SHIVAJI UNIVERSITY, KOLHAPUR

“A”

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Revised Syllabus and Structure of
(B.E. Computer Science & Engineering
Sem – VII & VIII )

To be introduced from the academic year 2016-17
(i.e. from June 2016) Onwards

(Subject to the modifications will be made from time to time)
### SEMESTER VII

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### SEMESTER VIII

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**Elective – I**
A. Soft Computing  
B. Mobile Applications  
C. Adhoc Wireless Networks

**Elective – II**
A. Internet of Things  
B. Software Testing and Quality Assurance  
C. Introduction to Mainframes
Note:

1. The term work as prescribed in the syllabus is to be periodically and jointly assessed by a team of teachers from the concerned department.
2. In case of tutorials, students of different batches be assigned problems of different types and be guided for the solution of the problem during tutorial session. Problems thus solved be translated into computer programs wherever applicable and executed by respective batches during practical session.
3. The assignments of tutorials and practical’s need to be submitted in the form of soft copy and / or written journal.
4. The Term Work (TW) Assessment be done based on the performance of the student in the Class Tests, Timely submission of Tutorials/Assignments, Practical Performance during the entire semester etc.
5. Project work should be continually evaluated based on:
   a. The contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
   b. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
6. In addition to the above list of electives, any other elective based on the current developments and need may be offered with prior sanction from the University Authorities.
7. The elective should be offered by the department, if the minimum number of students opting for a particular elective must be 15 students and it should be taught by the concerned teacher.
B.E. (COMPUTER SCIENCE & ENGINEERING) Sem – VII
CS7C01. ADVANCED COMPUTER ARCHITECTURE

Lecture : 4 hrs / week  Theory : 100 Marks
Tutorials : 1 hr/ week  Term work : 25 Marks

Pre-requisite: Digital systems and microprocessors, computer organization and architectures.

Objectives:
1. To understand different computer architectures
2. To learn concepts of pipeline architectures and different performance measures
3. To understand memory organizations
4. To understand latest technologies in parallel processing
5. To understand loosely coupled architectures

Section - I

Unit 1. Introduction

Unit 2. Principles of Pipelining and Vector Processing:
Pipelining, linear pipelining, classification of Pipeline Processors, Interleaved memory organizations, performance evaluation factors. Vector processing concepts, characteristics, pipelined vector processors, Cray type vector processor - design e.g. Array processors, Systolic arrays.

Unit 3. Different parallel processing architectures:
Introduction to Associative memory processors, Multithreaded architecture — principles of multithreading, Latency hiding techniques, Scalable coherent multiprocessor model with distributed shared memory.

Section - II

Unit 4. Distributed Memory Architecture :
Loosely coupled and tightly coupled architectures. Cluster computing as an application of loosely coupled architecture. Examples – CM*.

Unit 5. Data-Level Parallelism in Vector, SIMD and GPU Architectures
Introduction, Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units Detecting and Enhancing Loop-Level Parallelism, Crosscutting Issues Mobile versus Server GPUs and Tesla versus Core i7.

Unit 6. Program and Network Properties:
Conditions of parallelism Data and Resource Dependences, Data dependency analysis - Bernstein’s condition, Hardware and Software Parallelism, Grain Sizes and Latency, Grain Packing and Scheduling.

Text Books:
1. Advanced computer architecture – Kai Hwang (MGH). (for Unit 1, 3 & 6)
2. Computer Architecture & Parallel Processing – Kai Hwang & Briggs (MGH) (for Unit 2 & 4)

Reference Books:
1. Advanced computer Architecture – Dezso Sima, Terence Fountain & Peter Kacsuk (Pearson Education)

Term Work: It should consist of minimum 8-10 assignments with emphasis on solving exercise problems

CS7L02. DISTRIBUTED SYSTEMS

Lecture : 3 hrs / week 
Practical : 2 hrs/ week 
Theory : 100 Marks 
Term work : 25 Marks

Objectives:
1. To present the principles underlying the function of distributed systems and their extension to grid and cloud computing and virtualization techniques
2. To expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles and paradigms, including grid and cloud computing
3. Expose students to past and current research issues in the field of distributed systems and new challenges in cloud computing
4. Enhance students understanding of key issues related to multi-level interoperability across a distributed infrastructure and across multiple heterogeneous and distributed resources in a dynamically changing computing environment

Section I

UNIT 1: Introduction (5)
UNIT 2: Communication and Synchronization : (8)
Remote Procedure Call, Message Oriented Transient Communication, Physical Clock
Synchronization, Logical Clock, Mutual exclusion, Election Algorithms

UNIT 3: Distributed File Systems and Fault Tolerance (8)
Architecture, Processes, Communication, Naming, Synchronization, Consistency and
Replication, Introduction to fault tolerance, Process Resilience, Distributed Commit, Recovery.

Section II

UNIT 4: Introduction to Cloud (4)
Getting to know the Cloud, Cloud and other similar configurations, Components of Cloud
Computing, Cloud Types and Models: Private Cloud, Community Cloud, Public Cloud, Hybrid
Clouds.

UNIT 5: Virtualization (5)
Introduction and benefits, Implementation Levels of Virtualization, Virtualization at the OS
Level, Virtualization Structure, Virtualization Mechanism, Open Source Virtualization
Technology, Xen Virtualization Architecture, Binary Translation with Full Virtualization,
Paravirtualization, Virtualization of CPU, Memory and I/O Devices.

UNIT 6: Cloud Computing Services and Data Security in Cloud (6)
Infrastructure as a Service, Platform as a Service, Software as a Service, Database as a Service ,
Specialized Cloud Services, Challenges with Cloud Data, Challenges with Data Security, Data
Confidentiality and Encryption, Data availability, Data Integrity, Cloud Storage Gateways.

