



**(For the candidates admitted from the academic year 2016-2017 onwards)**

**Updated on 12.06.2017**

Se m.	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks		Total
						Int.	Ext.	
<b>I</b>	Core Course – I (CC)	Distributed Technologies	6	4	3	25	75	100
	Core Course – II (CC)	Web Services	6	4	3	25	75	100
	Core Course – III (CC)	OOAD and UML	6	4	3	25	75	100
	Core Course – IV (CC)	Organizational Behaviour	6	4	3	25	75	100
	Core Practical – I (CP)	Distributed Technologies Lab	6	4	3	40	60	100
<b>TOTAL</b>			<b>30</b>	<b>20</b>				<b>500</b>
<b>II</b>	Core Course – V (CC)	Mobile Computing	6	5	3	25	75	100
	Core Course – VI (CC)	Multimedia Technology	6	5	3	25	75	100
	Core Practical – II (CP)	Mobile Computing Lab	6	4	3	40	60	100
	Elective Course – I (EC)	Any one from the list	6	5	3	25	75	100
	Elective Course – II (EC)	Any one from the list	6	5	3	25	75	100
<b>TOTAL</b>			<b>30</b>	<b>24</b>				<b>500</b>
<b>I</b>	Core Course – VII (CC)	J2EE Technologies	6	5	3	25	75	100
	Core Course – VIII (CC)	Network Security	6	5	3	25	75	100
	Core Practical – III (CP)	J2EE Technologies Lab	6	4	3	40	60	100
	Elective Course III (EC)	Any one from the list	6	5	3	25	75	100
	Elective Course – IV (EC)	Any one from the list	6	5	3	25	75	100
<b>TOTAL</b>			<b>30</b>	<b>24</b>				<b>500</b>
<b>IV</b>	Core Course – IX (CC)	Internet of Things	5	5	3	25	75	100
	Core Course – X (CC)	Distributed Operating Systems	5	5	3	25	75	100
	Core Practical - IV (CP)	Open Source Technologies Lab	8	4	3	40	60	100
	Elective Course – V (EC)	Any one from the list	5	4	3	25	75	100
	Project Work		7	4	-	-	-	100
<b>TOTAL</b>			<b>30</b>	<b>22</b>				<b>500</b>
<b>GRAND TOTAL</b>			<b>120</b>	<b>90</b>				<b>2000</b>

## List of Elective Courses (For 2016 – 2017)

Elective I		Elective II	
1	Cloud Computing	1	Management Information Systems
2	Grid Computing	2	E-Commerce
3	Parallel Computing	3	Marketing Management
Elective III		Elective IV	
1	Big Data Analytics	1	Software Engineering
2	Digital Image Processing	2	Software Testing
3	Pattern Recognition	3	Software Metrics
Elective V			
1	Pervasive Computing		
2	Human Computer Interaction		
3	Soft Computing		

**Note:**

Project : 100 Marks  
 Dissertation : 80 Marks  
 Viva Voice : 20 Marks

Core Papers - 10  
 Core Practical - 4  
 Elective Papers - 5  
 Project - 1

**Note:**

1. Theory	Internal	25 marks	External	75 marks
2. Practical	”	40 marks	”	60 marks

Note:

1. Theory Internal 25 marks External 75 marks
2. Practical ” 40 marks ” 60 marks
3. Separate passing minimum is prescribed for Internal and External
  - a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
  - b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
  - c) The passing minimum not less than 50% in the aggregate.

**Reference/Text Books contain the following details:**

- I. Name of the Author
- II. Title of the Book
- III. Name of the Publisher
- IV. Year

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## **CORE COURSE I**

### **DISTRIBUTED TECHNOLOGIES**

#### ***Objective:***

To introduce the technologies behind the distributed computing environment and to provide the programming expertise to develop applications for distributed environment.

#### **Unit I**

Introduction to distributed Computing – Challenges involved in establishing remote connection – Strategies involved in remote computation – Current Distributed computing practices through Dot Net and Java technologies

#### **Unit II**

Advanced ADO, NET – Disconnected Data Access – Gridview, Details View, Form View controls – Crystal Reports – Role of ADO, NET in Distributed Applications

#### **Unit III**

Advanced ASP, NET – AdRotator, Multiview, Wizard and Image Map Controls – Master Pages – Site Navigation – Web Parts – Uses of these controls and features in Website development

#### **Unit IV**

Advanced features of ASP.NET – Security in ASP, NET – State Management in ASP, NET – Mobile Application development in ASP, NET – Critical usage of these features in Website development

#### **Unit V**

Web services – Role of Web services in Distributed Computing – WSDL, UDDI, SOAP concepts involved in Web Services – Connected a Web Service to a Data Base – Accessing a Web Service through n ASP, NET application

#### **Text Book:**

1. Walther, “ASP.NET 3.5”, SAMS Publication, 2005

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## **CORE COURSE II**

### **WEB SERVICES**

#### **Objective:**

To impart knowledge on the concepts and applications of Web Services.

#### **UNIT I**

Introduction – What are web services? SOAP WSDL UDDI-Why Web Services are important? – The evolution of web applications -Not just another distributed computing platform – Web services and enterprises.

#### **UNIT II**

XML Fundamentals XML: The Lingua Franca of web services - XML Documents-XML namespaces: Explicit and Default namespaces, Inheriting namespaces, And not inheriting namespaces, Attributes and namespaces –XML Schema. XML schema and namespaces, A first schema, Implementing XML schema types, The any Element, Inheritance, Substitution groups, Global and local type declarations, Managing Schemas, Schemas and instance documents, XML schema best practices- Processing XML SAX: Simple API for XML, DOM: Document object Model, XSLT, XPATH.

#### **UNIT III**

SOAP and WSDL5: The SOAP Model- SOAP- SOAP Messages, SOAP Envelope, SOAP Header, SOAP Body, SOAP Faults- SOAP encoding – SOAP RPC- Using alternative SOAP Encodings, Document, RPC, Literal, Encoded SOAP RPC and SOAP Document-Literal, SOAP web services and the REST Architecture- Looking back to SOAP 1.1: Syntactic differences between SOAP 1.2 and SOAP 1.1- Changes to SOAP-RPC- SOAP Encoding- WSDL structure - The stock quote WSDL interface, definitions, The type element, bindings, services, managing WSDL descriptions, Extending WSDL – Using SOAP and WSDL.

