FACULTY OF ENGINEERING

Syllabus

M.E. (Information Technology) 2017 Course

(With effect from Academic Year 2017-18)

INDEX

Program Educational Objectives

1) To develop professionals required to meet the needs of the industry in exploiting security infrastructure.
2) To promote an academic career for further research in Security Domain for effective utilization of system resources.
3) To develop the spirit of entrepreneurship in providing secured services.
4) To provide the necessary skills for design develop and deploy services related to security paradigm.

Program Outcomes

1) An ability to effectively apply knowledge of mathematics, science and engineering in practice
2) An ability to identify, critically analyze, formulate and solve engineering problems with comprehensive knowledge in the area of specialization
3) An ability to select modern engineering tools and techniques and use them with dexterity
4) An ability to design a system and process to meet desired needs within realistic constraints such as health, safety, security and manufacturability
5) An ability to contribute by research and innovation to solve engineering problems
6) An ability to devise and conduct experiments, interpret data and provide well informed conclusions
7) An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude

M.E. (Information Technology) 2017 Course to be implemented from Academic Year 2017-18

SYLLABUS STRUCTURE

SEMESTER – I

Subject Code	Subject	Teaching Scheme	Examination Scheme					
		Lecture / Practical	Paper		TW	OR/ Presentation	Marks	Credits
		Lecture	In-Sem. Paper	End-Sem. Paper				
514401	Mathematical Foundation Of Information Technology	04	50	50	-----	-----	100	04
514402	Advance Software Engineering and Project Management	04	50	50	-----	-----	100	04
514403	Applied Algorithms	04	50	50	-----	-----	100	04
514404	Research Methodology	04	50	50	-----	-----	100	04
514405	Elective I	05	50	50	-----		100	05
514406	Lab Practice I	04	-----	-----	50	50	100	04
	Total	**25**	**250**	**250**	**50**	**50**	**600**	**25**

SEMESTER – II

Subject Code	Subject	Teaching Scheme	Examination Scheme					
		Lecture / Practical	Paper		TW	OR/ Presentation	Marks	Credits
		Lecture	In-Sem. Paper	End-Sem. Paper				
514407	Cyber Security And Forensics	04	50	50	-----	-----	100	04
514408	Cloud And Data Technologies	04	50	50	-----	-----	100	04
514409	Information Technology Oriented Operations Research	04	50	50	-----	-----	100	04
5144010	Elective II	05	50	50	-----	-----	100	04
5144011	Seminar I	04	-----	----	50	50	100	05
5144012	Lab Practice II	04	-----	-----	50	50	100	04
	Total	**25**	**200**	**200**	**100**	**100**	**600**	**25**

M.E. (Information Technology) 2017 Course to be implemented from June 2017

SYLLABUS STRUCTURE

SEMESTER – III

Subject Code	Subject	Teaching Scheme	Examination Scheme					
		Lecture / Practical	Paper		TW	Oral/ Presentation	Marks	Credits
		Lecture	In-Sem. Paper	End-Sem. Paper				
5144013	Mobile Ad-Hoc Networks	04	50	50	-----	-----	100	04
5144014	Advance Operating Systems	04	50	50	-----	-----	100	04
5144015	Elective III	05	50	50	-----	-----	100	05
5144016	Seminar II	04	---	---	50	50	100	04
5144017	Project Stage I	08	-----	----	50	50	100	08
	Total	**25**	**150**	**150**	**100**	**100**	**500**	**25**

SEMESTER – IV

Subject Code	Subject	Teaching Scheme	Examination Scheme					
		Lecture / Practical	Paper		TW	OR/ Presentation	Marks	Credits
		Lecture	In-Sem. Paper	End-Sem. Paper				
5144018	Seminar III	05	--	--	50	50	100	05
5144019	Project Stage II	20	--	--	150	50	200	20
	Total	**25**	**--**	**--**	**200**	**100**	**300**	**25**

List of Electives: Minor Subjects (5 Credit)

Domain ⇩	Semester – I		Semester – II		Semester - III	
	Elective – I		Elective – II		Elective – III	
	Subject Code	Subject Name	Subject Code	Subject Name	Subject Code	Subject Name
Advance Network Technologies	**514405 A**	Cluster, Grid and Cloud Computing	**5144011 A**	Internet Routing Design	**5144015 A**	Internet of Things and Software Defined Networks
Advance Software Engineering	**514405 B**	Software Quality Metrics and Assurance	**5144011 B**	User Experience Design	**5144015 B**	Enterprise Application Integration And Management
Disruptive Technologies in IT	**514405 C**	Web and Social Network Data Analysis	**5144011 C**	Natural Language Processing	**5144015 C**	Product Life Cycle Management
Signal and Image Intelligence	**514405 D**	Speech Synthesis and Processing	**5144011 D**	Image Analysis and Interpretation	**5144015 D**	Computer Vision and Video Processing
Cognitive Computing / Intelligence	**514405 E**	Machine and Deep Learning	**5144011 E**	Advanced Computing Intelligence	**5144015 E**	Green ICT
Industry Specific(Multi core / Web Pgmg / Industry)	**514405 F**	Multicore Architecture and Programming	**5144011 F**	Advanced Web Programming	**5144015 F**	Institute Elective with Industry Association / Interdisciplinary Elective

SEMESTER-I

514401: MATHEMATICAL FOUNDATION OF INFORMATION TECHNOLOGY

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Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester: 50 Marks

Prerequisites:

1. Basic Mathematics
2. Linear Algebra
3. Basic Probability

Course Objectives:

1. To understand the basic mathematics behind Information Technology.
2. To understand the different mathematical approaches for optimization.
3. To understand and apply the statistical measures for research activity.
4. To understand the fuzzy logic and genetic algorithm concept for mathematical modeling.

Course Outcomes:

By the end of the course, students should be able to:

1. Apply mathematical concept for Information Technology problem solving.
2. Learn and apply different mathematical models for real time projects and applications.
3. Analyze each learning model come from a different algorithmic approach and it will perform differently under different conditions.

UNIT – I Graph Theory 08 Hours

Undirected and Directed Graphs, Bipartite Graphs, Connectivity, Graph Traversal, Trees, Spanning Trees, Rooted and Binary Trees, Algorithms – Kruskal's and Prim's Minimal Spanning Tree, Dijkstra's Algorithm, Max-flow Min-cut theorem, Algorithms for computing maximum s-t flows in graphs.