Text Books:

Reference Books:

List of experiments:
1. Study / Configuring P2P clients
2. RPC
3. Configuring the Client/Server for NTP
4. Simulation of Mutual Exclusion Algorithms
5. Simulation of Election algorithms
6. Client/Server Configuration of NFS
7. Auto mounting in NFS
8. Simulation of Distributed Commit
9. Simulation of recovery techniques
10. Installing a private cloud
11. Installing OS on a Virtual Machine Monitor
12. Offline migration of virtual OS
13. Live migration of virtual OS
14. Developing application on Google AppEngine

(Minimum 4 experiments from Section-I and 4 from Section-II should be framed based on the above list)

CS7L03. ADVANCED DATABASE SYSTEMS

<table>
<thead>
<tr>
<th>Lecture</th>
<th>: 3 hrs / week</th>
<th>Theory</th>
<th>: 100 Marks</th>
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<tr>
<td>Practical</td>
<td>: 2 hrs/ week</td>
<td>Term work</td>
<td>: 25 Marks</td>
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<td>OE</td>
<td>: 50 Marks</td>
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Objectives:

1. To learn Basics of design of databases.
2. To acquire knowledge on parallel and distributed databases and its applications.
3. To study the usage and applications of Object Oriented database.
4. To Understand and perform common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
5. To understand the usage of advanced data models.

Section - I

Unit I: Parallel and Distributed Databases


Unit II: Object And Object Relational Databases


Unit III : Advanced SQL

PL SQL- A Basic introduction, Functions and Procedure, Packages, Synonyms, Database Links, Embedded SQL and Dynamic SQL. Database Design: systems development life cycle, database life cycle, DBMS Software Selection, top-down versus bottom-up design, centralized versus decentralized design.
Section - II

Unit IV: Database Security and Authorization (5)

Discretionary Access Control, Mandatory Access Control, Audit Trails in Databases, Statistical Databases

Unit V: Databases on the Web and Semi-structured data (5)

Overview of XML, structure of XML data, document schema, querying XML data, storage of XML data, XML applications, the semi-structure data model, implementation issues, indexes for text data.

Unit VI: Business Intelligence and Data Warehouses (5)

The Need for Data Analysis, Business Intelligence, Business Intelligence Architecture, Decision Support Data, Online Analytical Processing, Star Schemas, Implementing a Warehouse, Data Mining, SQL Extension for OLAP.

Text Books:
1. Database System Concepts – Silberschatz, Korth, Sudarshan – 5th Edi (MGH International edition). (Unit No.1,Unit No.5,Unit No.2)
2. Fundamentals of Database Systems - Elmasri and Navathe [4e], Pearson Education ( Unit No.2)
3. Database Systems, Design, Implementation and Management - Coronel-Morris- Rob ( Unit No.3,4,6)

References:

Term Work:

It should consist of minimum 8-10 assignments, based on the syllabus and below mentioned experiment list.

1. To develop and write SQL queries for a distributed database of Bookstore at four sites S1, S2, S3 and S4. The Bookstores are divided into four sites by their ZIP codes.
2. Deadlock Detection Algorithm For Distributed Database Using Wait For Graph.
3. Implement Partitioning on the tables.
4. Implement semi join in distributed DBMS.
5. Implement bloom join in Distributed DBMS.
6. Implement two phase commit in distributed DBMS.
7. Develop an application using multi-valued Attributes, complex types, procedure, function and Inheritance in ORDBMS.

8. Demonstration of Active Database.

9. Implementation of Synonyms and Sequence.

10. Implementation of XML commands.


12. Implement K-Means Data Mining Clustering Algorithm.

13. Implement a priori algorithm.


15. Implementation of cube operator in OLAP queries in data warehousing and decision support system.

16. Implement view modification and materialization in data warehousing and decision support systems.

**CS7E04. ELECTIVE – I A) Soft Computing**

<table>
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<tr>
<th>Lecture</th>
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<tr>
<td>Tutorials</td>
<td>1 hr/ week</td>
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**Course Objectives:**

1. To earn fuzzy set theory and properties of Fuzzy sets.
2. To learn Neuro-Fuzzy modeling concepts
3. To learn Neural networks and training algorithms
4. To apply derivative based and derivative free optimization
5. To demonstrate applications of computational intelligence

**Section - I**

**Unit 1:** Introduction: Artificial Neural Network, Advantages of Neural Network, Fuzzy Logic, Genetic Algorithms, Hybrid Systems: Neuro Fuzzy Hybrid System, Neuro Genetic Hybrid System, Fuzzy Genetic Hybrid System. (4)

**Unit 2.** Artificial Neural Networks: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Reparability, Hebb Network. (7)

**Unit 3.** Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neuron, Back Propagation Network, Radial Basis Function Network. (7)
Section - II


Unit 6. Applications of Soft Computing: GA Based Internet Search Technique; Soft Computing Based Hybrid Fuzzy Controllers. (4)

Text Books:
2) Elements of Artificial Neural Networks - K Mehrotra, C.K. Mohan, and S. Ranka Published by MIT Press, 1997)

Reference Books:

Term Work: It should consist of minimum 10-12 assignments including problem solving assignments based on Neural Networks and Fuzzy Logic.

CS7E04. ELECTIVE – I B) Mobile Applications

Lecture : 3 hrs / week  Theory : 100 Marks
Tutorials : 1 hr/ week  Term work : 25 Marks

Course Objectives:
1. To develop problem solving abilities using Mobile Applications
2. To study different Mobile OS
3. To study procedure to develop applications using Mobile OS.
4. To study practical applications of Mobile.