#### **UNIT IV**

UDDI: UDDI at a glance- The UDDI Business registry- UDDI under the covers – Accessing UDDI- How UDDI is playing out Conversations Overview – Web Services – Web services Conversation Language – WSCL Interface components – The Bar scenario conversations – Relationship between WSCL and WSDL Workflow Business Process Management – Workflow and Workflow management systems – Business process execution language for web services

#### **UNIT V**

Transactions: ACID Transactions – Distributed Transactions and two phase commit – Dealing with Heuristic outcomes – Scaling transactions to web services – OASIS business transaction protocol – Other web services transaction Protocol Security Everyday security basis – Security is an end to end product – Web service security issues – Types of Security attacks and threats - Web services security road map – WS security

#### **Text Book:**

1. “Developing Enterprise Web Services - An Architect’s Guide” – Sandeep Chatterjee, James Webber, Pearson Education– Second Indian Reprint 2005.

#### **Reference Book:**

1. “*Understanding SOA with Web Services*”, Eric Newcomer, Greg Lomow, Pearson Education, and First Indian Reprint 2005.

## **CORE COURSE III**

### **OOAD AND UML**

#### **Objective:**

To provide basic understanding on Object Oriented Analysis and Design and to familiarize the modelling mechanisms, facilities, tools and techniques available for the design and development of software applications.

#### **UNIT I**

Structured approach to system construction: SSADM/SADT - An overview of object oriented systems development & Life cycle

#### **UNIT II**

Various object oriented methodologies – Introduction to UML

#### **UNIT III**

Object oriented analysis – Use cases- Object classification, relationships, attributes, methods

#### **UNIT IV**

Object oriented design – Design axioms – Designing classes – Layering the software design: - data access layer, User interface layer, Control/business logic layer

#### **UNIT - V**

UML - Examples on: Behavioural models – Structural models – Architectural models from real world problems.

#### **Text Books:**

1. **Bahrami Ali**, Object oriented systems development, Irwin McGrawHill, 2005 (First 4 units covered here).
2. **Booch Grady, Rumbaugh James, Jacobson Ivar**, The Unified modeling language – User Guide, Pearson education, 2006 (ISBN 81-7758-372-7) (UNIT -5 covered here).

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**CORE COURSE IV**  
**ORGANIZATIONAL BEHAVIOUR**

**Objective:**

To enable good understanding on the principles and practices essential for effective functioning of an organization.

**UNIT I Introduction:**

Elements of OB – Nature and Scope of OB – Contributing Disciplines to OB. Organisational Behaviour in Historical Perspective – **Foundations of Individual Behaviour:** Introduction – The Individual and Individual Differences – Human Behaviour and its Causation.

**UNIT II Personality – Perception – Attitudes:**

Concept of Attitudes – Formation of Attitudes – Types of Attitudes – Measurement of Attitude – Change of Attitude. **Values:** Concept of Value – Types of Values – Formation of Values – Values and Behaviour. **Job Satisfaction.**

**UNIT III Learning:**

Meaning and Definition – Determinants of Learning – Learning Theories – Learning Principles – Reinforcement – Punishment – Learning and Behaviour. **Motivation:** Concepts – Meaning of Motivation – Nature of Motivation – Motivation Cycle or Process – Need for Motivation – Theories of Motivation – Motivation and morale.

**UNIT IV Organisational Conflicts:**

Definition of Conflict – Sources of Conflict – Types of Conflicts – Aspects of Conflicts – Functional Conflict – Dysfunctional Conflict – Conflict Process – Conflict Management. **Job Frustration – Stress Management.**

**UNIT V Communication:**

Nature and Need for Communication – Communication Process – Communication Channel – Communication Networks – Communication Barriers – Effective Communication. **Leadership – Organisational Structure – Organisational Culture.**

**Text Book**

1. S.S Khanka, **Organizational Behaviour**, S.Chand and Company Ltd, 2002.

**Reference Books**

1. John W Newstorm and Keith Davis, **Organizational Behaviour**, TMH, 2001.
2. Hugh J Arnold and Daniel C Fieldman, **Organizational Behaviour**, Mc Graw Hill, 1996.

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## **CORE PRACTICALS I**

### **DISTRIBUTED TECHNOLOGIES LAB**

***Objective:***

To provide hands on experience in developing applications for distributed environments.

- 1) Create a table and insert a few records using Disconnected Access.
- 2) Develop a project to update and delete few records using Disconnected Access.
- 3) Develop a project to view the records using GridView, DetailsView, FormView Controls.
- 4) Develop a project to generate a crystal report from an existing database.
- 5) Design a web page that makes uses of Ad Rotator Control.
- 6) Design a web page involving Multi View or Wizard Control.
- 7) Make use of Image Control involving two hot spots in a web page.
- 8) Design a simple web site that makes use of Master Pages.
- 9) Establish the security features in a simple web site with five pages.
- 10) Use state management concepts in a mobile web application.
- 11) Develop a web service that has an ASP.NET client.
- 12) Develop a web service to fetch a data from a table and send it across to the client.

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**CORE COURSE V**  
**MOBILE COMPUTING**

**Objective:**

To provide hands on experience in developing applications for distributed environments.

**UNIT I**

Introduction: Mobile Computing – Networks – Middleware and Gateways – Developing Mobile Computing Applications – Mobile Computing Architecture: Architecture for Mobile Computing – Three-Tier Architecture –Emerging Technologies: - Bluetooth – Rfid -Wireless Broadband (WiMax) - Mobile IP – IPV6 - Java Card.

**UNIT II**

Global System for Mobile Communications: GSM Architecture – GSM Entities - Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Short Message Service (SMS): Mobile Computing Over SMS – Value Added Services through SMS.

**UNIT III**

GPRS: - GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations –Data Services in GPRS Applications for GPRS – Limitations of GPRS. CDMA and 3G: Spread Spectrum Technology- CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G.

**UNIT IV**

Getting Started with Android – Activities, Fragments and Intents – Android User Interface: Understanding the Components of a screen- Adapting to Display Orientation – Designing User Interface with views – Displaying Pictures and Menus with Views – Data Persistence.

**UNIT V**

Content Providers – Messaging – Location Based Services – Networking – Developing Android Services – Publishing Android Applications.

**Text Books:**

1. Ashok K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing”, 2nd Edition, Tata McGraw Hill Publishing Company Limited, 2010.
2. Wei Meng Lee, “Beginning Android 4 Application Development”, Wiley India Pvt. Ltd., 2012.

**Reference Books:**

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning.
2. Jochen Schiller, “Mobile Communications”, Pearson Education, 2008.
3. Reto Meir, “Professional Android 4 Application Development”, Wiley India Pvt. Ltd., 2012.
4. Pradeep Kotari, “Android Application Development Black Book”, Dreamtech Press, 2014.

