

**PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018**

**(AUTONOMOUS)**

**MASTER OF COMPUTER APPLICATIONS**

**REGULATIONS 2015**

**CURRICULUM**

**SEMESTER V**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
CA15501	Web Application Development	3	0	0	3
CA15502	Software Project Management	3	0	0	3
CA15503	Mobile Computing	3	0	0	3
CA1525*	Elective II	3	0	0	3
CA1535*	Elective III	3	0	0	3
CA15504	Advanced Internet Programming Laboratory	0	0	4	2
CA15505	XML and Web Services Laboratory	0	0	4	2
CA15506	Mini Project (Socially Relevant)	0	0	4	2

**SEMESTER VI**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
CA15601	Project Work	0	0	24	12

**LIST OF ELECTIVES**

**ELECTIVE II**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
CA15251	Network Protocols	3	0	0	3
CA15252	High Performance Computing	3	0	0	3
CA15253	Cloud Computing	3	0	0	3
CA15254	Green Computing	3	0	0	3
CA15255	Software Testing and Quality Assurance	3	0	0	3
CA15256	Ad hoc and Sensor Networks	3	0	0	3

**ELECTIVE III**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
CA15351	Internet of Things	3	0	0	3
CA15352	M Commerce	3	0	0	3
CA15353	Health Care Management	3	0	0	3
CA15354	Geological Information Systems	3	0	0	3
CA15355	Human Resource Management	3	0	0	3
CA15356	Semantic web	3	0	0	3

## SEMESTER V

CA15501

WEB APPLICATION DEVELOPMENT

3 0 0 3

### COURSE OBJECTIVES

- To acquire knowledge on the usage of recent platforms in developing web applications
- To understand architecture of J2EE and design applications using J2EE, Struts and hypernet
- To understand framework of .NET and design applications using .NET, C#, silver lite
- To design and develop interactive, client-side, server-side executable web applications LAMP stack.
- To explore the features of various platforms and frameworks used in web applications development

### UNIT I J2EE Platform 9

Introduction -Enterprise Architecture Styles - J2EE Architecture - Containers - J2EE Technologies - Developing J2EE Applications - Naming and directory services - Using JNDI - JNDI Service providers - Java and LDAP- LDAP operations - Searching an LDAP server - Storing and retrieving java objects in LDAP – Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview- Configuring J2EE packages

### UNIT II STRUTS AND HIBERNATE 9

Struts Architecture - Struts classes - Action Forward, Action Form, Action Servlet, Action classes -Understanding struts - config.xml, Understanding Action Mappings, Struts flow with an example application, Struts Tiles Framework, Struts Validation Framework – Hibernate - Architecture of Hibernate – Downloading Hibernate - Exploring HQL - Understanding Hibernate O/R Mapping.

### UNIT III LAMP STACK 9

Overview of Lamp Stack - Features of Lamp Stack –Understanding Python Understanding LAMP and Its Effect on Web Development

### UNIT IV XML AND WEB SERVICES 9

XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types, Attributes – XSL Transformations – Parser – Web Services Overview – Architecture.

### UNIT V WEB SERVERS and WEB FRAMEWORKS 9

Web servers: Introduction – HTTP/HTTPS Transactions – Multi tier Application architecture –Configuring web servers –Apache installation – Microsoft IIS Express and web matrix- Web Frame works. MVC Struts, Java Server Faces (JSF) POJO–WebSevices : WSDL-UDDI-SOAP-RPC and RESTFull web services. Introduction to Ruby on Rails

**TOTAL PERIODS 45**

### COURSE OUTCOMES

At the end of this course, the students will be able to

- knows how to design and implement Internet systems for enhancing education and engineering design.
- understand functionality of Internet system.
- design a system according to customer needs using the available Internet technologies.
- design and develop interactive, client-side, server-side executable web applications.
- explore the features of various platforms and frameworks used in web applications development.