UNIT – II Probability Theory 08 Hours

Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quintiles, Markov inequality, Chebyshev's inequality, problems.

Special Distributions: Discrete uniform, binomial, geometric, negative binomial, hyper geometric, Poisson, continuous uniform, exponential, gamma, Weibull, Pareto, beta, normal, lognormal, inverse Gaussian, Cauchy, double exponential distributions, reliability and hazard rate, reliability of series and parallel systems, problems.

UNIT – III Optimization 08 Hours

Introduction: Optimization, Types of Problems and Algorithms, Convex Sets and Convex Functions, Unconstrained Optimization: Basic properties of solutions and algorithms, Global convergence, Basic

Descent Methods: Line Search Methods, Steepest Descent and Newton Methods, Trust-Region Methods, Constrained Optimization: First Order Necessary Conditions, Linear Programming: The Simplex Method, Duality and Interior Point Methods, Karmarkar's algorithm.

UNIT IV Fuzzy Theory 08 Hours

Classical Sets, Introduction to Fuzzy Sets – Basic Definition and Terminology – Set-theoretic operations, Fuzzy Rules and Fuzzy Reasoning - Extension principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning, Uncertainty and Information, Membership functions, Defuzzification, Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Decision Making.

UNIT V Genetic Algorithm 08 Hours

Introduction to genetic Algorithm, Basic Operators and Terminologies in GA, Traditional Algorithm vs. Genetic Algorithm, Simple GA, General Genetic Algorithm, The Schema Theorem, The optimal allocation of trials, Classification of Genetic Algorithms with mathematical perspective: Messy, Adaptive, Hybrid, Parallel, Independent Sampling, Real coded.

UNIT VI Statistical methods 08 Hours

Measures of central value: Types of averages: Arithmetic Mean, Median, Geometric mean, Harmonic mean, Measures of Dispersion, Correlation analysis, Regression analysis, Chi square test for goodness of fit, F-Test and analysis of variance, Partial and Multiple correlation.

Text Books

1) Probability and Statistics with reliability, Queuing and Computer Science Applications by Kishor S. Trivedi, WSE publication, ISBN:978-81-265-1853-1
2) Principles of Soft Computing by S.N. Sivanandam and S.N. Deepa , Wiley India , ISBN:10:81-265-1075-7

Reference Books

1) Elements of discrete mathematics by C L Liu and D P Mohapatra, Tata McGraw Hill ISBN: 13:978-0-07-066913-0.
2) David Luenberger and Yinyu Ye, Linear and Nonlinear Programming, 3rd Edition, Springer, 2008.
3) Statistical Methods by S.P. Gupta, ISBN: 81-8054-739-6
4) NPTEL Course Statistical and Stochastic Random Processes.

514402: ADVANCE SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

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Teaching Scheme:
Lectures: 4 Hours/Week

Credits:
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Basic Principles of Software Engineering
2. Basics of Project planning and management

Course Objectives:

1. To apply a systematic, disciplined, quantifiable approach to the cost-effective development, operation and maintenance of software systems to the satisfaction of their beneficiaries.
2. To prepare a technologically competent computer by training them in the contemporary software engineering principles and paradigms.
3. To illustrate core project management techniques so as to manage project schedule, expenses and resources with the aid of suitable project management tools.
4. To analyze the various issues in each phase of project management and people management.
5. To provide the students with recent trends and practices in software engineering and supporting tools.
6. To emphasize the importance of software project management skills in order to cater the changing industry needs and constraints across the advancing domains of computing.

Course Outcomes:

By the end of the course, students should be able to

1. Identify the resources required for a software project and to produce a work plan and resource schedule
2. Decide and justify the use of most appropriate software process model for a given project definition
3. Apply risk management analysis techniques
4. Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift
5. Use appropriate metrics to manage the software development outcome
6. Understand emerging trends in software engineering and project management.

UNIT – I Introduction **08 Hours**

Software Process Framework; Various Software Process Models: Prescriptive, Specialized, Unified, Personal and Team Process models; Software Requirement Engineering- Requirements elicitation, specification, Formal Specifications, Specification Qualities, Classification of Specification Styles , Descriptive Specifications: Logic and Algebraic Specifications , Operational Specifications: DFD, FSM, Petri Nets, validation, change; System Modeling - Context, Interaction, Structural, Behavioral models; Unified Modeling Language.

UNIT – II Software Design Methodologies 08 Hours

Design Process, Design concepts, Design Models, User interface design, Pattern-based and web application design, Software Product Lines, Design modeling using UML [Specification techniques of diagrams in UML].

UNIT – III Agile Development 08 Hours

Agile methods, Agile development techniques, Extreme Programming, Various Agile Process Models – ASD, SCRUM, DSDM, Crystal, FDD, LSD, AM, AUP.

UNIT IV Software Project Management 08 Hours

Project Management Spectrum: Project Metrics; Project planning- Estimation and scheduling- PERT, CPM, GERT, Resource loading and Resource Leveling, Types of project Contracts from Project Management. , Agile Planning, Risk Mitigation and monitoring, , Project Control Techniques, Earned Value Project, Change Management, Quality management, Challenges in software project maintenance - Code Cloning: Detection, Classification, and Refactoring.

UNIT V In-Stream Activities in Project Management 08 Hours

Software Measurement Framework, Ishikawa's seven tools, Process Assessment and patterns, CMMI –IPPD, Product and Process attributes, Software Quality and configuration management.

UNIT VI Emerging Trends in Software Engineering and Project Management 08 Hours

Agents and Mobile Agents in Software Engineering, Aspect Oriented Programming, Software Process Improvement and maturity models, Distributed Software Engineering, Service-oriented Software Engineering, Real-time Software Engineering

Text Books

1. Roger S. Pressman, Software Engineering: A practitioners approach, TMH, Seventh Edition, ISBN 978–0–07–337597–7, ISBN 0–07–337597–7.
2. Ian Sommerville, Software Engineering, Addison-Wesley, and Tenth Ed. ISBN-13:978-0133943030 ISBN-10: 0133943038.