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**CORE COURSE VI**  
**MULTIMEDIA TECHNOLOGY**

**Objective:**

*To teach students about various tools & technologies that provide audio, video data handling capabilities to a computer.*

**UNIT I**

Introduction to Multimedia – Multimedia Authoring and Tools – Graphics and Image Data Representations - Color in Image and Video.

**UNIT II**

Fundamental Concepts in Video – Basics of Digital Audio - Lossless Compression Algorithms.

**UNIT III**

Lossy Compression Algorithms - Image Compression Standards - Basic video compression techniques.

**UNIT IV**

MPEG Video Coding (MPEG-1 and 2) - Basic Audio Compression techniques - MPEG Audio Compression.

**UNIT V**

Computer and Multimedia Networks- Multimedia network communications and applications – Content based Retrieval in Digital Libraries.

**Text Book:**

1. **Ze-Nian Li and Mark S. Drew** , Fundamentals of Multimedia , Pearson education/Prentice Hall of India, First Edition,2006, (ISBN 81-7758-823-0) [Unit-I ⊕ Chapters 1,2,3,4); **Unit-II** : (Chapters 5,6,7); **Unit-III** (Chapters 8,9,10); **Unit- IV** (Chapters 11, 13);**Unit- V** (Chapters 15,16,18)]

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**CORE PRACTICAL II**  
**MOBILE COMPUTING LAB**

**Objective:**

To provide programming experience on application development for Mobile Devices.

1. Create an Application which deals with the Android Content Providers.
2. Create Application using Android Layouts, Views and Events
3. Create an application which uses Files, Preferences and Notifications
4. Create Application to Create, Modify and Query an SQLite Database
5. Create an application for Querying web services and Parsing response
6. Create Application which uses the concept of Services and Background Threats
7. Creating Android Audio Video Application
8. Create an Application which uses Map Activity and points the locations onto the Map Locations
9. Create an Application with One-Time, Repeating Alarms, and Long-Running Background Task as Service.
10. Create an Application for Simple Mobile Game.

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## **ELECTIVE COURSE I:1**

### **CLOUD COMPUTING**

#### **Objective:**

To provide understanding on concepts & technologies associated with Cloud Computing.

#### **UNIT I FOUNDATIONS: -Introduction to Cloud Computing :**

Cloud Computing in a Nutshell – Roots of Cloud Computing – Layers and types of Clouds – Desired features of a Cloud – Cloud Infrastructure Management – Challenges and Risks – **Migrating into a Cloud:** - Introduction – Broad Approaches – The Seven step model – **Enriching the ‘Integration as a Services’ Paradigm for the Cloud Era:** - Introduction – The Evolution of SaaS – The Challenges of SaaS Paradigm – Approaching the SaaS Integration Enigma – New Integration Scenarios – The Integration Methodologies – SaaS Integration Services – **The Enterprise Cloud Computing Paradigm:** - Introduction – Background – Issues – Transition Challenges – The Cloud Supply Chain.

#### **UNIT II INFRASTRUCTURE AS A SERVICE :- Virtual Machine Provisioning and Migration Services:**

Introduction – Background – Manageability – Migration Services – **Management of Virtual Machines for Cloud Infrastructures:** - Anatomy of Cloud Infrastructures – Distributed Management of Virtual Infrastructures – Scheduling techniques for Advance Reservation of Capacity – **Enhancing Cloud Computing Environments Using a Cluster as a Service:** - Introduction – Related Work – RVWS Design – The Logical Design – **Secure Distributed Data Storage in Cloud Computing:** - Introduction – Cloud Storage from LANs to WANs – Technologies for Data Security – Challenges.

#### **UNIT III PLATFORM AND SOFTWARE AS SERVICE (PAAS/IAAS) Aneka-Integration of Private and Public Clouds :**

Introduction– Technologies and Tools – Aneka Cloud Platform - Aneka Resource Provisioning Service – Hybrid Cloud Implementation – **CometCloud: An Autonomic Cloud Engine:** - Introduction – CometCloud – Architecture – Autonomic Behavior of CometCloud – Overview of CometCloud-based Applications – Implementation and Evaluation

#### **UNIT IV PLATFORM AND SOFTWARE AS SERVICE (PAAS/IAAS) T-Systems Cloud-based Solutions for Business Applications:**

Introduction – Enterprise Demand of Cloud Computing – Dynamic ICT Service – Importance of Quality and Security in Clouds – Dynamic Data Centre-Producing Business-ready; Dynamic ICT Services – **The MapReduce**

**Programming Model and Implementations:** - Introduction – MapReduce Programming Model – MapReduce implementations for the Cloud.

## **UNIT V MONITORING AND MANAGEMENT: An Architecture for Federated Cloud Computing**

Introduction – A typical Usecase – The Basic Principles of Cloud Computing – A Federated Cloud Computing Model – Security Considerations – **Service Providers Perspective of SLA Management in Cloud Computing:** - Traditional Approaches to SLO Management – Types of SLA – Life Cycle of SLA – SLA Management in Cloud –Automated Policy-based Management – Performance Prediction for HPC on Clouds: - Introduction – Background – Grid and Cloud – Performance related issues of HPC in the Cloud.

### **Text Book:**

1. Rajkumar Buyya, James Broberg, Andrzej Goscinsky, **“Cloud Computing Principles and Paradigms”**, Wiley India Pvt. Ltd., 2011.

### **Reference Books:**

1. Barrie Sosinsky, **“Cloud Computing Bible”**, 1<sup>st</sup> Edition, Wiley India Pvt. Ltd., New Delhi, 2011.
2. Michael Miller, **“Cloud Computing”**, 1<sup>st</sup> Edition, Pearson Education Inc., New Delhi, 2008.

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## ELECTIVE COURSE I:2

### GRID COMPUTING

#### **Objective :**

*To impart knowledge on architectures, services & toolkits of Grid Computing.*

#### **UNIT I Introduction:**

Early Grid Activities – Current Grid Activities – An Overview of Grid Business Areas - Grid Applications-Grid Infrastructure. **Grid Computing Organizations and Their Roles:** Organizations Developing Grid Standards and Best Practice Guidelines - Organizations Developing Grid Computing Toolkits and the Framework - Organizations Building and Using Grid-Based Solutions to Solve Computing, Data and Network Requirements - **The Grid Computing Anatomy:** The Grid problem.

#### **UNIT II The Grid Computing Road Map:**

Autonomic Computing - Business On Demand and Infrastructure Virtualization - Service-Oriented Architecture and Grid - Semantic Grids. **Merging the Grid Services Architecture with the Web Services Architecture:** Service-Oriented Architecture - XML.Related Technologies, and their Relevance to Web Services - XML Messages and Enveloping - Service Message Description Mechanisms - Relationship between Web Service and Grid Service.