## **REFERENCES**

1. James Holmes "Struts: The Complete Reference, " 2nd Edition 2012, McGraw Hill Professional
2. Patrick Peak And Nick Heudecker, Patrick Peak, Nick Heudecker Hibernate Quickly, " 2013,Dream tech.,
3. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming (J2EE1.3 Edition)", Shroff Publishers & Distributors Pvt Ltd
4. Heather Williamson, "XML, The Complete Reference", McGraw Hill Education, 2012.
5. Paul J. Deitel, Harvey Deitel, Abbey Deitel , Internet and World Wide Web How to Program ,5th Edition, 2011, ISBN 0132151006, 9780132151009

## **WEB LINKS**

1. <http://docs.oracle.com/cd/E19159-01/819-3680/abfar/index.html>
2. <http://www.w3schools.com/aspnet>
3. [www.freebooks-library.com](http://www.freebooks-library.com)

**COURSE OBJECTIVES**

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software
- To understand the knowledge and skills needed for the construction of highly reliable software project
- To understand to create reliable, replicable cost estimation that links to the requirements of project planning and managing

**UNIT I SOFTWARE PROJECT MANAGEMENT CONCEPTS 9**

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and Allocate resources.

**UNIT II SOFTWARE EVALUATION AND COSTING 9**

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, Structured methods.

**UNIT III SOFTWARE ESTIMATION TECHNIQUES 9**

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

**UNIT IV RISK MANAGEMENT 9**

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

**UNIT V SOFTWARE QUALITY MANAGEMENT 9**

TQM, Six Sigma, Software Quality: defining software quality, ISO9126, External Standards, Comparison of project management software's: dot Project, Launch pad, Open Project. Case study:PRINCE2

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the activities during the project scheduling of any software application
- learn the risk management activities and the resource allocation for the projects
- can apply the software estimation and recent quality standards for evaluation of the software projects
- acquire knowledge and skills needed for the construction of highly reliable software project
- create reliable, replicable cost estimation that links to the requirements of project planning and managing

## **REFERENCES**

1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications, Fifth Edition 2012.
2. S. A. Kelkar," Software Project Management" PHI, New Delhi, Third Edition, 2013.
3. Richard H. Thayer "Software Engineering Project Management,": IEEE Computer Society
4. Futrell , "Quality Software Project Management", Pearson Education India, 2012
5. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications, Fifth Edition 2012.

## **WEB LINKS**

1. [http://en.wikipedia.org/wiki/Comparison\\_of\\_project\\_management\\_software](http://en.wikipedia.org/wiki/Comparison_of_project_management_software)
2. [http://www.ogc.gov.uk/methods\\_prince\\_2.asp](http://www.ogc.gov.uk/methods_prince_2.asp)
3. [http://www.comparison\\_of\\_project\\_management\\_software](http://www.comparison_of_project_management_software)

**COURSE OBJECTIVES**

- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture
- To have an exposure about wireless protocol-WLAN, Bluetooth, WAP
- To know the network functionalities of mobile communication
- To know the transport functionalities of mobile communication.
- To impart knowledge about mobile Application

**UNIT I INTRODUCTION 9**

Frequencies Spectrum- Multiplexing- Spread spectrum- GSM Architecture-Entities-Call Routing-PLMN-Address and identifiers-Network Aspects-Mobility Management-Frequency Allocation-Authentication and Security-SMS Architecture-Value Added Service through SMS-GPRS GPRS and Packet Data Network-Architecture – Application.

**UNIT II MOBILE WIRELESS SHORT RANGE NETWORKS 9**

Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN - WAP Architecture-WAP 2.0-Bluetooth enabled Devices Network-Layers in Bluetooth Protocol.

**UNIT III MOBILE IP NETWORK LAYER 9**

IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management-Registration- Tunneling and Encapsulation-Route Optimization- Dynamic Host Configuration Protocol– VoIP – IPSec.

**UNIT IV MOBILE TRANSPORT LAYER 9**

Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP- Fast Retransmit/ Fast Recovery –Transmission/ Timeout Freezing – Selective Retransmission – Transaction Oriented TCP.

**UNIT V MOBILE APPLICATION DEVELOPMENT 9**

Mobile Applications Development -Application Development Overflow-Techniques For Composing Applications– Android Application Architecture – Developing for Android – The Android Application Life Cycle – The Activity Life Cycle –Creating Your First Android Activity – Creating Applications and Activities – Data Storage, Retrieval, and Sharing.-Geo services- creating mobile applications like game, Clock, Calendar.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain the knowledge about various types of wireless data networks and wireless voice networks
- understand the architectures, the challenges and the solutions of wireless communication those are in use.
- realize the role of wireless protocols in shaping the future internet.
- know about the Transmission control protocol.