Reference Books

1. Linda I. Shafer, Robert T. Futrell, Donald F. Shafer, Quality Software Project Management, Prentice Hall, ISBN 0130912972.
2. Scott Berkun, The Art of Project Management, O'Reilly, First Edition, ISBN 0596007868.
3. Orit Hazzan and Yael Dubinsky, Agile software engineering, Springer -Verlag London, First Edition, ISBN 978-1-84800-199-2
4. Pankaj Jalote, Software Project Management in practice, Addison-Wesley Professional, ISBN 0201737213.
5. Craig Larman, Applying UML and Patterns, Pearson Education, Third Edition.
6. Grady Booch, James Rambaugh, Ivar Jacobson, Unified Modeling Language Users Guide, Addison-Wesley, Second Edition, ISBN 0321267974.

514403: APPLIED ALGORITHMS

Index

Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester: 50 Marks

Prerequisites:

1. Fundamentals of Programming
2. Data Structures
3. Discrete Structures

Course Objectives:

1. To equip the students with mathematical preliminaries required to analyze and design computer algorithms.
2. To know the basics of computational complexity analysis and various algorithm design paradigms.
3. To provide a thorough knowledge of the most common algorithms and data structures.
4. To introduce the concept of NP-complete problems and different techniques to deal with them.
5. To study online and randomized algorithms.
6. To apply knowledge of advanced data structures to real world problems.

Course Outcomes:

By the end of the course, students should be able to

1. Apply knowledge of Mathematics to perform asymptotic analysis of algorithms.
2. Prove the correctness and analyze the running time of algorithms for problems in various domains and estimate their worst case, average case and best case behavior
3. Identify and select appropriate data structures to offer suitable solution to real world problems
4. Recommend appropriate design paradigm amongst various algorithmic strategies
5. Distinguish amongst P, NP, NP hard and NP complete problems.
6. Identify the need for approximation, parallel algorithms to solve NP Complete problems.

UNIT – I Analysis of Algorithms **08 Hours**

Asymptotic analysis: upper and average complexity bounds, Identifying differences among best, average and worst Case Behaviors, Big-O, little-O, Omega and theta notations, Standard complexity classes, Empirical measurements of performance, Time and space tradeoffs in algorithms, Solving homogeneous and Non-Homogeneous recurrences. Analyzing recursive algorithms using recurrence relations. Divide and Conquer method: Tower of Hanoi, Quick sort, Merge sort with their analysis, Master theorem to solve recurrences

UNIT – II Algorithmic Strategies and Graph Algorithms 08 Hours

Undirected and Directed Graphs, Bipartite Graphs, Connectivity, Traversability, Trees, Spanning Trees, Rooted and Binary Trees Algorithms – Kruskal's and Prim's Minimal Spanning Tree (Greedy), Dijkstra's Algorithm, Bellman Ford Algorithm, Floyd Warshall Algorithm (Dynamic Programming), Johnson's algorithm for sparse graph, Max-flow Min-cut theorem. Algorithms for computing maximum s-t flows in graphs. Finding Hamiltonian Circuits (Backtracking), Travelling Salesman Problem (Branch and Bound)

UNIT – III Computational Geometry, String Matching and Number Theoretic Algorithms: 08 Hours

Line - segment properties, Determine whether any pair of segments intersects, Finding Convex Hull by Graham's scan and Jarvis's march, finding closest pair of problems (1D and 2D) Naive string matching algorithm, Rabin-Karp algorithm GCD and modular Arithmetic, Chinese remainder theorem, Primality testing and RSA Public-key cryptosystem

UNIT IV NP-Completeness and Approximation Algorithms 08 Hours

Non Deterministic algorithms, The classes: P, NP, NP Complete, NP hard; Proofs for NP Complete Problems: Satisfiability Problem, Clique, Vertex Cover, Approximation Algorithms: Performance ratios, Vertex Cover, Travelling salesman problem, approximating weighted vertex cover using linear programming

UNIT V Advanced Data Structures and Randomized Algorithms 08 Hours

B-Trees: Properties, Insertion and deletion, **Persistent Data Structures**: Insert, delete and concatenate on singly linked list, Insertion in Binary Search tree (From Perspective point of view) **Splay Tree:** Basic operations zig, zig-zig, zig-zag, algorithms for access, join, split, insert, delete **Red-Black Tree**: Properties, insertion and deletion **Randomized Algorithms:** A randomized algorithm to solve the closest pair problem, the average performance of the randomized closest pair problem, A randomized algorithm to test whether a number is a prime, A randomized algorithm for pattern matching, A randomized linear time algorithm for minimum spanning trees.

UNIT VI Parallel and Online Algorithms, Case Studies 08 Hours

Parallel Algorithms Introduction, models for parallel computing, computing with complete binary tree, Pointer doubling algorithm.

Online Algorithms: Introduction, the online Euclidean spanning tree problem solved by the greedy method, The online k-server problem and greedy algorithm to solve this problem defined on planner trees, an online obstacle traversal algorithm based on the balance strategy, The online bipartite matching problem solved by the compensation strategy, The online m-machine problem solved by the moderation strategy.

Case studies: Algorithmic case studies in

Embedded Systems: Cognitive Intelligence

Distributed Systems: Leader Election

Internet of Things: Data management algorithms

Text Books:

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" PHI, 3rd Edition, ISBN:- 81-203-2141-3.
2. Horowitz and Sahani, "Fundamentals of computer Algorithms", Galgotia, ISBN: 81-7371-612-9.
3. Gilles Brassard, Paul Bratle, “Fundamentals of Algorithms “, Pearson, ISBN: 978-81-317-1244-3.

Reference Books:

1. R.C.T.Lee, S S Tseng, R C Chang, Y T Tsai, “ Introduction to Design and Analysis of Algorithms, A Strategic approach”, Tata McGraw Hill, ISBN-13:978-1-25-902582-2, ISBN-10:1-25-902582-9.
2. Steven S Skiena, The Algorithm Design Manual, Springer, 2nd Edition, ISBN 978-81-8489-865-1.
3. George T. Heineman, Gary Pollice, Stanley, “Algorithms in a Nutshell, A Desktop Quick Reference”, O’Reilly, ISBN 13:978-81-8404-608-3.
4. Rajiv Motwani & Prabhakar Raghavan, Randomized Algorithms, Cambridge University Press.
5. Dan Gusfield, “Algorithms on Strings, Trees and Sequences”, Cambridge University Press, ISBN: 978-0-521-67035-7.
6. S.Sridhar, “Design and Analysis of Algorithms”, Oxford, ISBN: 10:0-19-809369-1.