#### **UNIT III Open Grid Services Architecture(OGSA):**

Introduction - OGSA Architecture and Goal - **Some Sample Use Cases that Drive the OGSA:** - Commercial Data Center (CDC) - National Fusion Collaboratory (NFS) - Online Media and Entertainment - **The OGSA Platform Components: -Open Grid Services Infrastructure (OGSI):** Introduction - Grid Services - A High-Level Introduction to OGSI - Technical Details of OGSI Specification - Introduction to Service Data Concepts.

#### **UNIT IV OGSA Basic Service:**

Common Management Model (CMM) - Service Domains - Policy Architecture - Security Architecture - Metering and Accounting - Common Distributed Logging -Distributed Data Access and Replication - **GLOBUS GT3 Toolkit:Architecure:** - GT3 Software Architecture Model.

#### **UNIT V GLOBUS GT3 Toolkit: Programming Model:**

Introduction-Service Programming Model - Grid Service Behaviour Implementation - Operation Providers - Grid Service Lifecycle Callbacks and Lifecycle Management - Client Programming Model - **GLOBUS GT3 Toolkit - High Level Services:** Introduction - Resource Discovery and Monitoring - Resource Allocation - Data Management - Information Services - Index Services – Resource Information Provider Service –Resource Management Services – Data Management Services.

#### **Text Book:**

Joshy Joseph, Craig Fellenstein, **“Grid Computing”**, Pearson Education, 2004.

#### **Reference Book:**

Rawel Plaszczall, Richard Wellner Jr. **“Grid Computing”**, Pearson Education, 2006.

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## **ELECTIVE COURSE I:3**

### **PARALLEL COMPUTING**

#### **Objective:**

To introduce algorithm design for parallel computing architectures.

#### **UNIT I**

Introduction to Parallel Computing – Motivating Parallelism – Scope of Parallel Computing – parallel programming platforms: Implicit parallelism trend in microprocessor architecture – Limitations of memory system performances – Dichotomy of parallel platforms – Physical organization of platforms Communication cost in parallel machines – Routing mechanism for interconnection networks

#### **UNIT II**

Principles of parallel algorithm Design – Preliminaries – Decomposition techniques – Characteristics of task and interactions – Mapping techniques for load balancing

#### **UNIT III**

Methods for containing interaction overhead – Parallel Algorithm models – one –to – All Broadcast and All – to – One Reduction – All – to – All Broadcast and Reduction

#### **UNIT IV**

Analytical Modelling of Parallel Programs – Sources of overhead in parallel programs – Performance metrics for parallel systems – The effect of Granularity on performances – Scalability of parallel systems – Minimum execution time and minimum cost – optimal execution time – Asymptotic analysis of parallel programs

#### **UNIT V**

Sorting – Issues in sorting on parallel computers – Sorting Networks – Bubble sort and its variables – Quicksort – Bucket and sample sort – Others sorting algorithms

#### **Text Book:**

1. Introduction to Parallel Computing, Second edition, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education,

#### **Reference Book**

1. Introduction to Parallel Processing Algorithms and Architecture, Bchrooz Parhami, Plenum Series, 2002

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## ELECTIVE COURSE 2:1

### MANAGEMENT INFORMATION SYSTEMS

#### **Objective:**

*To inculcate the principles and use of computer based information systems for Management of Businesses and Organizations.*

#### **UNIT I Introduction to Information Systems:**

Why study Information System? – Why Business need Information Technology?  
– Fundamentals of Information Systems – Overview of Information Systems.

#### **UNIT II Solving Business Problems with Information Systems:**

System Approach to Problem Solving – Developing Information System Solution. **Database Management:** Managing Data Resources – Technical Foundation of Database Management.

**UNIT III Information Systems for Strategic Advantage:** Fundamentals – Strategic Advantage – Strategic Applications and Issues in IT. **Managing:** Enterprise and Global Management.

#### **UNIT IV Business Applications of Information Technology:**

The Internet Electronic Commerce – Fundamentals of Electronic Commerce – Information System for Business Operations – Business Information System – Transaction Processing Systems.

#### **UNIT V Information Systems for Managerial Decision Support:**

Decision Support Systems – Artificial Intelligence Technology in Business – Management IT – Planning for Business Change with IT – Implementing Business Changes with IT – Security and Control Issues in I/S – Ethical and Societal Challenge of Information Technology.

#### **Text Book**

1. James A. O'Brien, **Management Information Systems**, Galgotia Publications, Fourth Edition, 1999.

#### **Reference Book**

1. Gordon B. Davis, Margrethe H. Olson, **Management Information Systems**, McGraw Hill, 2000.

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## **ELECTIVE COURSE 2:2**

### **E-COMMERCE**

#### **Objective:**

To provide exposure on the principles of E-Commerce and its applications

#### **UNIT I**

Electronic Commerce Framework – Electronic Commerce and Media Convergence – The Anatomy of E-Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce Organization Applications. The Network Infrastructure for Electronic Commerce: Components of the High way – Network Access Equipment – Global information Distribution Networks.

#### **UNIT II**

The Internet as a Network Infrastructure: The Internet Terminology – NSFNET Architecture and components – National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization :Telco/Cable/On-Line Companies - National Independent ISPs – Regional Level ISPs – Local –level ISPs – Internet Connectivity options.

#### **UNIT III**

Electronic Commerce and the World Wide Web: Architectural Framework for Electronic Commerce – World Wide Web as the Architecture – Technology behind the Web – Security and the Web, Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications – mercantile process model – mercantile models from the consumers perspective.

#### **UNIT IV**

Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Credit Card – Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems. Inter Organizational Commerce and EDI: Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues.

#### **UNIT V**

Advertising and the Marketing on the Internet: The New Age of Information Search and Retrieval – Electronic Commerce Catalogs – Information filtering – Consumer – Data Interface – Emerging Tools. On Demand Education and Digital Copyrights: Computer-based Education and Training – Technological Components of Education on demand. Software Agents: Characteristics and Properties of Agents – The Technology behind Software Agents – Applets, Browsers and Software Agents.

#### **Text Book:**

“Frontiers of Electronic Commerce”, Ravikalakota & Andrew Whinston, Adison Wesley, 2000.

#### **Reference Book:**

“Electronic Commerce”, Pete Loshin & Paul A.Murphy, Second edition, Jaico Publishing House, 2000.

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**ELECTIVE COURSE 2:3**  
**MARKETING MANAGEMENT**

**Objectives:**

To make the students to know the importance of marketing a developed product and to enrich the knowledge of marketing with development, advertising, selling and management of a new product.