Section - I
Unit 1: Introduction
Mobile Development Importance, Survey of mobile based application development, Mobile myths, Third party frameworks, Mobile Web Presence and Applications, Creating consumable web services for mobile, JSON, Debugging Web Services, Mobile Web Sites, Starting with Android mobile Applications.

Unit 2: Mobile Web
Introduction, WAP1, WAP2, Fragmentation Display, Input Methods, Browsers and Web Platforms, Tools for Mobile Web Development.

Unit 3: Application Architectures and Designs
Mobile Strategy, Navigation, Design and User Experience, WML, XHTML Mobile Profile and Basics, Mobile HTML5, CSS for Mobile, WCSS extensions, CSS3, CSS for mobile browsers, HTML5 Compatibility levels, Basics of Mobile HTML5: Document Head, Document Body, HTML5 Mobile Boilerplate, the Content, HTML5 Forms: Design, Elements, Attributes, validation.

Section - II

Unit 4 : Devices, Images, Multi-Media

Unit 5: Advanced Tools, Techniques

Unit 6: Advanced Applications
Geolocation and Maps APP, Offline Apps, Storage, and Networks, Distribution and Social Web 2.0

Text Books:

Reference Books:

Term Work: It should consist of minimum 10-12 assignments based on latest Web Technologies and Mobile operating systems.
CS7E04. ELECTIVE – I C) Adhoc Wireless Networks

Lecture : 3 hrs / week   Theory : 100 Marks
Tutorials : 1 hr/ week   Term work : 25 Marks

Course Objectives:-
To expose students to:

1. Adhoc wireless networks, their unique applications and design issues.
2. How Adhoc N/w works at MAC layer, forwarding mechanism and link recovery strategies.
3. Different routing mechanisms in Adhoc N/w, finding path from source node to destination node, recovery of routes.
4. Forming multicast sessions in Adhoc N/w, efficiently using resources available in networks.
5. Modification in traditional TCP protocol to make it best suitable for Adhoc Wireless Network.
6. Security issues in Adhoc N/w and strategies to overcome these issues.
7. Strategies for providing QoS in Adhoc N/w and dealing with power management issues to effectively use energy in Adhoc N/w.

Section - I

Unit 1. Introduction to Ad-hoc wireless networks: (3)

Unit 2. MAC Protocols for Ad-hoc wireless networks: (6)
Introduction, Issues in designing MAC protocol, Design goals of MAC protocol, Classification of MAC protocols, Contention based protocols :- MACAW, Busy Tone Multiple Access, MACA-By Invitation, Media Access with Reduced Handshake.

Unit 3. Routing protocols for Ad-hoc wireless networks (8)
Introduction, Issues in designing a routing protocol for ad hoc wireless networks, Classification of routing protocols, Table driven protocols :- DSDV, WRP, CGSR; On-Demand Hybrid routing protocols:- DSR, AODV, LAR, ABR, SSA , ZRP, ZHLS.

Section - II

Unit 4. Multicast Routing in Ad hoc wireless networks (8)
Introduction, Issues in designing a multicast routing protocol, Operation of multicast routing protocols, An architecture reference model for multicast routing protocols, Classification of multicast routing protocols, Tree-based Multicast Routing Protocols:- BEMR, MZRP, ABAM, PLBM, MAODV ; Mesh-based multicast routing protocols:- NSMP, CAMP.

Unit 5. Transport layer and security protocols for ad hoc wireless networks (6)
Introduction, Design issues and goals, Classification of transport layer solutions, TCP over ad hoc wireless networks:- TCP-F,Ad Hoc TCP, Split TCP; Security in ad hoc wireless networks:- ,

Unit 6. Energy Management and Quality of Service

Introduction, Need, Classification of energy management schemes, System Power Management schemes- Processor Power Management Scheme, Device Power Management Scheme, Issues and challenges, Classification of QoS solutions, QoS framework – INSIGNIA, INORA, SWAN.

Text Books:


Reference Books:

1. Ad Hoc Wireless Networks – A communication Theoretic perspective by O.K.Tonguz & G.Ferrari, Wiley India.
3. Ad Hoc Networking by Charles E. Perkins (Pearson Education)
5. Mobile AD HOC Networking, Student Edition; by Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic
6. The Handbook Of Ad Hoc Wireless Networks By Mohammad Ilyas Florida Atlantic University Boca Raton, Florida.(for Network Simulation Tool )

Term Work:

It should consist of minimum 8-10 assignments based on the above topics and some assignments should be on NS-2/3 to simulate MAC, Routing and Multicast routing protocols.

CS7L05. WEB TECHNOLOGIES - I

Lecture : 3 hrs / week Term work : 50 Marks
Practical : 4 hrs/ week POE : 50 Marks

Course Objectives:

1. To introduce students to emerging web technologies
2. To teach front end web designing tools and to develop web applications
3. To know XML concepts and its applications
4. To motivate students to develop web applications using Servlets and JSP

Section - I

Unit 1: Front End Web Designing (7)

HTML Design Patterns: HTML Structure, XHTML, DOCTYPE, Header Elements, Conditional Style Sheet, Structural Block Elements, Terminal Block Elements, Multipurpose Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces

CSS Selector and Inheritance: Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudo-class Selectors, Subclass Selector, Inheritance, Visual Inheritance

Box Model: Display, Box Model, Inline Box, Inline-Block Box, Block Box, Table Box, Absolute Box, Float Box, Box Extends: Width, Height, Sized, Shrink, wrapped, Stretched, Box Margin, Border, Padding, Background, Overflow, Visibility, Page Break Positioning Models, Closest Positioned Ancestor, Stacking Context, Atomic, Static, Absolute, Fixed Relative, Float and Clear, Relative Float