514404: RESEARCH METHODOLOGY

Index

Teaching Scheme:
Lectures: 04 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50Marks

Prerequisites:

1. Fundamental of Mathematics

Course Objectives:

1. To enable to student to understand and work methods and concepts related Research.
2. To enable the student to develop research proposal and to work with research problem.
3. To develop broad comprehension of research area.

Course Outcomes:

By the end of the course, students should be able to

1. Perform the research work in a methodological way.
2. Use tools for organizing the literature survey.
3. Apply appropriate tools for paper writing
4. Apply data analysis methods to generate results, drawing conclusion etc. from the project work

UNIT – I Introduction 08 Hours

Research Aptitude: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, and Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done.

UNIT – II Research Process 08 Hours

Research Formulation: Reviewing the literature, Formulation of research problem, Nature and type of variables, Hypothesis - meaning, types, development of hypothesis and its testing, Meaning & Functions of Research Design.

Importance of literature review in defining a problem, Literature review, Primary and secondary sources, reviews, treatise, monographs, patents, web as a source, searching the web, Critical literature review, identifying gap areas from literature review, Development of working hypothesis.

Literature Recourses: Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Searching patents,

Manage Bibliographic Data: Mendeley, EndNote, Zotero, Evernote

Build and Share Article Collections: Bibliogo, WizFolio

UNIT – III Data Collection and Analysis 08 Hours

Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiments.

Data Analysis: Sources, acquisition and interpretation of data, Quantitative and qualitative data, Graphical representation and mapping of data, Sensitivity Analysis with Data Tables, Optimization with EXCEL Solver, Summarizing Data with Histograms and Descriptive Statistics, Pivot Tables,

Summarizing Data with database statistical functions: Correlation, Multiple Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, Moments and response curve methods, State vector machines and uncertainty analysis, Probable errors in the research, Error analysis.

UNIT IV Research Article – Reading and Writing 08 Hours

Types of technical papers - Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, when to go for what type of technical paper in the research process.

How to read a scientific paper - The three pass approach, comparing the approaches to find the potential research issues.

How to write scientific paper - Paper Design Process, Readers, Concept Sheet, Embodiment, General advice about writing technical papers in English – Grammar, Punctuation, Tips for writing correct English.

UNIT V Report Writing 08 Hours

Significance of Report Writing: Different Steps in writing Report, Layout of the Research Report, Types of Reports, Mechanics of Writing a Research Report, Art of scientific writing- Steps to better writing, flow method, organization of material and style, Drawing figures, graphs, tables, footnotes, references etc. in a research paper

Research Tools:

Detect and avoid plagiarism: Viper, The Plagiarism Checker, Turnitin

Report Writing and Plotting Tools – Latex, LatexDraw, GNU Plot, Octave, Scrivener

UNIT VI Research Proposals and IPR 08 Hours

Research proposal writing – how to write a research proposal, how research is funded, budgeting, sponsoring agencies, Funded Research for Product Development etc.

Application of results and ethics - Environmental impacts - Ethical issues - ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

Introduction to Indian Patent laws etc., process of patenting a research finding, Copy right, Cyber laws etc.

Text Books:

1. Research Methodology Methods and Techniques, Kothari, C. R., Wiley Eastern Ltd.
2. Research methodology: an introduction for science & engineering students', by Stuart Melville and Wayne Goddard.
3. Practical Research Methods, Dawson, C., UBSPD Pvt. Ltd.

Reference Books:

1. Research methodology: an introduction for science & engineering students', by Stuart Melville and Wayne Goddard.
2. Research Methodology: An Introduction' by Wayne Goddard and Stuart Melville.
3. Research Methodology: A Step by Step Guide for Beginners', by Ranjit Kumar, 2nd Edition.
4. Operational Research by Dr. S.D. Sharma, Kedar Nath Ram Nath & co.
5. Microsoft Excel Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Press, ISBN: 0735619018.

514405A: ELECTIVE I: CLUSTER, GRID AND CLOUD COMPUTING

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	05	In-Semester : 50 Marks End-Semester: 50 Marks

Prerequisites:

1. Basic concepts of Operating Systems with clear understanding of how they work and operate at high level.
2. Basic working of network based systems with features of inter-machine communications.
3. Basic understanding of distributed computing systems and their working principles.

Course Objectives:

1. To define cluster, Grid and cloud computing.
2. To provide exposure of the frontier areas of cluster, Grid and Cloud computing.
3. To make awareness about the programming and software environments related to cluster, grid and cloud computing.
4. To focus on the grid and cloud computing security related issues.
5. To provide depth knowledge of the cluster, grid and cloud computing technologies and applications.
6. To explore the features of the grid and cloud computing technologies.

Course Outcomes:

By the end of the course, students should be able to

1. Identify distributed computing technologies based on cluster, grid and cloud computing systems.
2. Provide detail descriptions about cluster computing basics and its use as parallel computing techniques.
3. Articulate the main concepts and key technologies of Grid Computing.
4. Describe basic cloud computing architecture and infrastructure such as IaaS, PaaS and SaaS.
5. Explain the comparative study of Grid and Cloud computing technologies with descriptions of core issues of Grid and Cloud security and privacy.
6. Provide details about the programming and software tools for cluster, grid and cloud computing emerging software systems.

UNIT – I Introduction 08 Hours

Distributed Computing perspective: Scalable Computing over the Internet, Technologies for Network-Based Systems, Clusters of Cooperative Computers, Grid Computing Infrastructures, Cloud Computing over the Internet, Service-Oriented Architecture (SOA), Trends toward Distributed Operating Systems, Parallel and Distributed Programming Models.

Virtualization: Virtual machine, Implementation levels of virtualization, Hardware support for virtualization, CPU virtualization, Memory virtualization, I/O virtualization, Virtualization in multicore processors, Hypervisor and Xen Architecture, Binary Translation with Full Virtualization, Para-Virtualization with Compiler Support.

UNIT – II Cluster Computing 08 Hours

Overview of cluster computing: A taxonomy of Parallel Computing, Hardware System Structure, Node Software, Resource Management, Distributed Programming, Cluster computing classification schemes.