**UNIT I Marketing Management:**

Meaning of Market, Marketing and Marketing Management – Marketing Functions – Marketing Concepts – Marketing Environment – Approaches to Study of Marketing – Market Segmentation – Brand Positioning – Factors Influencing Buyer's Behaviour.

**UNIT II New Product Development:**

Meaning of Product, Idea Screening – Concept Development and Testing – Strategy Development – Market Testing – Commercialization – Consumer Adoption Process – Product Life Cycle – Product Mix Decisions – Product Line Decisions – Individual Product Decision – Product Positioning.

**UNIT III Managing Marketing Channels:**

Nature of Marketing channels – Channel Design Decisions – Channel Management Decisions – Channel Dynamics – Retailing – Types – Decisions – Trends – Wholesaling – Types – Decision Trends – Physical Distribution – Objective – Order Processing – Warehousing – Inventory – Transportation – Distribution Cost Analysis – Packing.

**UNIT IV Advertising and Sales Promotion**

Advertising – Setting and Objectives – Deciding on the Message – Deciding on the Media – Evaluating the Effectiveness – Sales Promotion – Purpose of Sales Promotion – Decision in Sales Promotion – Objectives of Sales Promotion – Developing Sales Promotion Programme – Pretesting Sales Promotion Programme – Implementing Sales Promotion Programme – Evaluating Sales Promotion Programme – Management of Sales Force.

**UNIT V Pricing of Product / Service**

Setting the Price – Adopting the Price – Methods of Pricing.

**Text Book**

1. Philip Kotler, *Marketing Management*, Dorling Kindersley Pvt Ltd., 2009.

**Reference Books**

1. Gordon B. Davis Margrethene H. Olson, *Management Information Systems*, McGraw Hill, 2000.
2. Edward W. Cundiff, Richard Ralph Still, Norman A. P. Govoni, *Fundamentals of Modern Marketing*, Prentice Hall of India, 1980.

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**CORE COURSE VII**  
**J2EE TECHNOLOGIES**

**Objective:**

To provide understanding on developing distributed enterprise applications using J2EE

**UNIT I Client – Server Architecture:**

Two Tier Model – 3 Tier Model – n Tier Model – J2EE Architecture - .net Architecture – MPC Architecture.

**UNIT II Interaction Services:**

RMI – CORBA – XML – JMS.

**UNIT III Presentation Services:**

JSP – Javamail – Servlet.

**UNIT IV Component Model:**

EJB: Session beans: Stateless and Statefull – Entity beans – CMP and BMP – Message Driven Beans.

**UNIT V Struts Framework:**

Introduction – Building a simple struts – Model layers –View layer – controller layer – Validator – Tiles –Declarative Exception Handling –Struts Modules.

**Text Books:**

1. Jim Keogh “The Complete Reference J2EE “Tata McGraw – Hill Edition 2002.
2. James Holmes “The Complete References Struts Second Edition “ Tata McGraw Hill Edition-2007.

**Reference Books:**

1. Jusin Couch, Daniel H. Steinberg, “J2EE Bible” Wily India (P) Ltd, New Delhi 2002.
2. Paul Tremblett, “Instant Enterprise Java Y-Beans”, Tata McGraw Hill Publishing Company, New Delhi, 2001.

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**CORE COURSE VIII**  
**NETWORK SECURITY**

**Objective:**

To provide knowledge for establishing secured network based computing and information systems.

**Unit I**

Overview-Symmetric Ciphers: Classical Encryption Techniques.

**Unit II**

Symmetric Ciphers: Block ciphers and the Data Encryption Standards Public-key Encryption and Hash Functions: Public-Key Cryptography and RSA.

**Unit III**

Network Security Practices: Authentication applications-Electronic Mail Security.

**Unit IV**

Network Security Practices: IP Security-Web Security.

**Unit V**

System Security: Intruders-Malicious Software-Firewalls.

**Text Book**

1. William Stallings, Cryptography and Network Security-Principles and Practices, Prentice-Hall, Third edition, 2003.

**Reference Books**

1. Johannes A. Buchaman, Introduction to cryptography, Springer-Verlag.
2. Atul kahate, Cryptography and Network Security, TMH.

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**CORE PRACTICALS III**  
**J2EE TECHNOLOGIES LAB**

**Objective:**

To provide experience in developing distributed enterprise applications using J2EE

1. To find the marks of the students using Remote Method Invocations.
2. To write a Servlet program to calculate the bonus of an employee
3. To write a Servlet program to implement Session Tracking.
4. To write a Servlet program to check authentication for user using Cookies.
5. To write a Servlet program and use JDBC in it.
6. To write a simple program for JSP.
7. To write a JSP program that works with JDBC.
8. To write a JSP Program with Bean Class.
9. To write a EJB Stateless Program to create bonus of an employee.

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## **ELECTIVE COURSE 3:1**

### **BIG DATA ANALYTICS**

#### **Objective:**

To impart knowledge in Fundamentals, Big Data Analytics, Technologies and databases, Hadoop and Map Reduce Fundamentals

#### **Unit I**

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment

#### **Unit II**

Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

#### **Unit III**

Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of Cassandra

#### **Unit IV**

Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures

#### **Unit V**

HadoopMapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats

#### **Text Book**

Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd., 2016

#### **Reference Books**

1. “Big Data” by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.
2. “Big Data Imperatives : Enterprise Big Data Warehouse, BI Implementations and Analytics” by Soumendra Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
3. “Mining of Massive Datasets”, Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman, Springer, July 2013.
4. “Hadoop: The definitive Guide”, Tom White, O'Reilly Media, 2010.

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## **ELECTIVE COURSE 3:2**

### **DIGITAL IMAGE PROCESSING**

#### **Objective:**

To impart knowledge on the algorithms and techniques to perform various image processing tasks over digital images.

#### **Unit I**

Images and Digital Processing – Digitizing Images – Digital Image Display – Image Processing Software.

#### **Unit II**

The Gray Level Histogram – Point Operations – Algebraic Operations – Geometric Operations.

#### **Unit III**

Linear System Theory - Harmonic Signals and Complex Signal Analysis – The Fourier Transform : - Filter Design - Processing Sampled Data.

#### **Unit IV**

Discrete Image Transforms – Wavelet Transforms – Optics and System Analysis. - Image Restoration – Image Compression.

#### **Unit V**

Pattern Recognition: Image Segmentation – Object Measurement – Classification and Estimation - Color and Multispectral Image Processing – Three Dimensional Image Processing.

#### **Text Book:**

1. Kenneth R. Castelman, “Digital Image Processing”, Pearson Education Inc. New Delhi, 2007.

#### **Reference Book:**

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing” 3<sup>rd</sup> Edition, PHI Publications, New Delhi, 2008.

