2.2 Proposed System	
2.3 Requirement Analysis	
2.4 Hardware Requirements	
2.5 Software Requirements	
2.6 Justification of selection of Technology	

Chapter 3: System Design	
3.1 Module Division	
3.2 Data Dictionary	
3.3 ER Diagrams	
3.4 DFD/UML Diagrams	

Chapter 4: Implementation and Testing

4.1 Code (Place Core segments)	
4.2 Testing Approach	
4.2.1 Unit Testing (Test cases and Test Results)	
4.2.2 Integration System (Test cases and Test Results)	

Chapter 5: Results and Discussions (Output Screens)	
Chapter 6: Conclusion and Future Work	
Chapter 7: References	

List of Tables (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

List of Figures (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

(Project Introduction page format)

Chapter 1

Introduction (20 Bold, centered)

Content or text (12, justified)

Note: Introduction has to cover brief description of the project with minimum 4 pages.

Chapter 2

System Analysis (20 bold, Centered)

Subheadings are as shown below with following format (16 bold, CAPS)

2.1 Existing System (16 Bold)

2.1.1 ----- (14 bold, title case)

2.1.1.1 ----- (12 bold, title case)

2.2 Proposed System

2.3 Requirement Analysis

2.4 Hardware Requirements

2.5 Software Requirements

2.6 Justification of Platform – (how h/w & s/w satisfying the project)

Table 2.1: Caption

Chapter 3

System Design (20 bold, centered)

Subheadings are as shown below with following format (16 bold, CAPS)
Specify figures as Fig 11.1 – caption

3.1 Module Division

3.2 Data Dictionary

3.3 E-R Diagrams

3.4 Data Flow Diagrams / UML

Note: write brief description at the bottom of all diagrams

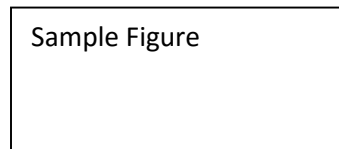


Fig. 3.1: Caption

Chapter 4

Implementation and Testing (20 bold, centered)

4.1 Code (Place Core segments)

Content includes description about coding phase in your project (Font-12)

(* don't include complete code-----just description)

4.2 Testing Approach

Subheadings are as shown below with following format (16 bold, CAPS)

4.2.1 Unit Testing

4.2.2 Integration Testing

Note:

- Explain about above testing methods
- Explain how the above techniques are applied in your project
Provide Test plans, test cases, etc relevant to your project

Chapter 5

Results and Discussions (20 bold, centered)

Note: Place Screen Shots and write the functionality of each screen at the bottom

Chapter 6

Conclusion and Future Work (20 bold, centered)

The conclusions can be summarized in a fairly short chapter around 300 words. Also include limitations of your system and future scope (12, justified)

Chapter 7

References (20 bold, centered)

Content (12, LEFT)

[1] Title of the book, Author

[2] Full URL of online references

[3] -----

*** NOTE ABOUT PROJECT VIVA VOCE:**

Student may be asked to write code for problem during VIVA to demonstrate his coding capabilities and he/she may be asked to write any segment of coding used in the in the project. The project can be done in group of at most four students. However, the length and depth of the project should be justified for the projects done in group. A big project can be modularised and different modules can be assigned as separate project to different students.

Marks Distribution:

Semester V: 50 Marks

Documentation: 50 marks

Semester VI: 150 Marks

Documentation: 50 Marks:

Implementation and Viva Voce: 100 Marks

The plagiarism should be maintained as per the UGC guidelines.