Cluster for Scalable Parallel Computing: Cluster Development Trends, design objectives of cluster computing, Fundamental Cluster Design Issues, Cluster Organization and Resource Sharing, Node Architectures and MPP Packaging, Cluster System Interconnects, Hardware, Software, and Middleware Support, GPU Clusters for Massive Parallelism, Design Principles of Computer Clusters, Cluster Job Scheduling Methods, Cluster Job Management Systems, Load Sharing Facility (LSF) for Cluster Computing. Cluster Setup and its Administration, Deploying a High Throughput Computing Cluster, Beowulf cluster as a Representative Cluster Systems.

UNIT – III Grid Computing 08 Hours

Grid computing Introduction: Grid Computing Concept, Computational Grid Applications, characterization of the Grid, Grid related standards bodies, Classifying grid systems, Grid applications, Grid Computing Infrastructure Development, Grid Computing Software Interface.

The Grid Computing Anatomy: The Grid Problem, the Concept of Virtual Organizations, Grid Architecture, Grid Architecture and Relationship to Other Distributed Technologies.

Grid Computing Systems and Resource Management: CPU Scavenging and Virtual Supercomputers, Open Grid Services Architecture (OGSA), Data-Intensive Grid Service Models, National Grids and International Projects, NSF TeraGrid in the United States, DataGrid in the European Union, The ChinaGrid Design Experiences, Resource Management and Job Scheduling, Grid Resource Monitoring with CGSP, Resource Brokering with Gridbus.

UNIT IV Cloud Computing 08 Hours

Cloud computing overview: Cloud Computing Methodologies (Service Oriented Architecture, Virtualization), The Cloud Architecture and Cloud Deployment Techniques, Cloud Services, Cloud Applications, Issues with Cloud Computing. High Performance Computing (HPC) vs. Cloud Computing, Taxonomy of HPC Clouds, Virtualized HPC Offerings in the Cloud.

Cloud Platform Architecture: Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS), Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms.

UNIT V Grid and Cloud Security 08 Hours

Comparison of Cloud and Grid Computing: Cloud Architecture vs. Grid Architecture, Computational Model, and Data model, Virtualization, Monitoring, Programming Model, Application model, Security Model, Business models. **Grid Security:** The Grid Security Infrastructure, Authorization modes in GSI, Getting an e-Science certificate, managing credentials in Globus, Generate a client proxy, Firewall traversal, Authentication, Proxies, Authorization. **Cloud Security:** Taxonomy of Security, Security Benefits of the Cloud, Cloud Computing Security Scenarios, Cloud Security Challenges, Cloud Computing Privacy, Trust Management, Security of Virtualization, Virtual Machine Security, Security Risks Posed by a Management OS.

UNIT VI Software Environments for Cluster, Grid and Cloud Computing 08 Hours

Parallel and Distributed Programming Paradigms: Parallel Computing and Programming Paradigms, Map Reduce, Twister, and Iterative MapReduce, Hadoop Library from Apache, Sawzall and Pig Latin High-Level Languages, Mapping Applications to Parallel and Distributed Systems, Programming the Google App Engine, BigTable, Google's NOSQL System.

Emerging Cloud Software Environments: Programming on Amazon EC2, Amazon Simple Storage Service (S3), Amazon Elastic Block Store (EBS) and SimpleDB, Microsoft Azure Programming Support, Open Source Eucalyptus and Nimbus, OpenNebula, Sector/Sphere, and OpenStack, Manjrasoft Aneka Cloud and Appliances.

Text Books:

1. Kai Hwang, Jack Dongarra Geoffrey Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers Inc. San Francisco, CA, USA , 1st Edition, eBook ISBN:9780128002049, Paperback ISBN: 9780123858801.
2. Lizhe Wang, Rajiv Ranjan, Jinjun Chen, Boualem Benatallah, CLOUD COMPUTING Methodology, Systems, and Applications, CRC Press , 1st Edition, ISBN:9781439856413.

Reference Books:

1. Thomas Sterling, Beowulf Cluster Computing with Linux, The MIT press Cambride, 2nd Edition , ISBN No.: 9780262692748.
2. Frederic Magoules, Fundamentals of grid computing, Theory and applications, Chapman and Hall/CRC , 1st Edition, ISBN No.: 9781439803677.
3. Barry Wilkinson, GRID COMPUTING Techniques and Applications, Chapman and Hall/CRC , 1st Edition, ISBN No.9781439803677.
4. Grid Computing, Joshy Joseph, Craig Fellenstein, IBM Press, 1st Edition, ISBN No.: 9781420069532.
5. Maozhen Li, Mark Baker, The Grid: Core Technologies, John Wiley & Sons, 1st Edition, ISBN No. 978-0-470-09417-4.
6. Rajkumar Buyya, High Performance Cluster Computing: Architectures and Systems, Prentice Hall, 1st Edition, ISBN No. 0130137847

514405B: ELECTIVE-I SOFTWARE QUALITY METRICS AND ASSURANCE

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	05	In-Semester : 50 Marks
		End-Semester : 50 Marks

Prerequisites:

1. Software Engineering.

Course Objectives:

1. To understand software metrics and measurement.
2. To emphasize the use of product and quality metrics.
3. To explain quality assurance and various tools used in quality management.
4. To learn in detail about various quality assurance models.
5. To understand the audit and assessment procedures to achieve quality.
6. To educate various metrics and models to assess software.

Course Outcomes:

By the end of the course, students should be able to

1. Knowledge on how to choose which metrics to collect and use them to make predictions.
2. Ken on product and quality metrics.
3. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Understand how to detect, classify, prevent and remove defects.
5. Choose appropriate quality assurance models and develop quality.
6. Ability to conduct formal inspections, record and evaluate results of inspections.

UNIT – I Introduction to Software Metrics 06 Hours

Fundamentals of measurement, scope of software metrics, measurement theory, software measurement validation & software metrics data collection, analysis methods.

UNIT – II Product and Quality Metrics 08 Hours

Measurement of internet product attributes-size and structure, external product attributes-measurement of quality, software quality metrics-product quality, process quality, metrics for software maintenance, complexity metrics and Models, structure Metrics, metrics for Object-oriented projects, design and complexity Metrics, Lorenz metrics and rules of thumb, CK OO metrics suite, Productivity Metrics.