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**ELECTIVE COURSE 3:3**  
**PATTERN RECOGNITION**

**Objective:**

To provide understanding on concepts and techniques used for recognition and segregation of patterns.

**Unit I Introduction and Bayesian Decision Theory:**

Introduction to pattern recognition, Systems, design cycles, learning and adaptation, Bayesian decision theory, minimum error-rate classification, classifiers, discriminant functions and decisions surfaces.

**Unit II Maximum – Likelihood and Bayesian parameter estimation:**

Maximum – Likelihood estimation, Bayesian estimation, Bayesian parameter estimation, Gaussian case and general theory, problems of dimensionality, Hidden marker models.

**Unit III Nonparametric Techniques:**

Density estimation, Parzen windows,  $K_n$  – Nearest neighbor estimation, The nearest neighbor rule, metrics and nearest – neighbor classification, fuzzy classification, approximations by series expansions.

**Unit IV Linear Discriminant Functions: Linear Discriminant Functions: Linear Discriminant Functions: Linear Discriminant Functions:**

Linear discriminant functions and decision surfaces, generalized linear discriminant functions, The two category linearly separable case, minimizing the perception criterion function, relaxation procedures, nonseparable behaviour, Minimum squared-error procedures, The Ho–Kashyap Procedures, support vector machines, multicategory generalizations.

**Unit V Multilayer Neural Networks:**

Feedforward operation and classification, back propagation algorithm, error surfaces, back propagation as feature mapping, back propagation, Bayes theory and probability, practical techniques for improving backpropagation, regularization, complexity adjustment and pruning.

**Text Book:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley & Sons, 2012.

**Reference Book:**

1. John Hertz, Andres Krogh & Richard G. Palmer, “Introduction to the theory of Neural Computation”, Addison Wesley, 1991.

**ELECTIVE COURSE 4:1**  
**SOFTWARE ENGINEERING**

**Objective:**

To provide exposure on the principles and practices used in Software Development.

**UNIT I**

Need for S/w Engineering: Need for S/w engineering – About software and S/w engineering – A systems approach, - Engineering approach – Members of the development team – Change in S/w engineering. - Modeling the process and Life cycle: The meaning of process – S/w process models – Tools and techniques for process modeling – Practical process modeling.

**UNIT II**

Planning and Managing the project: Tracking progress – Project personnel – Effort estimation – Risk management – The project plan – Process models and project management.

**UNIT III**

Capturing the requirements : The requirement process – Types of Requirements – Characteristics of requirements – Expressing requirements – Additional requirements notations – Prototyping requirements – Requirements Documentation – Participants in the requirements process – Requirements validation – Measuring requirements – Choosing a requirements specification Techniques.

**UNIT IV**

Designing the system : Design Introduction – Decomposition and Modularity – Architectural styles and strategies – Characteristics of good design – Techniques for improving design – Design evaluation and validation – Documenting the design – Programming standards and procedures – Programming guidelines – Documentation.

**UNIT V**

Testing Strategies : Testing strategic issues – Test strategies for conventional S/w – Test strategies for object oriented S/w – Validation testing – system testing – S/w testing. Fundamentals – Black-box and White-box testing – White box testing – Black box testing – McCall's Quality factors – ISO 9126 - QF – S/w Engineering – S/w Maintenance – A S/w engineering process model.

**Text Books:**

1. Shari Lawrence P. Fleegeer, "**Software Engineering Theory and Practice**", 2<sup>nd</sup> Edition, Pearson Education, Delhi, 2001. [(for Units 1–4) Chapters 1, 2, 3, 4, 5, 7]
2. Roger S. Pressman, "**Software Engineering A Practitioner's Approach**", 6<sup>th</sup> Edition, Tata McGraw Hill Publication, [(for Unit 5) Chapters : 13, 14, 15, 31]

**Reference Books:**

1. Ian Sommerville, "**Software Engineering**", 6<sup>th</sup> Edition, Pearson Education, Delhi, 2005.
2. Douglas Bell, "**Software Engineering for Students-A Programming Approach**", 4<sup>th</sup> Edition, Pearson Education, Delhi 2007.

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**ELECTIVE COURSE 4:2**  
**SOFTWARE TESTING**

**Objective:**

To provide exposure on the principles and practices used in Software Testing

**UNIT I      Software Development Life Cycle Models:**

Phases of Software Project – Quality, Quality Assurance and Quality control – Testing, Verification & Validation – Process Model – Life Cycle Models - **White Box Testing:** What is White Box Testing? – Static Testing – Structural Testing – Challenges - **Black Box Testing:** What is Black Box Testing? – Why Black Box Testing? – When to do Black Box Testing? – How to do Black Box Testing?

**UNIT II      Integration Testing:**

What is Integration Testing? – Integration Testing as a Type of Testing – Integration Testing as a Phase of Testing – Scenario testing – Defect Bash - **System and Acceptance Testing:** Overview – Why System Testing? – Functional Vs Non Functional Testing – Functional System Testing – Non Functional Testing – Acceptance Testing – Summary of Testing Phases.

**UNIT III      Performance Testing:**

Factors governing Performance Testing – Methodology for Performance Testing – Tools for Performance Testing – Process for Performance Testing - **Regression Testing:** – What is Regression Testing – Types of Regression Testing – When to do Regression Testing – How to do Regression Testing – Best Practices in Regression Testing.

**UNIT IV      Internationalization (I18n) Testing:**

Primer – Test Phases – Enabling Testing – Locale Testing – Validation – Language Testing – Localization Testing – Tools – Challenges and Issues - **Ad hoc Testing:** - Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative Testing – Agile and Extreme Testing – Defect Seeding - **Usability and Accessibility Testing:** - What is Usability Testing? – Approach – When to do Usability Testing? – How to Achieve Usability? – Quality Factors – Aesthetics Testing – Accessibility Testing – Tools – Lab Setup – Test Roles

**UNIT V      Test Planning, Management, Execution and Reporting:**

Test Planning -Test Management – Test Process – Test Reporting – Best Practices - **Software Test Automation:** What is Test Automation – Terms used in Automation – Skills Needed for Automation – What to Automate, Scope of Automation – Design & Architecture for Automation – Generic Requirement for Test Tool Framework – Process model for Automation – Selecting a Test tool – Automation for Extreme Programming Model – Challenges in Automation.

**Text Book:**

1. Srinivasan Desikan, Gopalaswamy Ramesh, **Software Testing – Principle & Practices**, Pearson Education, New Delhi, 2006.