- develop simple Mobile Application Using Android

## **REFERENCES**

1. J.Schiller, - Mobile Communicationl, Addison Wesley, 2003.
2. William C.Y.Lee, - Mobile Communication Design Fundamentalsl, John Wiley, 1993.
3. William Stallings, - Wireless Communication and Networks, Pearson Education, 2003.
4. Anubhav Pradhan, Anil V. Deshpande, “Composing Mobile Apps Learn|Explore|Apply “, Wiley 2014.



**COURSE OBJECTIVES**

- To acquire knowledge on the usage of recent platforms in developing web applications
- To understand architecture of JDBC and design applications using Java, Struts and JSP

**LIST OF EXPERIMENTS**

1. Develop a car showroom inventory web application with 2-tier architecture. Use JSP and JDBC
2. Develop a real estate web application with n-tier architecture. Use JSP, Servlets and JDBC. The application should be able to add and search all properties such as rental/own, individual/apartment and duplex/semi-duplex
3. Develop any web application which authenticates using LDAP
4. Develop a standalone java application or a web application to add, modify and delete the LDAP attributes of the given input
5. Design a student identity management web application using struts framework. The application should be able to provide an identity such as student id, access to department assets with department id, access to lab assets with lab id.
6. Create an online bookstore that includes all validation controls available in ASP.NET
7. Create a component that receives two numbers from the user through a Web Form, and based on the user's selection add or subtract the two numbers and returns the result to the Web Form. The result should be displayed the Web Form using ASP.NET
8. Create a Silverlight Application for the SharePoint Client Object Model
9. Create a graph using the SharePoint Object Model and Silverlight Graphing controls

**TOTAL PERIODS 60****COURSE OUTCOMES**

At the end of this course, the students will be able to

- knows how to design and implement Internet systems for enhancing education and engineering design,
- explore the features of various platforms and frameworks used in web applications development

**COURSE OBJECTIVES**

- To provide fundamental concepts of Service Oriented Architecture.
- To gain knowledge about SOAP, UDDI and XML to create web services.

**LIST OF EXPERIMENTS**

1. XML document creation.
2. Importing and Exporting XML document in database.
3. XSL Transformation
4. Internal and External DTD creation
5. XML Schema creation
6. Parsing XML document using DOM/SAX parser.
7. Web Service creation using JAX-WS
8. Web Service creation using JAX-RS
9. Web Service creation using .NET
10. JAXB Marshaling and Unmarshaling

**A possible set of applications may be the following**

- a. Currency Conversion
- b. Temperature Conversion
- c. Ticket Booking
- d. Dictionary

**TOTAL PERIODS 60****COURSE OUTCOMES**

At the end of this course, the students will be able to

- known about the basic principles of service oriented architecture, its components and techniques
- understand the architecture of web services

**CA15506**

**MINI PROJECT (SOCIALY RELEVANT)**

**0 0 4 2**

**COURSE OBJECTIVES**

- Team Project with a maximum of four in a team
- Students shall select a domain and develop an application with social relevance

**TOTAL PERIODS 60**

**COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the students shall select a domain and develop an application with social relevance
- documentation is to be based on the standards



4. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, Addison Wesley, 1999.
5. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

**WEB LINKS**

1. <http://www.ciscopress.com/articles/article.asp?p=2180210&seqNum=7>
2. <http://www.networkworld.com/article/2289123/lan-wan/telephony-protocols.html>

**COURSE OBJECTIVES**

- To know how modern high performance processors are organized their strengths and weaknesses.
- To study about the architecture of parallel systems.
- To gain depth knowledge about the analytical parallel algorithms.

**UNIT I MODERN PROCESSORS 9**

Stored-program computer architecture – General-purpose cache-based microprocessor architecture – Memory hierarchies - Multicore processors - Multithread processors - Vector processors – Basic optimization techniques for serial code - Common sense optimizations - Simple measures – large impact - Role of compilers.

**UNIT II PARALLEL COMPUTERS 9**

Data access optimization - Balance analysis and light speed estimates - Storage order - Taxonomy of parallel computing paradigms - Shared memory computers - Distributed memory computers -Hierarchical systems – Networks - Basics of parallelization- Parallelism – Parallel scalability

**UNIT III INTRODUCTION TO PARALLEL COMPUTING 9**

Motivating parallelism - Scope of parallel computing - Parallel programming platforms: Implicit parallelism trends in microprocessor architectures - Limitations - Dichotomy - Physical organizations- Communication costs – Routing mechanisms for interconnected networks- Impact of process.