UNIT – III Measuring Software Quality 08 Hours

Quality control and international competition, defining quality for measurement and estimation, five steps to software quality control, measuring software defect removal, measuring defect removal

efficiency, measuring the costs of defect removal, evaluating defect prevention methods, measuring customer reported defects, measuring invalid defects, duplicate defects and special cases, reliability models, The Rayleigh model, Reliability Growth models.

UNIT IV Fundamentals of Software Quality Assurance 08 Hours

SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, total quality management, 7 QC Tools and Modern Tools.

UNIT V Quality Assurance Models 06 Hours

Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM.

UNIT VI Software Quality Assurance Trends 08 Hours

Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their Effect on Software Quality.

Text Books:

1. Stephen H. Kan, Metric and Models in software Quality Engineering, Addison Wesley.
2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Addison Wesley,

Reference Books:

1. Norman E-Fentor and Share Lawrence Pflieger, Software Metrics International, Thomson Computer Press.
2. S. A. Kelkar, Software quality and Testing, PHI Learing, Pvt, Ltd., New Delhi.
3. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison Wesley.
4. Mark Lorenz, Jeff Kidd, Object-Oriented Software Metrics, Prentice Hall.
5. Caper Jones, Applied Software Measurement: Global Analysis of Productivity and Quality, McGraw Hill, Third Edition.

514405C: ELECTIVE- I WEB AND SOCIAL NETWORK DATA ANALYSIS

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	05	In-Semester : 50 Marks End-Semester : 50 Marks

Prerequisites:

1. Information Storage and Retrieval.
2. Data Mining.

Course Objectives:

1. To revise the basic concepts of Web and Information Retrieval.
2. To understand role of Web Mining concepts in Social Network.
3. To study the basic concepts of Social Network Analysis.
4. To interpret Social networks through mathematical representation.
5. To analyze relations, descriptive measures and models to overview research questions related to Social Networks.
6. To build various applications based on Social Network platform.

Course Outcomes:

By the end of the course, students should be able to

1. Choose and analyze various Information Retrieval Models and in turn will be able to develop Information Retrieval Systems
2. Have ideas about how to gather relevant network data, and some of the associated questions and problems
3. Choose among Social Network designs based on research goals
4. Able to formulate meaningful research questions concerning Social Network Analysis
5. Develop the applications based Social Network
6. Apply Social Network theory to example data sets and to research work.

UNIT – I Introduction 08 Hours

Introduction to Web -What is Web? World Wide Web (WWW), A Brief History of the Web and the Internet, what is Web Engineering, Web Engineering Models, Software Engineering v/s Web Engineering, Categories of Web Applications. Information Retrieval and Web Search.

Basic Concepts of Information Retrieval, Information Retrieval Methods - Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stop word Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming

UNIT – II Web Data Mining 08 Hours

Concept of Data Mining, Web Mining–Web Content Mining, Web Structure Mining, Web Usage Mining.

Web Usage Mining - Data Collection and Preprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns

UNIT – III Web Data Mining 08 Hours

Social Network Analysis in the Social and Behavioral Sciences:

The Social Networks Perspective, Historical and Theoretical Foundations, Empirical Motivations, Theoretical Motivations, Mathematical Motivations, Fundamental Concepts in Network Analysis, Distinctive Features.

Social Network Data:

What Are Network Data?, Structural and Composition Variables, Modes, Affiliation Variables, Boundary Specification and Sampling, What Is Your Population?, Sampling, Types of Networks, One-Mode Networks, Two-Mode Networks, Ego-centered and Special Dyadic Networks, Measurement, Collection, Longitudinal Data Collection, Measurement Validity, Reliability, Accuracy, Error.

UNIT IV Mathematical Representations of Social Networks 08 Hours

Notation for Social Network Data:

Graph Theoretic Notation, A Single Relation, O Multiple Relations, Sociometric Notation, Single Relation, Multiple Relations, O Algebraic Notation, O Two Sets of Actors

Graphs and Matrices:

Graphs, Directed Graphs, Signed Graphs and Signed Directed Graphs, Valued Graphs and Valued Directed Graphs, Multigraphs, Hypergraphs, Relations, Matrices

UNIT V Structural and Locational Properties 08 Hours

Centrality and Prestige

Prominence: Centrality and Prestige, Non directional Relations, Directional Relations, Social Group and Subgroup, Subgroups Based on Complete Mutuality –Clique, n-cliques with example, Subgroups Based on Nodal Degree- k-plexes, k-cores, Measures of Subgroup Cohesion, Directional Relations -Cliques Based on Reciprocated Ties, Connectivity in Directional Relations, n-cliques in Directional Relations.

Measuring Structural Equivalence- Euclidean Distance as a Measure of Structural Equivalence, Correlation as a Measure of Structural Equivalence, Considerations in Measuring Structural Equivalence, Representation of Network Positions- Partitioning Actors, Spatial Representations of. Actor Equivalences, Ties Between and Within Positions, Dyads, Triads.

UNIT VI Applications of Social Network Data 08 Hours

Sentiment Analysis/ Opinion Mining- Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros and Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam. Recommendation Systems- Content Based and Collaborative Filtering Techniques, Case studies of – FaceBook, Twitter and LinkedIn.

Text Books:

1. Bing Liu, Web Data Mining Exploring Hyperlinks, Contents, and Usage Data, Springer, Second Edition, ISBN 978-3-642-19459-7.
2. Stanley Wasserman, Katherine Faust, Social Network Analysis: Methods and Applications, Cambridge University Press, ISBN. No. 0-521-38269-6.

Reference Books:

1. Stephen P. Borgatti, Analyzing Social Networks Paperback, ISBN-13: 978-1446247419. ISBN-10: 1446247414.
2. John Scott, Social Network Analysis Paperback, ISBN-10: 1446209040, ISBN-13: 978-1446209042.
3. Robert A. Hanneman and Mark Riddle, Introduction to social network methods, University of California, Riverside *(published in digital form at http://faculty.ucr.edu/~hanneman/)*.

514405D: ELECTIVE-I SPEEECH SYNTHESIS AND PROCESSING

Index

Teaching Scheme:
Lectures: 05 Hours/Week

Credits
05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Discrete time signals and systems
2. Fourier transform, Discrete Fourier transform
3. Sampling theorem.