**Reference Books:**

1. Ron Patton, **“Software Testing”**, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2006.
2. William E. Perry, **“Effective Methods for Software Testing”**, 3<sup>rd</sup> Ed., Wiley India, 2006.
3. Renu Rajani, Pradeep Oak, **“Software Testing – Effective Methods, Tools and Techniques”**, TMH Publishing Company Limited, New Delhi, 2004.

## **ELECTIVE COURSE 4:3**

### **SOFTWARE METRICS**

#### **Objectives:**

To impart knowledge and to develop research skills on many aspects of framework for software Measurement, software metrics data collection, measurements and predictions, and latest trends in software metrics.

#### **UNIT I**

Measurement – measurement in everyday life – measurement in software engineering – the scope software metrics - Basics of measurement - The representational theory of measurement – measurement and models - measurement scales and scale types – meaningfulness in measurement - A goal-based framework for software measurement- classifying software measures- determining what to measure- applying the framework- software measurement validation- software measurement validation in practice

#### **UNIT II**

Empirical Investigation – four principles of investigation – planning formal experiments – planning case studies – Software metrics data collection- what is good data – how to define data – how to collect data- how to store and extract data- Analyzing software measurement data – Introduction – analyzing the results of experiments – examples of simple analysis techniques – more advanced methods – overview of statistical tests

#### **UNIT III**

Software-Engineering Measurement – Measuring internal product attributes : size – Aspect of software size – length – reuse – functionality – complexity – Measuring internal product attributes – structure –Types of structural measures – control flow structure – modularity and information flow attributes – object oriented metrics- data structure – difficulties with general complexity measures –Measuring external product attributes – modelling software quality – measuring aspects of quality

#### **UNIT IV**

Software Reliability : Measurement and Prediction - basics of reliability theory – the software reliability problem – parametric reliability growth models – predictive accuracy – the recalibration of software – reliability growth predictions – the importance of operational environment – wider aspect of software reliability – Resource measurement : Productivity, teams and tools - the meaning of productivity – productivity of what? - Measuring productivity – teams, tools, methods – Making process predictions – Good estimates – cost estimation problems and approaches – models of effort and cost – problems with existing modelling methods – dealing with problems of current estimation methods – implication for process prediction

#### **UNIT V**

Measurement and Management : Planning a measurement program – what is a metrics plan – Why and What : developing goals, questions and metrics – Where and When: mapping measures to activities – How: measurement tools – Who: measurers , analysts and audience - revising the plan – Measurement in Practice – Success criteria – Measurement in the small – Measurement in large – lessons learned – Empirical Research in Software Engineering - Problem with empirical research – investigating products – investigating resources - investigating processes - measurement today and tomorrow.

#### **Text Book:**

**“Software Metrics”**, Norman E. Fenton, Shari Lawrence Pfleeger A Rigorous & Practical Approach Second Edition 2010, International Thomson Publishing

## CORE COURSE IX INTERNET OF THINGS

### Objectives:

To understand the underlying concepts in Internet of Things (IoT) and to provide in-depth knowledge on state of the art in the IoT, challenges and future directions.

### UNIT I INTRODUCTION TO IoT

**Requirements of IoT:** The definition of the Internet of Things, main assumptions and perspectives- Platform for IoT devices. Economics and Technology of the IoT –Issues in IoT and solutions-Architecture of IoT. **Anatomy of IoT:** Traditional Internet Protocol Vs Chirps –Applying network intelligence at propagator nodes-Transport and functional architectures.

### UNIT II IoT DEVICES

**IoT Devices**-Temporary and Ad-hoc devices-Addressing issues-End devices in dedicated networks- Converting states to chirps-RFID integration in the IoT-End devices with higher demands- Small data-Building a web of things-Autonomy and coordination-Structuring a tree-Housekeeping message-Role of integrator function-Degrees of functionality-Aggregating end points-Packaging options.

### UNIT III DATA AND HUMAN INTERACTION

**Data and Human Interaction:** Functions of IoT-Analysis and control-Neighborhood and affinities- Public private and other kinds of data- Publishing agent- Searching for and managing agents- High and low level loops- Human interface and control points-Collaborative scheduling tools-Packaging and provisioning- Distributed integrator functions- Filtering the streams-IP Alternative-Protocol based on category classification-Skeletal architecture of chirp packets- Pattern driven-Propagator node networks and operation-Power of local agents and integrator functions-High level interchange.

### UNIT IV IoT APPLICATIONS

Moore's Law –Intelligence near the edge- Incorporating legacy devices- Staying in the loop -Social machines-Applications of IoT–Agriculture- Home healthcare-Efficient process control-Factory application- Home automation- Natural sciences- Living applications- Origin of IoT- Open source networking solutions- Shared software and business process vocabularies.

### UNIT V CREATING IoT PROJECTS

**Creating the IoT projects:** Sensor project-Actuator project – Controller-Camera. Using an IoT service platform- Selecting an IoT. **Platform-** The claysterplatform- Interfacing our devices using XMPP- Creating control application.

### Text Books:

1. ***“Rethinking the Internet of Things-A scalable approach to connecting everything”***, by Francis DaCosta,Apress open publication,2013.
2. ***“Learning Internet of Things”*** by Peter Waher,PACKT Publishing-Birmingham-mumbai-2015.

### Reference Books:

1. ***“Internet of Things: A Hands on Approach”***, by Arhdeep Bahga and Vijay Madiseti (<http://www.internet-of-things-book.com/>).
2. ***“Getting started with the internet of things”***, by Cuno Pfister,O’Rielly Publication.

## CORE COURSE X

### DISTRIBUTED OPERATING SYSTEMS

#### Objective :

To impart understanding on the working of the Operating Systems for Distributed Computing Environments

#### UNIT I Fundamentals:

What is Distributed Operating System – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Computing System – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment. Introduction to Computer Networks – Network types – LAN –WAN – Communication protocols – Internetworking – ATM Technology.

#### UNIT II Message Passing:

Introduction – Desirable features – Issues in IPC by Message Passing – Synchronization – Buffering – Multidatagram Messages – Encoding and Decoding – Process Addressing – Failure Handling – Group Communication.

#### UNIT III Distributed Shared Memory:

Introduction – General Architecture of DSM systems – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory Space – Consistency Models – Replacement Strategy – Thrashing – Other Approaches to DSM – Heterogeneous DSM – Advantages of DSM.

**Synchronization:** Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithm.

#### UNIT IV Distributed File Systems:

Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles.

#### UNIT V Security:

Introduction – Potential Attacks to Computer Systems – Cryptography – Authentication – Access Control – Digital Signatures – Design Principles.