**UNIT IV PRINCIPLES OF PARALLEL ALGORITHM DESIGN 9**

Preliminaries - Decomposition techniques - Characteristics of tasks and interactions – Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.

**UNIT V SORTING AND GRAPH ALGORITHMS 9**

Dense matrix Algorithm: Matrix-vector multiplication - Matrix- matrix multiplication- Issues insorting on parallel computing - Sorting networks - Bubble sorts and its variants - Quick sort – Graphalgorithms – Definition and representation - Prims algorithm - Dijkstra's algorithm - All pairs shortestpath - Transitive closure – Connected components.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- apply basic principles and practices of Computer Science and Engineering to productively engage in the research.
- design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, manufacturability, and sustainability.
- identify, analyze, formulate and solve engineering problems.

## **REFERENCES**

1. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers
2. AnanthGrama and George Karypis, Introduction to parallel computing, Addison-Wesley 2009.
3. John Levesque and Gene Wagenbreth, High Performance Computing: Programming and Applications
4. John L. Hennessy and David Patterson, Computer Architecture- A Quantitative Approach,Elsevier, 2012.

## **WEB LINKS**

1. <http://nptel.ac.in/courses/106102114/1>
2. [https://computing.llnl.gov/tutorials/parallel\\_comp/](https://computing.llnl.gov/tutorials/parallel_comp/)

**COURSE OBJECTIVES**

- To introduce the broad perspective of cloud architecture and model to understand the concept of virtualization and design of cloud Services to be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To learn to design the trusted cloud Computing system
- To address the core issues of cloud computing such as security, privacy and interoperability

**UNIT I CLOUD ARCHITECTURE AND MODEL 9**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS)– Public vs. Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

**UNIT II VIRTUALIZATION 9**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization – Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-centre Automation.

**UNIT III CLOUD INFRASTRUCTURE 9**

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

**UNIT IV PROGRAMMING MODEL 9**

Parallel and Distributed Programming Paradigms – Map Reduce , Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim

**UNIT V SECURITY IN THE CLOUD 9**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security –Security Governance – Risk Management – Security Monitoring – Security Architecture Design –Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- compare the strengths and limitations of cloud computing
- identify the architecture, infrastructure and delivery models of cloud computing
- apply suitable virtualization concept.
- choose the appropriate cloud player, programming models and approach.
- design cloud services and set a private cloud



## **REFERENCES**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management and Security”,CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
4. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.
5. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O’Reil’ly

## **WEB LINKS**

1. [http://en.wikipedia.org/wiki/Cloud\\_computing](http://en.wikipedia.org/wiki/Cloud_computing)
2. [http://www.tutorialspoint.com/cloud\\_computing/cloud\\_computing\\_architecture.htm](http://www.tutorialspoint.com/cloud_computing/cloud_computing_architecture.htm)

**COURSE OBJECTIVES**

- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
- To skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user
- To understand how to minimize equipment disposal requirements

**UNIT I FUNDAMENTALS 9**

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

**UNIT II GREEN ASSETS AND MODELING 9**

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

**UNIT III GRID FRAMEWORK 9**

Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting– Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

**UNIT IV GREEN COMPLIANCE 9**

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

**UNIT V GREEN TECHNOLOGY 9**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs– Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
- skill in energy saving practices in their use of hardware concept.
- understand the technology tools that can reduce paper waste and carbon footprint by user.

**REFERENCES**

1. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.
2. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011
3. John Lamb, “The Greening of IT”, Pearson Education, 2009.
4. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008.

**WEB LINKS**

1. [http://en.wikipedia.org/wiki/Green\\_computing](http://en.wikipedia.org/wiki/Green_computing)
2. <http://thefutureofthings.com/3083-green-computing/>

**COURSE OBJECTIVES**

- To know the behavior of the testing techniques to detect the errors in the software
- To understand standard principles to check the occurrence of defects and its removal.
- To learn the functionality of automated testing tools
- To understand the models of software reliability.

**UNIT I TESTING ENVIRONMENT AND TEST PROCESSES 9**

World-Class Software Testing Model – Building a Software Testing Environment - Overview of Software Testing Process – Organizing for Testing – Developing the Test Plan – Verification Testing – Analyzing and Reporting Test Results – Acceptance Testing – Operational Testing – Post Implementation Analysis

**UNIT II TESTING TECHNIQUES AND LEVELS OF TESTING 9**

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing– Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design –Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing– Compatibility testing – Levels of Testing - Unit Testing – Integration Testing - Defect Bash Elimination System Testing - Usability and Accessibility Testing – Configuration Testing -Compatibility Testing – Case study for White box testing and Black box testing techniques.