Course Objectives:

1. To introduce speech production and related parameters of speech.
2. To introduce pitch as well as speech perception.
3. To understand the Speech features and linear prediction.
4. To explore the automatic speech recognition system.
5. To introduce speech synthesis.
6. To understand the applications of speech processing.

Course Outcomes:

By the end of the course, students should be able to

1. Apply Knowledge of Mathematics to perform analysis of Speech.
2. Demonstrate a familiarity with Speech Psychoacoustics and Speech Perception.
3. Develop speech prediction models using variety of speech features.
4. Design and develop speech recognition systems.
5. Improve performance of speech processing systems using speech synthesis.
6. Design Real-time applications using audio processing and analysis.

UNIT – I Basics of Speech Processing **08 Hours**

Speech signal, digital speech processing, Process of speech production: Mechanism, sound propagation Acoustic tube modeling of speech production: Excitation mechanisms in speech production

UNIT – II Auditory Perception **08 Hours**

Psychoacoustics:-Sound pressure and loudness, frequency analysis and critical bands, masking Models of pitch perception:-Introduction, physiological exploration of place vs periodicity. Speech perception:-Vowel perception, confusion matrix, perceptual cues for plosives.

UNIT – III Speech Features **08 Hours**

The cepstrum as a spectrum analyser: Real cepstrum, complex cepstrum, application of cepstrum analysis. Linear prediction: Predictive mode, properties of representation, related representation.

UNIT IV Automatic Speech Recognition 08 Hours

Feature extraction for ASR: Common feature vectors, dynamic features, auditory models, multichannel input. Deterministic sequence recognition for ASR: Isolated word recognition, connected word recognition, segmental approaches.

UNIT V Speech Synthesis 08 Hours

Speech synthesis: Parametric source filter synthesis, concatenative methods. Pitch detection: Pitch detection perception and articulation, difficulties in pitch detection, signal processing to improve pitch detection, pattern recognition methods for pitch detection, median smoothing to fix errors in pitch estimation.

UNIT VI Applications 08 Hours

Music synthesis concepts, reverberation Characteristics of packetized speech, speech coding and protocol implications.

Text Books:

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, Wiley, ISBN No. 9-814-12655-1.
2. L.R. Rabiner and Schafer, Digital Processing of Speech Signals, Pearson, ISBN No. 978-81-317-0513-1.

Reference Books:

1. Lawrence Rabiner and BH Juang, Fundamentals of Speech Recognition, Pearson.
2. Chris Rowden, Speech Processing, Mc Graw Hill.
3. JL Flanagan, Speech Analysis Synthesis and Perception, Sprenger Vertag, Second Edition.

514405E: ELECTIVE-I MACHINE AND DEEP LEARNING

Index

Teaching Scheme:
Lectures: 05 Hours/Week

Credits
05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Linear Algebra
2. Probability Basics
3. Analysis of Algorithms.

Course Objectives:

1. To introduce machine learning techniques
2. To become aware of various parametric and non-parametric methods in machine learning
3. To learn state-of-art dimensionality reduction techniques
4. To become familiar with widely used kernel machines
5. To understand various techniques of deep learning
6. To acquaint with neural networks.

Course Outcomes:

By the end of the course, students should be able to

1. Devise/develop machine learning model for real time applications.
2. Propose solution to real world problems in the domain of data mining.
3. Develop skills of using recent machine learning techniques and solve practical problems.
4. Evaluate a given problem and apply appropriate machine learning technique to gain knowledge from the problem.
5. Understand how to solve present-day problems using deep learning.
6. Understand models of deep neural network.

UNIT – I Introduction to Machine Learning 08 Hours

Introduction: What Is Machine Learning? Examples of Machine Learning Applications

Supervised Learning: Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.

Bayesian Decision Theory: Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules

UNIT – II Parametric Methods AND Non-Parametric Methods 08 Hours

Parametric Methods: Introduction

Maximum Likelihood Estimation, evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures, Over fitting and Under fitting.

Multivariate Methods: Multivariate Data, Multivariate Normal Distribution, Multivariate Classification, Discrete Features, Multivariate Regression

Nonparametric Methods: Introduction, Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification.

UNIT – III Dimensionality Reduction and Clustering 08 Hours

Dimensionality Reduction: Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap.

Clustering: Introduction, Mixture Densities, *k*-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the number of clusters.

UNIT IV Kernel Machines 08 Hours

Introduction, Optimal Separating Hyperplane, The Non-Separable Case: Soft Margin Hyperplane, *v*-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels, Multiple Kernel Learning, Multiclass Kernel Machines, Kernel Machines for Regression, One-Class Kernel Machines, Kernel Dimensionality Reduction.

UNIT V Fundamentals of Deep Learning 08 Hours

The Neural Network: Building Intelligent Machines, The Limits of Traditional Computer Programs, The Mechanics of Machine Learning, The Neuron, Expressing Linear Perceptron as Neurons, Feed-forward Neural Networks, Linear Neurons and their Limitations, Sigmoid Tanh and ReLU Networks, Softmax Output Layers.

Training Feed-Forward Neural Networks: The Cafeteria Problem, Gradient Descent, The Delta Rule and Learning Rates, Gradient Descent with Sigmoidal Neurons, The Back propagation Algorithm, Test Sets, Validation Sets, and Over fitting, Preventing Over fitting in Deep Neural Networks.

UNIT VI Convolution Neural Networks 08 Hours

Convolutional Neural Networks: Neurons in Human Vision, The Shortcomings of Feature Selection, Vanilla Deep Neural Networks, Filters and Feature Maps, Full Description of the Convolutional Layer, Max Pooling, Full Architectural Description of Convolution Networks, Closing the Loop on MNIST with Convolutional Networks, Image Preprocessing Pipelines Enable More Robust Models.

Text Books:

1. Ethem Alpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203-5078-6.
2. Nikhil Buduma, Fundamentals of Deep Learning, O'Reilly, First Edition, ISBN No. 978-14-919-2561-4.

Reference Books:

1. Shai shalev-Shwartz and Shai Ben-David, Understanding Machine Learning(From Theory to Algorithms), Cambridge University Press, First Edition, ISBN No. 978-1-107-51282-5.