#### Text Book:

1. Pradeep K Sinha, “Distributed Operating Systems – Concepts and Design”, PHI, 2012.

#### Reference Book

1. Andrew S Tanenbaum, Distributed Operating Systems, 1e, Pearson Education, 1995.

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## CORE PRACTICALS IV

### OPEN SOURCE TECHNOLOGIES LAB

#### Objectives :

To provide web programming experience using open source software platforms and tools.

1. Write a server side PHP program that displays marks, total, grade of a student in tabular format by accepting user inputs for name, number and marks from a HTML form.
5. Write a PHP program that adds products that are selected from a web page to a shopping cart.
6. Write a PHP program to access the data stored in a mysql table.
7. Write a PHP program interface to create a database and to insert a table into it.
  - i). Write a PHP program using classes to create a table.
  - ii). Write a PHP program to upload a file to the server.
5. Write a PHP program to create a directory, and to read contents from the directory.
6. Write a shell program to find the details of an user session.
7. Write a shell program to change the extension of a given file.
8. Create a mysql table and execute queries to read, add, remove and modify a record from that table.

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## **ELECTIVE COURSE 5:1**

### **PERVASIVE COMPUTING**

#### **Objective :**

To provide an exposure on the technologies, tools and gadgets of Pervasive and Ubiquitous Computing.

#### **UNIT I**

Pervasive Computing: Past, Present and Future Pervasive Computing-Pervasive Computing Market-m-Business-Application examples: Retail, Airline check-in and booking-Sales force automation-Health care-Tracking-Car information system-E-mail access via WAP

#### **UNIT II**

Device Technology: Hardware-Human Machine Interfaces-Biometrics-Operating Systems-Java for Pervasive devices

#### **UNIT III**

Device Connectivity: Protocols-Security-Device Management Web Application Concepts: WWW architecture-Protocols-Transcoding-Client authentication via internet

#### **UNIT IV**

WAP and Beyond: Components of the WAP architecture-WAP infrastructure-WAP security issues-WML-WAP push-Products-i-Mode-Voice Technology: Basics of Speech recognition- Voice Standards-Speech applications-Speech and Pervasive Computing

#### **UNIT V**

PDA: Device Categories-PDA operation Systems-Device Characteristics-Software Components-Standards-Mobile Applications-PDA Browsers Pervasive Web Application architecture: Background-Scalability and availability-Development of Pervasive Computing web applications-Pervasive application architecture

#### **Text Book:**

1. Pervasive Computing, Technology and Architecture of Mobile Internet Applications, Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, Pearson Education, 2006

#### **Reference Book:**

1. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, McGraw Hill edition, 2006

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## **ELECTIVE COURSE 5:2**

### **HUMAN COMPUTER INTERACTION**

#### **Objectives :**

To understand the concepts and techniques for effective interaction between Human and Computers

#### **UNIT I**

Cognitive Psychology and Computer Science - Capabilities of Human-Computer Interaction-Goals of Human-Computer Interaction-Roles of Human, Computer and Interaction in HCI-Basic User Interfaces - Advanced User Interfaces - Justification of Interdisciplinary Nature- Standard Framework of HCI-HCI Design Principles-Interface Levels in HCI-Steps in Designing HCI Applications - Graphical User Interface Design -Popular HCI Tools - Architecture of HCI Systems-Advances in HCI-Overview -HCI Sample Exercises **Usability Engineering** HCI and Usability Engineering-Usability Engineering Attributes - Process of Usability-Need for Prototyping.

#### **UNIT II Understanding Process Modelling-**

Goals, Operators, Methods, Selection Rules-Cognitive Complexity Theory-Adaptive Control of Thought-Rational-State, Operator, and Result-Belief-Desire-Intention-ICARUS-Connectionist Learning with Adaptive Rule Induction On-line (CLARION)-Subsumption Architecture-**Spoken Dialogue System**-Factors Defining Dialogue System-General Architecture of Spoken Dialogue System-Dialogue Management Strategies-Computational Models for Dialogue Management- Statistical Approaches to Dialogue Management-Learning Automata as Reinforcement Learners.

#### **UNIT III Recommender Systems**

HCI Study Based on Personalisation - Personalisation in Recommender Systems -Application Areas of Recommender Systems-Recommender System Field as an Interdisciplinary Area of Research -Phases of Recommender Systems -User Profiling Approaches-Classification of Recommendation Techniques -Advantages and Disadvantages of Recommender System Approaches -Need of Software Agent-based Approach in Recommender Systems -Evaluating Recommender Systems-Integrated Framework for Recommender Systems -Case Study.

#### **UNIT IV Advanced Visualisation Methods-**

Ontology Definition -Ontology Visualisation Method -Space Dimensions of Ontology Visualisation -Ontology Languages -Ontology Visualisation Tools - Ontology Reasoning -Reasoner.

## **UNIT V      Ambient Intelligence: The New Dimension of Human–Computer Interaction**

Ambient Intelligence Definition-Context-aware Systems and Human–Computer Interaction -Middleware - Modelling Data for Aml Environment -Development of Context-awareness Feature in Smart Class Room— A Case Study - Context-aware Agents for Developing Aml Applications—A Case Study.

### **Text Book:**

1. K. Meena, R. Sivakumar, **“Human–Computer Interaction”**, PHP Learning Private limited Delhi-110092, 2015.

### **Reference Books:**

1. John M. Carroll, **“Human Computer Interaction–in the New Millennium”**, Pearson Education, 2007.
2. Ian Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, **“Human-Computer Interaction”**, Pearson Education, 2009.

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## **ELECTIVE COURSE 5:3**

### **SOFT COMPUTING**

#### **Objective :**

To enable a good understanding on different areas of soft computing such as Fuzzy Set Theory, Neural Networks, Neuro-Fuzzy Modelling and their applications.

#### **UNIT I FUZZY SET THEORY**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

#### **UNIT II OPTIMIZATION**

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton’s Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

#### **UNIT III NEURAL NETWORKS**

Supervised Learning Neural Networks – Perceptrons – Adaline Backpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

#### **UNIT IV NEURO FUZZY MODELING**

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

#### **UNIT V APPLICATION OF COMPUTATIONAL INTELLIGENCE**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

#### **TEXT BOOK**

1. J. S. R. Jang, C.T. Sun and E. Mizutani, “Neuro Fuzzy and Soft Computing”, PHI, Pearson Education, 2004.

#### **REFERENCE BOOKS**

1. Timothy J. Ross, “Fuzzy Logic with Engineering Application, “ Mc Graw Hill, 1977.
2. Davis E. Goldberg, “Genetic Algorithms Search, Optimization and Machine Learning”, Addison Wesley, 1989.
3. S. Rajasekaran and G.A.V. Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003. Emereo Pty Limited, July 2008