Unit 2: Introduction to XML (6)


DTD and Namespaces: Validation, Element Declarations, Attribute Declaration, General Entity Declarations, External Parsed General Entities, External Unparsed Entities and Notations, Parameter Entities, Conditional Inclusion, Two DTD Example, Locating Standard DTD, The need for namespaces, Namespace Syntax, How Parsers Handle Namespaces, Namespaces and DTDs

Unit 3: Working with XML (7)


XPath: The Tree Structure of an XML Document, Location Paths, Compound Location Paths, Predicates, Unabbreviated Location Paths, General Xpath Expressions, Xpath Functions

Processing Models: Common XML Processing Models, Common XML Processing Issues, Generating XML Documents Document Object Model (DOM), DOM Foundations, Structure of DOM Core, Node and Other Generic Interfaces, Specific Node-Type Interfaces, The DOM Implementation Interface, DOM Level 3 Interfaces, Parsing a Document with DOM, A Simple DOM Application Simple API for XML (SAX), The ContentHandler Interface, Features and Properties, Filters

Section - II
Unit 4: Basics of Servlets

**Introduction to Servlet**: History of Web Application, Support for Servlets, The power of Servlets, HTTP Basics, The Servlet API, Page Generation, Server-Side Includes, Servlet Chaining and Filters, Java Server Pages

**The servlet Lifecycle**: The Servlet Alternative, Servlet Reloading, Init and Destroy, Single-Thread Model, Background Processing, Last Modified Time

**Retrieving Information and Sending Information**: Initialization Parameters, The server, The Client, The Request. The Structure of Response, Using Persistence Connection, HTML Generation, Status Codes, HTTP Headers

Unit 5: Advanced Topics in Servlet

**Session Tracking**: User Authorization, Hidden Form Fields, URL Rewriting, Persistent Cookies, The session Tracking API

**Database Connectivity**: Relational Database, The JDBC API, Reusing Database Objects, Transaction, Advanced JDBC Techniques

Unit 6: Java Server Pages (JSP)


**Text Books:**
1. Pro HTML5 and CSS3 Design Patterns by Michael Bowers, Dionysios Synodinos and Victor Sumner, Apress edition

**Reference Books:**

**Term Work:**
Term work marks is based on regular practical performance and final internal practical oral examination as well.

**Sample Experiment List:**
It should consist of 15-20 experiments based on the following topics.
1. Create html pages for website like login, registration and about us pages.
2. Design created pages using CSS
3. Create different types of valid XML documents
4. Search information from XML document using SAX parser
6. Creating XML document using DOM
7. Write XSLT styles-sheet to convert XML document to HTML
8. XML Validation using XSchema
9. Remote Procedure call using XML
10. Installation, Configuration of Tomcat Server and Deployment of Servlet based application
11. Write a servlet to store form data to database – use Type 4 JDBC driver
12. Write a servlet to search data from database
13. Session Management using Servlet
14. Write a JSP application to display database contents
15. Write a servlet to search data from database. Write a JSP application to input book information and store in the database. Application must provide facility to search book based on title of book, and author
16. Write a JSP application to input student information like first name, last name, department, date of birth, class, marks obtained in five subjects and store this information into database. Also generate report showing aggregate marks of all the students.
17. Write a JSP application to demonstrate Session Management using JSP (Application Controlled Authentication)

CS7L06. PROJECT - I

**Practical** : 4 hrs/ week

**Term work** : 75 Marks

**OE** : 75 Marks

The project work is to be carried out in two semesters of B.E. The project should be undertaken preferably by group of 4-5 students who will jointly work and implement the project in the two semesters.

In Semester VII, The group will select a project with the approval of the Guide (teaching staff) and submit the name of the project with a synopsis of the proposed work of not more than 02 to 08 pages before second week of August in the academic year. The 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 at the end of semester –VII as a part of the term work submission in the form of a joint report. The term work assessment will be done jointly by teachers appointed by Head of the Department.
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 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.
3. Care should be taken to avoid copying and outsourcing of the project work.
B.E. (COMPUTER SCIENCE & ENGINEERING) Sem – VIII
CSC801. DATA ANALYTICS

Lecture  : 4 hrs / week
Practical: 2 hrs/ week

Theory : 100 Marks
Termwork : 25 Marks
OE : 50 Marks

Objectives:
1. To understand Business Intelligence, decision support systems in Data warehouse
2. To study the Data analysis using data mining, data preparation and exploration
3. To forester the development of data mining capability in Hadoop and R and facilitate sharing of data mining codes/functions/algorithms among Hadoop and R users.

Section-I

Unit 1: Components of Decision-making process (8)
Business intelligence, Decision Support Systems, Data ware-housing.

Unit 2: Data analysis and exploration (8)
Mathematical models for decision making, data mining, data preparation, data exploration.

Unit 3: Introduction of Big data and Hadoop Echosystem (8)
Big data definition, Elements of Big data, Big data analytics, Big Data Stack, Virtualization and Big data, virtualization approaches, Hadoop Ecosystem, Hadoop Distributed file system(HDFS, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.

Section-II

Unit 4: Data mining tasks (8)
Regression and association rules- structure of regression model, single linear regression, and multiple linear regression.

Classification - classification problems, Classification models, classification trees, Bayesian methods.

Unit 5: Association rules and clustering (8)

Unit 6: Exploring R (8)
Basic Features of R, Exploring RGui, Working with vectors, Handeling data in R workspace. Reading datasets and exporting data from R, Manipulating and processing data in R.

