CLASS: B. Sc (Information technology)		Semester – IV	
COURSE: Software Engineering			
Periods per week **1 Period is 50 minutes**	**Lecture**	**5**	
	TW/Tutorial/Practical	**3**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	TW/Tutorial/Practical	**--**	**50**

Unit-I	**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
Unit-II	**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
Unit-III	**Requirements Engineering Processes** : Feasibility study, Requirements elicitation and anlaysis, Requirements Validations, Requirements Management. **System Models** : Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods. **Architectural Design :** Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures
Unit-IV	**Application Architectures** : Data Processing Systems, Transaction Processing Systems, Event Processing Systems, Language Processing Systems **Object Oriented Design** : Objects and Object Classes, An object Oriented Design Process, Design Evolution **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
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
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

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

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

Tutorial: At least **t**hree 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	
COURSE: Multimedia			
Periods per week **1 Period is 50 minutes**	**Lecture**	**5**	
	TW/Tutorial/Practical	**3**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	TW/Tutorial/Practical	**--**	**50**

Unit-I	**Introduction:** What is multimedia? Defining the scope of multimedia. Applications of multimedia, hardware and software requirements, multimedia database.
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.
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.
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
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.
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.

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.

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

Tutorial: At least **t**hree tutorials based on above syllabus must be conducted.

Mini Project: Develop a multimedia application

CLASS: B. Sc (Information technology)		Semester – IV	
COURSE: Java and Data Structures			
Periods per week **1 Period is 50 minutes**	**Lecture**	**5**	
	TW/Tutorial/Practical	**3**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	TW/Tutorial/Practical	**--**	**50**

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.
Unit-II	**Derived concepts:** Inheritance, Packages and Interfaces, Exception Handling, String handling, Multithreaded Programming
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
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
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
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.

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

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	
COURSE: Quantitative Techniques			
Periods per week **1 Period is 50 minutes**	**Lecture**	**5**	
	TW/Tutorial/Practical	**3**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	TW/Tutorial/Practical	**--**	**50**

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.
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 1st and 2nd Order Differential Equations.
Unit-III	**Random variables:** Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance. **Moments and moment generating functions:** Relation between Raw moments and Central moments. **Distributions:** Binomial, Poisson, Normal, exponential, uniform distributions for detailed study, Central Limit theorem (statement only) and problems based on this theorem.
Unit-IV	**Fitting of curves:** Least square method, Fitting the straight line and parabolic curve, Correlation, Covariance, Karl Pearson's coefficient and Spearman' s Rank, correlation coefficient, Regression coefficients and lines of regression.
Unit-V	**Sampling distribution:** Test of Hypothesis, Level of Significance, Critical Region, One Tailed and Two Tailed Test, Interval Estimation of Population Parameters, Test of Significance for large Samples and small Samples, Student's 't' Distribution and its properties.
Unit-VI	**Chi-Square Distribution and its properties,** Test of the Goodness of Fit and Independence of Attributes, Contingency Table, Yates Correction **Mathematical Programming:** Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution, Primal Simplex Method.

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

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 $1/3^{rd}$ rule.
    c. Program for numerical integration using Simpson's $3/8^{th}$ 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 2^{nd} order and 4^{th} 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:**
    a. Model sampling from Binomial and Poisson Populations.
    b. Model sampling from Uniform, Normal and Exponential Populations.
    c. Large sample tests-(Single mean, difference between means, single proportion, difference between proportions, difference between standard deviations.)
    d. Tests based on students 't-test'(Single mean, difference between means and paired 't')
10. **Practical 10: Chi-square test and LPP**
    a. Test based on Chi-square- Distribution (Test for variance, goodness of Fit,)
    b. Chi-square test of independence of attributes.
    c. Solution of LPP by Simplex method.

CLASS: B. Sc (Information technology)		Semester – IV	
COURSE: Embedded Systems			
Periods per week **1 Period is 50 minutes**	**Lecture**	**5**	
	TW/Tutorial/Practical	**3**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	TW/Tutorial/Practical	**--**	**50**

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.
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.
Unit-III	**Programming embedded systems:** structure of embedded program, infinite loop, compiling , linking and locating, downloading and debugging
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
Unit-V	**Peripherals:** Control and Status Registers, Device Driver, Timer Driver- Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process
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.

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

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

Tutorial: At least **t**hree 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.