**UNIT III INCORPORATING SPECIALIZED TESTING RESPONSIBILITIES 9**

Testing Client/Server Systems – Rapid Application Development Testing – Testing in a Multiplatform Environment – Testing Software System Security - Testing Object-Oriented Software –Object Oriented Testing– Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web based Software – Testing a Data Warehouse - Case Study for Web Application Testing.

**UNIT IV TEST AUTOMATION 9**

Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

**UNIT V SOFTWARE TESTING AND QUALITY METRICS 9**

Testing Software System Security - Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA – Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- test the software by applying testing techniques to deliver a product free from bugs
- evaluate the web applications using bug tracking tools.
- understand the technology tools that can reduce paper waste and carbon footprint by user.
- explore the test automation concepts and tools

## **REFERENCES**

1. William Perry, "Effective Methods of Software Testing", Third Edition, Wiley Publishing 2007
2. Srinivasan Desikan and Gopaldaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education
3. NareshChauhan , "Software Testing Principles and Practices " Oxford University Press , New Delhi , 2010.
4. Dale H. Besterfield et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
5. Stephen Kan, "Metrics and Models in Software Quality", Addison – Wesley, Second Edition,2004

## **WEB LINKS**

1. [http://en.wikipedia.org/wiki/Software\\_testing](http://en.wikipedia.org/wiki/Software_testing)
2. [http://www.tutorialspoint.com/qtp/qtp\\_test\\_automation\\_process.htm](http://www.tutorialspoint.com/qtp/qtp_test_automation_process.htm)

**COURSE OBJECTIVES**

- To understand the basics of ad-hoc and Sensor Networks
- To learn various fundamental and emerging protocols of all layers in ad-hoc network
- To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks
- To understand the nature and applications of ad-hoc and sensor networks
- To understand various security practices and protocols of Ad-hoc and sensor networks

**UNIT I ADHOC NETWORKS FUNDAMENTALS AND MAC PROTOCOLS 9**

Fundamentals Of WLans – IEEE 802.11 Architecture - Self Configuration And Auto Configuration Issues In Ad-Hoc Wireless Networks – MAC Protocols For Ad-Hoc Wireless Networks – Contention Based Protocols - - TCP Over Ad-Hoc Networks-TCP Protocol Overview - TCP And MANETs – Solutions For TCP Over Ad-Hoc Networks.

**UNIT II ADHOC NETWORK ROUTING AND MANAGEMENT 9**

Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches -Proactive, Reactive, Hybrid Routing Approach - Principles and issues – Location services – DREAM– Quorums based Location Service – Grid – Forwarding Strategies – Greedy Packet Forwarding –Restricted Directional Flooding- Hierarchical Routing- Other Routing Protocols.

**UNIT III SENSOR NETWORK COMMUNICATION PROTOCOLS 9**

Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations –Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer – Transceiver Design Considerations –MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues – Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols &QoS – Congestion Control Issues – Application Layer Support.

**UNIT IV SENSOR NETWORK MANAGEMENT AND PROGRAMMING 9**

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols – Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators.

**UNIT V ADHOC AND SENSOR NETWORK SECURITY 9**

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Antitamper Techniques – Water Marking techniques – Defense against Routing Attacks – Secure Adhoc Routing Protocols– Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course, the students will be able to

- work with existing Ad-hoc and sensor network protocols and standards.
- create a Sensor network environment for different type of applications
- design ad-hoc and sensor network architectures using QOS and Congestion control mechanisms
- interpret the various control fields of the protocol in each layer

- select appropriate routing algorithms for different network environments

## **REFERENCES**

1. Carlos De MoraesCordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications ”, Second Edition, World Scientific Publishing, 2011.
2. Holger Karl, Andreas willig, “Protocols and Architectures for Wireless Sensor Networks”, JohnWiley & Sons,Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
4. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
5. ErdalÇayırıcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, JohnWiley and Sons, 2009.