Text Books:
1. Business Intelligence - Data Mining and optimization for Decision Making- Carlo Vercellis-Wiley Publications. (For Units 1, 2, 4, 5)


3. Big Data (Black Book)- DT Editorial Services- Dreamtech Press (For Units 3, 6)

4. Data mining Introductory and Advanced topics- Margaret H. Dunham-Pearson (For Units 4, 5)

**Reference Books**:

1. Data Mining: Concepts and Techniques Second Edition- Jiawei Han and Micheline Kamber-Morgan KaufMan Publisher.


**List of Experiments:**

1. Installation of Hadoop and R.

2. Building Hadoop MapReduce application for counting frequency of word/phrase in simple text file.

3. Study of Hadoop YARN Administration command and User commands.


5. Study of Hadoop Hive DML commands like Insert, delete, update, data retrieval queries and Join-inner and outer.

6. Working with operators in Pig- FOREACH, ASSERT, FILTER, GROUP, ORDER BY, DISTINCT, JOIN, LIMIT, SAMPE, SPLIT, FLATIEN.

7. Study of R-declaring variables, expressions, functions and executing R script.

8. Working with R with data sets- create, read, write and R Tables- create, read, write.

9. Manipulating and processing data in R- merging datasets, sorting data, putting data into shape, managing data using matrices managing data using data frames.

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**CS8C02. PROJECT MANAGEMENT**

Lecture : 3 hrs / week
Theory : 100 Marks

**Objectives:**

1. To provide students with a basic understanding of project management principles and practices.

2. To demonstrate competency in the creation and management of a project plan.

3. To understanding impact of Scope, Time and Cost management.

4. To understanding the software quality metrics and quality assurance.

5. To develop strategies to calculate risk factors involved in IT projects.
Section - I

**Unit 1. Introduction to Project Management:** (5)
Project and Project Management (PM), Role of project Manager, System view of PM, Organization, Stakeholders, Project phases and lifecycle, Context of IT projects, process groups, mapping groups to Knowledge areas

**Unit 2. Project Integration Management:** (5)
Strategic planning and project selection, Developing a Project Management Plan, Directing and Managing Project Work, Monitoring and Controlling Project Work, Performing Integrated Change Control, Closing Projects or Phases

**Unit 3. Project Scope, Time and Cost management:** (9)
Planning Scope Management, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Validating Scope, Controlling Scope
Planning Schedule Management, Defining Activities, Sequencing and Estimating Activity, Resources & Duration, Developing & Controlling Schedule

Section - II

**Unit 4. Quality Management:** (6)
Importance, Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control, Modern Quality Management, Improving IT Project Quality

**Unit 5. Human Resource management:** (6)
Importance, keys to managing people, human resource planning, acquiring, developing and managing project team, software assistance.

**Unit 6. Risk management:** (5)
Importance, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control.

**Text Book:**
1. Information Technology Project Management, 7E, Kathy Schwalbe, Cengage Learning (India Edition)

**Reference Books:**

[NOTE: PM Software Platforms such as Microsoft Project Management, JIRA should be introduced to students]

CS8C03. REAL TIME OPERATING SYSTEM

Lecture : 4 hrs / week  
Theory : 100 Marks
Tutorial : 1 hr/ week  
Termwork : 25 Marks

Objectives:
1. To understand basic real time operating system concepts.
2. To understand software engineering process for real time system design.
3. To learn programming languages for programming real time systems.
4. To understand different performance measures for real time O.S.
5. To understand different features of commercial real time operating systems.

Section - I

Unit 1. Basic Real Time Concepts & Hardware Considerations  (3)
Terminology, Real Time System Design issues, Examples of Real-Time Systems

Unit 2. Hardware Considerations  (5)
Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, Input / Output, Other special devices

Unit 3. Real-Time Operating System  (10)
Real-Time Kernels, Theoretical Foundation of Real-Time Operating System, Scheduling ,Inter Task Communication and synchronization, System Services for Application Programs, Memory Management, Selecting Real Time Operating Systems ,Case study : POSIX .

Section - II

Unit 4. Software Requirements Engineering  (8)
UNIT 4. **Programming Language and the Software Production Process** (8)
Coding of Real Time Software, Assembly Language, Procedural Language, Object-Oriented Language. Overview of programming languages for real time systems. Real time features of JAVA, C# languages, Special Real Time Languages, Compiler Optimization of code.

UNIT 5 **Metrics & Cost Estimation** (8)
Lines of Code, McCabe’s Metric, Halstead’s Metric, Function points, Feature Points, Metric for Object-Oriented Software. Fault Tolerance, Cost Estimation using COCOMO, Basic COCOMO, Detailed COCOMO, COCOMO II model.

**Unit 6. Study of Commercial RTOS** (6)
Architecture of RT Linux, Initialization Task Management in RT Linux, Scheduling, Memory Management, Task Synchronization.

**Text Books:**
1. Real-Time Systems Design and Analysis.. Tools for the Practitioner by Phillip A Laplante, Seppo J. Ovaska, Wiley - 4th Edition (For Units 1, 2, 3, 4, 5)

**References:**
1. Real Time Systems Theory and Practice, Rajib Mall, Pearson Education.

**Term work:**
It should consist of minimum 8 – 10 assignments based on the above topics, out of which few practical assignments should be on RT Linux / QNX / VxWorks / MQX / other RTOS.

**CS8E04. ELECTIVE II – A) Internet of Things**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>3 hrs/ week</th>
<th>Theory</th>
<th>100 Marks</th>
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<tbody>
<tr>
<td>Tutorial</td>
<td>1 hr/ week</td>
<td>Termwork</td>
<td>25 Marks</td>
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**Course Objectives:**
1. To learn Internet of Things Technology
2. To know the basics of RFID, sensor and GPS technologies
3. To aware students about wireless technologies and IoT applications

**Section - I**

**UNIT 1. Introduction** (6)
What is the Internet of Things? : History of IoT, About objects/things in the IoT, Overview and motivations, Examples of applications, IoT definitions, IoT Frame work, General observations, ITU-T views, working definitions, Basic nodal capabilities.

UNIT 2. Fundamental IoT Mechanisms & Key Technologies :  (6)
Identification of IoT objects and services, Structural aspects of the IoT, Environment characteristics, Traffic characteristics, scalability, Interoperability, Security and Privacy, Open architecture, Key IoT Technologies, Device Intelligence, Communication capabilities, Mobility support, Device Power, Sensor Technology, RFID technology, Satellite Technology.

UNIT 3. Radio Frequency Identification Technology:  (6)
Introduction, Principles of RFID, Components of an RFID system, Reader, RFID tags, RFID middleware, Issue.
Wireless Sensor Networks: History and context, node, connecting nodes, networking nodes, securing communication.

Section - II

UNIT 4. Wireless Technologies For IoT : Layer 1/2 Connectivity :  (6)
WPAN Technologies for IoT/M2M, Zigbee /IEEE 802.15.4, Radio Frequency for consumer Electronics (RF4CE), Bluetooth and its low-energy profile, IEEE 802.15.6 WBANS, IEEE 802.15 WPAN TG4j, MBANS, NFC, dedicated short range communication (DSRC) & related protocols. Comparison of WPAN technologies cellular & mobile network technologies for IoT/M2M.

UNIT 5. Governance of The Internet Of Things:  (6)

UNIT 6. Internet Of Things Application Examples:  (6)
Smart Metering, advanced metering infrastructure, e-Health/Body area network, City automation, automotive applications. Home automation, smart cards, Tracking, Over-The-Air passive surveillance/Ring of steel, Control application examples.

Text Books :
1. Hakima Chaouchi, The Internet of Things, Connecting Objects to the Web, Wiley Publications (for Units 1, 3, 5, 6)
2. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6 The Evolving World of M2M Communications”, Wiley Publications (for Units 2, 4)

Reference Books :

CS8E04. ELECTIVE II – B) Software Testing Quality and Assurance

<table>
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<tr>
<th>Lecture</th>
<th>Theory</th>
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<tr>
<td>: 3 hrs / week</td>
<td>: 100 Marks</td>
</tr>
<tr>
<td>Tutorial</td>
<td>Termwork</td>
</tr>
<tr>
<td>: 1 hr/week</td>
<td>: 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives:
1) To provide knowledge about fundamentals of software testing and software quality
2) To understand the fundamentals of software verification
3) To understand and evaluate metrics and models used in software testing
4) To understand and compare testing web applications and desktop applications
5) To understand, compare and Choose from various software project assessment methods

Section - I

Unit 1. Introduction (4)

Unit 2. Software Verification (8)
Verification Methods, SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit

Creating test cases from SRS and Use cases: Use Case Diagram and Use Cases, Generation of test cases from use cases, Guidelines for generating validity checks, strategies for data validity, Database testing

Unit 3. Regression Testing (7)
What is regression testing?, Regression Test cases selection, Reducing the number of test cases, Risk analysis, Code coverage prioritization techniques

Object oriented testing: What is Object orientation?, What is object oriented testing?, Path testing, State based testing, Class testing

Section - II

Unit 4. Measurement - what is it and why do it? (6)
Measurement in everyday life, Measurement in software engineering, scope of software metrics

Metrics and Models in Software testing: Software Metrics, Categories of Metrics, Object oriented Metrics used in testing, what should we measure during testing, Software Quality attributes prediction models

Unit 5. Measuring Internal Product Attribute Size (5)
Aspects of software size, Length, Reuse, Functionality

Measuring External product Attributes: Modeling software quality, measuring aspects of software quality
Unit 6. Testing Web applications

What is web testing?, functional testing, UI testing, Usability testing, configurations and compatibility testing, security testing, performance testing, database testing, post deployment testing, web metrics.

Automated Test data generation: Automated Test Data generation, Approaches to test data generation, Test data generation tools

Text Books:
3) Software Quality Engineering, Jeff Tian, Wiley India Ltd.

Reference Books:
3) Software Quality, Mordechai Ben Menachem, Garry S. Marliss, BS Publications

Guidelines for tutorials:
It should consist of 8-10 assignments based on the following topics:
1. Software Testing Process, its need and limitations
2. Verification at different phases of SDLC for particular case study (SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit etc.)
3. Creating test cases from SRS and Use cases for particular case study
4. Generation of validity checks for particular case study
5. Regression testing with Test cases selection / Regression testing with reducing the number of test cases / Regression testing with code coverage prioritization techniques
6. Generation of test cases using Path testing/ State based testing/Class testing for particular case study
7. Measurement in Software Engineering
8. Software Metrics: Object oriented Metrics used in testing
9. Calculation of Software Quality attributes using different prediction models
10. Measurement of Internal / External Product Attributes
11. Generation of test cases in different key areas of Web application testing
12. Automated test data generation
CS8E04. ELECTIVE II – C) Introduction to Mainframes

Lecture : 3 hrs / week
Tutorial : 1 hr/ week

Theory : 100 Marks
Termwork : 25 Marks

Objectives:

1. Students will understand the fundamentals of Mainframes
2. Students will be able to know basics of JCL, COBOL & DB2
3. Students will simulate COBOL and JCL programs using SPFLite and Hercules and experience the Mainframes developer role

Section – I

Unit 1. Introduction to IBM Mainframe (4)

Unit 2. Z/OS, MVS and VSAM : (6)
z/Os and other Mainframe operating systems, What is z/OS,Overview of z/OS facilities, virtual Storage and other Mainframe Concepts, Workload management, MVS Concepts , Address Spaces ,Addressing Mode and Residence Mode , Multiple Virtual Storage, Multiprogramming, MVS/370 Address Space Organizations, How data sets are stored?, Catalogs, Data Set Organization, VSAM Basics.