## **WEB LINKS**

1. [http://www.antd.nist.gov/wahn\\_ssn.shtml](http://www.antd.nist.gov/wahn_ssn.shtml)
2. [http://en.wikipedia.org/wiki/Wireless\\_sensor\\_network](http://en.wikipedia.org/wiki/Wireless_sensor_network)

### ELECTIVE III

CA15351

INTERNET OF THINGS

3 0 0 3

#### COURSE OBJECTIVES

- To learn the basic issues, policy and challenges in the Internet
- To understand the components and the protocols in Internet
- To build a small low cost embedded system with the internet
- To understand the various modes of communications with internet
- To learn to manage the resources in the Internet

#### UNIT I INTRODUCTION

9

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy  
Components in internet of things: Control Units – Sensors – Communication modules –Power Sources –  
Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks –Mobile Internet – Wired  
Communication

#### UNIT II PROGRAMMING THE MICROCONTROLLER FOR IOT

9

Basics of Sensors and actuators – examples and working principles of sensors and actuators –Cloud computing  
and IOT – Aurdino / Equivalent Microcontroller platform – Setting up the board -Programming for IOT– Reading  
from Sensors Communication: Connecting microcontroller with mobile devices – communication through  
Bluetooth and USB – connection with the internet using wifi / Ethernet

#### UNIT III RESOURCE MANAGEMENT IN THE INTERNET OF THINGS

9

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture  
-The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of  
Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the  
Internet of Things-Technical Requirements for Satisfying the New Demands in Production -The Evolution from  
the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behavior of Objects

#### UNIT IV BUSINESS MODELS FOR THE INTERNET OF THINGS

9

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as a Basis for a DiY  
Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of  
Things Semantic Interoperability as a Requirement for DiY Creation -Ontology-Value Creation in the Internet of  
Things-Application of Ontology Engineering in the Internet of Things-Semantic Web-Ontology - The Internet of  
Things in Context of EURIDICE – Business Impact

#### UNIT V FROM THE INTERNET OF THINGS TO THE WEB OF THINGS

9

Resource-oriented Architecture and Best Practices- Designing REST full Smart Things – Web enabling  
Constrained Devices - The Future Web of Things - Set up cloud environment – send data from micro controller to  
cloud– Case studies – Open Source e-Health sensor platform – Be Close Elderly monitoring – Other recent  
projects.

**TOTAL PERIODS 45**

#### COURSE OUTCOMES

At the end of this course the students will be able to:

- identify the components of IOT



- design a portable IOT using appropriate boards
- program the sensors and controller as part of IOT
- develop schemes for the applications of IOT in real time scenarios
- establish the communication to the cloud through wifi / Bluetooth

#### **REFERENCES**

1. Charalampos Doukas , Building Internet of Things with the Arduino, Create space, April 2012
2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011
3. Luigi Atzor et.al, “The Internet of Things: A survey, “, Journal on Networks, Elsevier Publications, October, 2010.

#### **WEB LINKS**

1. <http://postscapes.com/>
2. <http://www.theinternetofthings.eu/what-is-the-internet-of-things>

**COURSE OBJECTIVES**

- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application.

**UNIT I ELECTRONIC COMMERCE 9**

Introduction -The e-commerce environment - The e-commerce marketplace -Focus on portals, Location trading in the marketplace - Commercial arrangement for transactions - Focus on auctions - Business models for e-commerce - Revenue models - Focus on internet start-up companies - the dot-com - E-commerce versus E-business.

**UNIT II MOBILE COMMERCE 9**

Introduction – Infrastructure Of M– Commerce – Types Of Mobile Commerce Services – Technologies of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M– Commerce – Wireless/Wired Commerce Comparisons

**UNIT III MOBILE COMMERCE: TECHNOLOGY 9**

A Framework For The Study Of Mobile Commerce – NTT Docomo’s I– Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks –The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks

**UNIT IV MOBILE COMMERCE: THEORY AND APPLICATIONS 9**

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption Of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – M–Commerce In The Automotive Industry – Location– Based Services: Criteria For Adoption And Solution Deployment – The Role Of Mobile Advertising In Building A Brand – M–Commerce Business Models

**UNIT V BUSINESS– TO– BUSINESS MOBILE E-COMMERCE 9**

Enterprise Enablement – Email And Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking And Maintenance/Management – Remote IT Support –Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course the students will be able to

- apply E – commerce principles in market place.
- apply M – commerce principles to various business domains
- understand the theory and applications of M-commerce in business domain
- get AN exposure to current technological advancements in M-commerce.