Unit 3. Introduction to JCL: (8)
Introduction to Job Control language-Mainframe information representation and storage, sequential and partitioned datasets, Indexed files, structure of JCL, JOB statement, EXEC statement, JOB and EXEC statements, DD statement, JCL procedures and symbolic parameters, IBM utility programs.

Section – II

Unit 4. COBOL Programming I : (8)
Introduction, History, coding format for COBOL programs, structure of COBOL program, character set, COBOL words, data names and identifiers, literals, figurative constants, continuation of lines, language description notation, IDENTIFICATION DIVISION, ENVIRONMENT DIVISION, DATA DIVISION-Level structure, data description entries, USAGE Clause, REDEFINES Clause, RENAMES Clause, SIGN Clause, FILE SECTION, WORKING-STORAGE SECTION, Editing, PROCEDURE DIVISION and basic verbs - Structure, MOVE, Arithmetic and Sequence Control Verbs, Input and Output Verbs, Conditional Verb

Unit 5. COBOL Programming II: (4)
Table Handling - OCCURS Clause and Subscripting, Assigning values to table elements, Multidimensional Tables, PERFORM verb and Table Handling, Indexed Tables and Indexing, SET verb, SEARCH verb. Statements for Sequential Files- OPEN, CLOSE, WRITE, REWRITE. Miscellaneous verbs- SORT, MERGE, STRING, UNSTRING.

Unit 6. Overview of DB2:
Introduction to DB2 , Major components of DB2- System Service component, Locking Service component, Database Service component, DB2 Application program preparation and Execution, DB2 Objects- Databases, Tablespaces, Stored tables, Indexes, Indexspaces, Storage groups, View, Bufferpool. DB2 SQL programming – Types of SQL statements, DCL, DDL, DML, Advanced SQL topics, UPDATE operations, Aggregate functions

Text Books:
1. IBM Mainframe Handbook – Alexis Leon. (For Unit 1, 2, 3, 6)

Reference Books:
1. Introduction to the New Mainframe z/OS Basics- Mike Ebbers, John Kettner, Wayne O’Brien, Bill Ogden - Redbooks http://www.redbooks.ibm.com/redbooks/pdfs/sg246366.pdf (Unit 1, 2)

CS8L05. WEB TECHNOLOGIES-II

Lecture : 2 hrs / week  Termwork : 50 Marks
Practical : 4 hr/ week  POE : 50 Marks

Course Objectives:
1. To introduce emerging Web technologies concepts and tools.
2. To introduce client side and server side scripting languages and validation techniques.
3. To learn database access technologies and state management techniques.
4. To develop real life Web applications using ASP.NET and PHP

Section - I

Unit 1: Introduction to ASP.NET 4.5

ONE ASP.NET: Introducing One ASP.NET, Simplifying a Complex Ecosystem, How Do You Benefit?

ASP.NET WEB FORMS STRUCTURE: Application Location Options, The ASP.NET Page Structure Options, ASP.NET 4.5 Page Directives, ASP.NET Page Events, Dealing with Postbacks, Cross-Page Posting ,ASP.NET Application Folders, Compilation, Build Providers, Global.asax,

Unit 2: Servlet Controls
ASP.NET SERVER CONTROLS AND CLIENT-SIDE SCRIPTS: ASP.NET Server Controls, HTML Server Controls, Identifying ASP.NET Server Controls, Manipulating Pages and Server Controls with JavaScript.


VALIDATION SERVER CONTROLS: - Understanding Validation, Client-Side versus Server-Side Validation, ASP.NET Validation Server Controls, Turning Off Client Side Validation, Using Images and Sounds for Error Notifications, Working with Validation Groups

Unit 3: Data Binding and State Management

DATA BINDING: Data Source Controls, Data Source Control Caching, Data-Bound Controls, Other Data-Bound Controls, Inline Data-Binding Syntax, Using Expressions and Expression Builders


Section - II

Unit 4: Client Side Development

AJAX: Understanding the need of AJAX, ASP.NET AJAX and Visual Studio 2012, Binding ASP.NET AJAX Applications, ASP.NET AJAX’s Server Side Controls, Using Multiple Update Panel Control, Working with page history, Script Combining.

JQuery: Introduction to JQuery, Selecting Elements, Modifying Elements, Event Handing, Ajax, JQuery UI

Unit 5: Basics of PHP

Introducing PHP: History, General Language Feature

PHP Basics: Embedding PHP code in Your Web Pages, Commenting Your Code, Outputting Data to the Browser, PHP supported Data Types, Identifiers, Variables, Constants, Expressions, String Interpolation, and Control Structures

Functions: Invoking a Function, Creating a Function, Function Libraries

Array: What is Array?, Creating an array, outputting an Array, Merging, slicing, splicing and Dissecting Arrays, Other useful Array Functions
Unit 6: Advanced Topics in PHP

Object-Oriented PHP: The benefits of OOP, Key OOP Concepts, Constructor and Destructors, Static Class Members, The instanceof Keyword, Helper Functions.

Advanced OOP Features: Object Cloning, Inheritance, Interfaces, Abstract classes, Introducing namespaces.