- build M – commerce business models.

## **REFERENCES**

1. Dave Chaffey, “E-Business and E-Commerce Management”, Third Edition, 2009, Pearson Education
2. Brian E. Mennecke, Troy J. Strader, “Mobile Commerce: Technology, Theory and Applications”, Idea Group Inc., IGI press, 2003.
3. P. J. Louis, “ M-Commerce Crash Course”, McGraw- Hill Companies February 2001.
4. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” Cambridge University Press March 2001.
5. Michael P. Papazoglou, Peter M.A. Ribbers, ‘e-business organizational and Technical foundation’, Wiley India 2009

## **WEB LINKS**

1. [http://www.brandchannel.com/features\\_effect.asp?pf\\_id=200](http://www.brandchannel.com/features_effect.asp?pf_id=200)
2. [http://en.wikipedia.org/wiki/Mobile\\_commerce](http://en.wikipedia.org/wiki/Mobile_commerce)

**COURSE OBJECTIVES**

- To understand the basic concepts of health care system.
- To know about creating and maintaining health care information systems
- To ensure access of clinical information system on the fly
- To understand IT governance and assessment of health care information system

**UNIT I INTRODUCTION 9**

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

**UNIT II HEALTH CARE INFORMATION SYSTEMS 9**

History and evolution of health care information systems – Current and emerging use of clinical information Systems– system acquisition – System implementation and support.

**UNIT III INFORMATION TECHNOLOGY 9**

Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

**UNIT IV MANAGEMENT OF IT CHALLENGES 9**

Organizing information technology services – IT alignment and strategic planning – IT governance and management.

**UNIT V IT INITIATIVES 9**

Management's role in major IT initiatives – Assessing and achieving value in health care information systems. Case study

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course the students will be able to

- develop an understanding of basic research skills applicable to the design, evaluation and implementation of appropriate Healthcare Information Systems (HIS)
- define and analyze the impact, strengths and weaknesses of various HIS in any healthcare settings
- write reports on the roles of HIS and their impact on facilitating superior healthcare delivery Design a suitable HIS architecture
- use research methods and analysis together to plan the successful implementation of inappropriate HIS solution

**REFERENCES**

1. Karen A Wager, Frances Wickham Lee, John P Glaser, "Managing Health Care Information Systems: A Practical Approach for Health Care Executives", John Wiley, 2<sup>nd</sup> edition 2009.
2. Marion J. Ball, Charlotte Weaver, Joan Kiel, "Healthcare Information Management Systems: Cases, Strategies, and Solutions", Springer, 2010, 3<sup>rd</sup> edition
3. Rudi Van De Velde and Patrice Degoulet, "Clinical Information Systems: A Component based approach", Springer 2005.

4. Kevin Beaver, Healthcare Information Systems, Second edition Best Practices, CRC Press, 2002
5. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-Verlag GmbH, 1995

#### **WEB LINKS**

1. <http://www.healthcatalyst.com/healthcare-information-systems-past-present-future>
2. [http://en.wikipedia.org/wiki/Health\\_informatics](http://en.wikipedia.org/wiki/Health_informatics)

**COURSE OBJECTIVES**

- To understand the basic concepts of Geological information systems.
- To provide an exposure to spatial database structures and their utility in GIS.
- To understand the process of scanning, digitizing and georeferencing.
- To introduce the raster and vector geoprocessing capabilities of GIS.

**UNIT I SPATIAL DATA REPRESENTATION 9**

GIS – Definition and related terminology- Components of GIS: Data, Technology, Application– digital representation of geospatial data – raster – vector – object oriented – geo database model-analysis.

**UNIT II DATA DIGITIZATION AND PREPARATION 9**

Characteristics of raster data processing—raster File format-Acquiring and handling raster Data – Georeferencing-Preprocessing-mosaicking – Linking digital databases: ODBC – GPS data integration Characteristics of Vector Geo processing -Vector Data Input – Digitizer: Principles, Co-ordinate transformation– Graphical data editing – Scanner: Principles, On Screen Digitization-post scanning importing- data editing

**UNIT III VECTOR DATA PROCESSING 9**

Non-topological analysis: Attribute database query, SQL, Summary statistics-statistical computation calculation-quantification- Address Geocoding, -Topological analysis Feature based topological functions-overlay-buffering- Layer based topological function-Reclassification, Aggregation, Overlay analysis- Point-in-polygon, Line-in-polygon, Polygon-on-polygon: Clip, Erase, Identity, Union, Intersection – Network based Geoprocessing –Output functions