Strings and Regular Expressions: Regular Expressions, Other String-Specific Functions, Alternatives for Regular Expression Functions

Working with HTML Forms: PHP and Web Forms, Validating Form Data

Handling File Uploads: Uploading Files with PHP

Using PHP with MySQL: Installation Prerequisites, Using the MySqIi Extension, Interacting with the Database, Executing Database Transactions

Session Handlers: What Is Session Handling, Configuration Directives, Working with Sessions, Practical Session-Handling Examples, Creating Custom Session Handlers

Text Books:
1. Professional ASP.NET 4.5 in C# and VB-Published by John Wiley & Sons, Inc. (WROX)

Reference Books:
1. ASP.NET 4.5- Black book – Kogent Dreamtech Publication

Open Source Resources
http://www.php.net

Sample Experiment List:
It should consist of 17-20 experiments based on the following topics.
1. Create registration form using different server controls
2. Accepting and validating user entered data in registration form using ASP.NET
3. Write a program to manage session in ASP.Net
4. Reading and writing HTML contents with JQuery
5. Write a sample application to demonstrate AJAX
6. Display database contents from SQL server or Oracle database using SQL Command class from ASP.NET
7. Display parameterized data using SQIDataReader and GridView in ASP.NET
8. Database access using DataSet in ASP.NET
9. Installing Apache and PHP on Linux, Configuring PHP at Build Time on Linux. Or Installation of XAMPP
10. Hello world Program-Embedded HTML with PHP
11. Program based on PHP variables, Expression, arrays, control structure
12. Experiment Based on OOP and Advance OOP PHP
13. Form validation using PHP using regular expressions
14. Upload various types of file from client side to server with validation
15. Write a program to send Mail using PHP
16. Insert user entered data in form to MySQL database using PHP
17. Update user’s data stored in MySQL database using PHP
18. Write a program to manage session in PHP having login facility in any web application

CS8L06. PROJECT - II

Practical : 4 hrs / week  Termwork : 75 Marks
OE : 75 Marks

Objective:
The group will continue to work on the project selected during the semester VII and submit the completed project work to the department at the end of semester VIII 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.
   vii) Open Source tools like Latex can be used for report preparation.

Termwork:
Term work will be jointly assessed by a panel of teachers appointed by Head of the Department

External Exam:
Oral examination will be conducted by internal and external examiners as appointed by the Shivaji University.

Note:
1. Project work should be continually evaluated based on the contributions of the 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.
3. **Care should be taken to avoid copying and outsourcing of the project work**

**CS8L07. COMMUNITY SERVICES**

**Practical** : 2 hrs / week  
**Termwork** : 25 Marks

**Objectives:**
1. To create an awareness among the common man of Western Maharashtra region and area coming under jurisdiction of the Shivaji University regarding the e-services provided by various public sector organization
2. To promote the use of technological services in day-to-day activities.
3. To understand the problems of the locality.
4. To make the student aware of the various engineering tools and techniques used in eservices.
5. Creating awareness of RTI (Right To Information) among general public for procuring public documents and it’s appropriate use.

**Details:**
The students project group is expected to do the following:
1. With the prior written permission from the Head of the Institute the project group should visit any Public Sector / Government/ Semi government organization like – Zilha Parishad, Collector Office, Municipal Corporation, Tahasildar Office, RTO, MSEB, Court, Railway station , Tourism Services, agricultural service sector, Banks where the facilities of e-governance and e-services available for public purposes.
2. The project group should understand the public related services and identify the required services for the common man.
3. Two/Three groups should plan awareness programs/camps to be carried out in the nearby villages / Taluka places / residential colonies / localities and visit the suitable areas along with the staff to create awareness among the common man about various eservices available in public domain.
4. They should prepare a presentation simulating the services that are being exposed to common man and give a demonstration during their visit to the concerned area.
5. Further group should take the feedback from the concerned locality on a pre-designed format that may be provided by the Head of the Institute.
6. Group should prepare a report detailing:
   a. The kind of services chosen.
   b. The office / organization visited mentioning the authorities meet.
   c. The facilities provided by the chosen service.
d. Preparations for the visit.
e. Presentation Techniques & Tools used
f. Analysis of the Feedback Form filled during visit
g. Observations and conclusions during the entire work

7. Submission of the above report duly signed by the concerned staff and Head of the department is to be done to the department at the end of semester.

**Equivalences of B. E. (CSE) for repeater / backlog students**

**BE (CSE) Sem.-VII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>B.E.(CSE) – I Pre-Revised</th>
<th>Equivalent / Replacement Subject (Revised)</th>
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<tr>
<td>2.</td>
<td>Distributed Systems</td>
<td>Distributed Systems Sem VII</td>
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<tr>
<td>5.</td>
<td>Network Engineering</td>
<td>Network Engineering (Pre-revised Sem VII)</td>
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**BE (CSE) Sem.-VIII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>B.E.(CSE) – II pre-Revised</th>
<th>Equivalent / Replacement Subject (Revised)</th>
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<tr>
<td>1.</td>
<td>Grid Technology</td>
<td>Grid Technology (Pre-revised Sem VIII. Two more chances)</td>
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<tr>
<td>2.</td>
<td>Storage Networks</td>
<td>Storage Networks (Sem VI)</td>
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<tr>
<td>3.</td>
<td>Real-time Operating System</td>
<td>Real-time Operating System (Sem VII)</td>
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<tr>
<td>4.</td>
<td>Elective – II A) Data Mining B) Business Intelligence System C) Adhoc Networks</td>
<td>Elective –II A) Data Mining (Pre-revised Sem VIII) B) Business Intelligence System (Pre-revised Sem VIII) C) Adhoc Wireless Networks (Sem VII)</td>
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<td>5.</td>
<td>Web Technology</td>
<td>Web Technology (Pre-revised Sem VIII)</td>
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