**UNIT IV RASTER DATA ANALYSIS 9**

Raster Geospatial Data Analysis-Local operations: Reclassification, Logical and Arithmetic overlay operations – Neighbourhood operations: Aggregation, Filtering, Slope and Aspect map – Extended operations: - Statistical Analysis, Proximity, Connectivity operations, Buffering, View shed operations: Area, Perimeter, Shape, and Identification of region and Classification-output of Raster geoprocessing

**UNIT V GIS MODELLING AND APPLICATIONS 9**

Spatial modeling – External, Conceptual, Logical, Internal –GIS Modeling with case study mining-DEM-introduction and applications

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course the students will be able to

- understand GIS concepts and spatial data representation
- design spatial data input in raster form as well as vector form
- understand vector data analysis and output functions
- understand raster data geo processing

## **REFERENCES**

1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall, 2/E,2009.
2. Peter A. Burrough, Rachael A. McDonnell, Principles of GIS, Oxford University Press
3. Kang-Tsung Chang ,Introduction to Geographic Information Systems, McGraw-Hill Higher Education,2006
4. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
5. Paul A. Longley, Mike Goodchild, David J. Maguire, Geographic Information Systems and Science, John Wiley & Sons Inc, 2011.

## **WEB LINKS**

1. [http://en.wikipedia.org/wiki/Geographic\\_information\\_system](http://en.wikipedia.org/wiki/Geographic_information_system)
2. <http://gis.washington.edu/phurvitz/professional/SSI/datatype.html>





## **REFERENCES**

1. Decenzo and Robbins, Human Resource Management, Wilsey, 10th edition, 2012.
2. Mamoria C.B. and Mamoria. S., Personnel Management, Himalaya Publishing Company, 1997.
3. Mirza S. Saiyadain Human Resource Management , Tata McGraw Hill , 4<sup>th</sup> edition 2009
4. EugenceMckenna and Nic Beach Human Resource Management, Pearson Education Limited, 2002.
5. Dessler, Human Resource Management, Pearson Education Limited, 2002.

## **WEB LINKS**

1. <http://www.hrmguide.net/hrm>
2. <http://www.managementstudyguide.com/importance-of-hrm.htm>

**COURSE OBJECTIVES**

- To understand the need of semantic web in web services
- To know the methods to discover, classify and build ontology for more reasonable results in searching
- To build and implement a small ontology that is semantically descriptive of chosen problem domain
- To implement applications that can access, use and manipulate the ontology

**UNIT I INTRODUCTION 9**

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies – Contrasting Semantic with Conventional Technologies –Semantic Modeling Potential of semantic web solutions and challenges of adoption

**UNIT II ONTOLOGICAL ENGINEERING 9**

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies –Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution –Versioning

**UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES 9**

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying –Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing -RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns- Transitivity

**UNIT IV WEB ONTOLOGY LANGUAGE 9**

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions –Advanced Class Description – Equivalence – Owl Logic.

**UNIT V SEMANTIC WEB TOOLS AND APPLICATIONS 9**

Development Tools for Semantic Web – Jena Framework – SPARQL –Querying semantic web - Semantic Wikis- Semantic Web Services – Modeling and aggregating social network data -Ontological representation of social relationships, Aggregating and reasoning with social network data.

**TOTAL PERIODS 45****COURSE OUTCOMES**

At the end of this course the students will be able to:

- understand semantic web basics, architecture and technologies
- represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology
- understand the semantic relationships among these data elements using Resource Description framework (RDF)
- design and implement a web services application that “discovers” the data and/or other web services via the semantic web

## **REFERENCES**

1. Liyang Yu, "A Developer's Guide to the Semantic Web", Springer, First Edition, 2011
2. John Hebel, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, "Semantic Web Programming", Wiley, First Edition, 2009.
3. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", Second Edition(Cooperative information Systems) (Hardcover), MIT Press, 2008
4. Robert M. Colomb, "Ontology and the Semantic Web", Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press, 2007.
5. Dean Allemang and James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann", Second Edition, 2011.

## **WEB LINKS**

1. <http://www.w3schools.com/xml/>
2. <http://www.ibm.com/developerworks/library/j-jena/>