2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No. 0-07-115467-1.
3. Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1.
4. Ian Goodfellow and Yoshua Bengio, Deep Learning (Adaptive Computation and machine Learning Series), Massachusetts London, England, ISBN No. 9780262035613.

514405F: ELECTIVE-I MULTI-CORE ARCHITECTURE AND PROGRAMMING

Index

Teaching Scheme:
Lectures: 05 Hours/Week

Credits
05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Microprocessor Techniques
2. Operating systems
3. Distributed and Parallel systems

Course Objectives:

1. To understand the challenges in parallel and multi-threaded programming.
2. To understand the recent trends in the field of Computer Architecture and identify performance related parameters.
3. To study the various parallel programming paradigms and solution.
4. To understand the different types of multicore architectures.
5. To study the warehouse scale as well as embedded architectures.

Course Outcomes:

By the end of the course, students should be able to

1. Identify the limitations of ILP and the need for multicore architectures.
2. Handle the issues related to multiprocessing.
3. Exploit the concept of parallelism.
4. Gain the knowledge of the architecture of warehouse scale computers and embedded processors.
5. Program Parallel Processors and develop programs using OpenMP and MPI.
6. Compare and contrast programming for serial processors and programming for parallel processors.

UNIT – I Fundamentals of Parallel and Multiprocessor Design 08 Hours

Principles of Computer Design, Classes of Parallelism ILP, DLP, TLP and RLP. Multiprocessors-Software and hardware multithreading – SMT and CMP architectures – Design issues. Multithreading, Computational models, Data flow architectures. MT and CMP Architectures Limitations of Single Core Processors.

UNIT – II Multi-Core Architectures and Analysis 08 Hours

Multi-core architectures SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design .Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- HP architecture, Performance measures.

UNIT – III Challenges in Parallel Program 08 Hours

Models of Memory Consistency-Interconnection networks, Buses, crossbar and multi-stage witches. Performance–Scalability–Synchronization and data sharing – Data races – Synchronization primitives– deadlocks and live locks– communication between threads.

UNIT IV Programming Models and Workloads for Warehouse 08 Hours

Warehouse Scale Computers –Introduction, Programming Models and Workloads, Architectures for Warehouse-Scale Computing –Physical Infrastructure and Costs, performance measures –Cloud Computing architecture, taxonomy, opportunities and challenges–Case Study: Warehouse architectures.

UNIT V Shared Memory Programming with OpenMP Distributed Memory Programming With MPI 08 Hours

OpenMP Model– OpenMP Directives – Work-sharing Constructs – Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations. MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived data types – Performance evaluation. Case studies – OpenMP and MPI implementations and comparison.

UNIT VI Architectures: Embedded Systems 08 Hours

Features and Requirements of Embedded Systems, Embedded Applications, Embedded, Multiprocessors, Signal Processing, The Digital Signal Processor, Case Study : Embedded Systems

Text Books

1. John L. Hennessey and David A. Patterson, " Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 4th. Edition.
2. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A hardware/ software approach", Morgan Kaufmann / Elsevier.
3. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris", Pearson, 2011.

Reference Books:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition.
2. Dezso Sima, Terence Fountain, Peter Kacsuk "Advanced Computer Architectures" A Design space approach, Pearson Education.
3. Advanced Computer Architecture Parallelism, Scalability – Kai Hwang, Programmability, Tata McGrawhill.
4. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
5. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.

514406: LAB PRACTICE-I

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 04 Hours/Week	04	Term Work : 50 Marks
		Oral/ Presentation : 50 Marks

The concerned faculty member should frame minimum two assignments having sufficient complexity based on the subjects **Mathematical Foundation of Information Technology(MFIT), Advanced Software Engineering and Project Management(ASEPM), Applied Algorithms(AA)**, Students should prepare a journal which will include necessary architecture/design, algorithm and its analysis, test cases, mathematical model etc. The assessment of the assignment should be carried out continuously throughout the semester and the record for the same should be produced at the time of examination. The evaluation will be done by a pair of examiners appointed by Savitribai Phule Pune University.

SEMESTER-II

514407: CYBER SECURITY AND FORENSICS

Index

Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Fundamentals of Mathematics
2. Data Communication and Computer Networks
3. Web Application

Course Objectives:

1. Understand computer, network and information security.
2. To study operating system security and malwares
3. To study security issues in internet protocols.
4. To study network defense tools.
5. To learn forensics and investigation techniques.

Course Outcomes:

1. Be able to use basic cryptographic techniques in software and system design.
2. Apply methods for authentication, access control, intrusion detection and prevention
3. Able to apply the scientific method to digital forensics and perform forensic investigations.
4. To develop computer forensics awareness.
5. Ability to use computer forensics tools.

UNIT – I Security Fundamentals and Data Encryption Techniques 08 Hours

Introduction to Cyber Security - The dawn of Computer Security, Attacks and Attackers, Introduction to security; Information Security; Security triad: Confidential, Integrity, Availability; Focus of control; Security threats and attacks; Security management, Risk and Threat Analysis.

Foundations of Computer Security - The Fundamental Dilemma of Computer Security, Data vs Information, Principles of Computer Security.

Identification and Authentication - Username and Password, Bootstrapping Password Protection, Guessing Passwords, Phishing, Spoofing, and Social Engineering, Protecting the Password File, Single Sign-on.

Access Control - Authentication and Authorization, Access Control Structures, Ownership, Intermediate Controls, Policy Instantiation, Comparing Security Attributes.

UNIT – II Modelling Techniques 08 Hours

Reference Monitors - Operating System Integrity, Hardware Security Features, Protecting Memory, Security Levels and Categories, Lattice Diagram, Security Kernel.

Bell–LaPadula Model - State Machine Models, The Bell–LaPadula Model, The Multics Interpretation of BLP. Security Models - The Biba Model, Chinese Wall Model, The Clark–Wilson Model, The Harrison–Ruzzo–Ullman Model, Information-Flow Models, Execution Monitors.

UNIT – III Cryptography and Security 08 Hours

Cryptography - Modular Arithmetic, Integrity Check Functions, Digital Signatures, Encryption, Strength of Mechanisms, Performance. Key Establishment - Key Establishment and Authentication, Key Establishment Protocols, Kerberos, Public-Key Infrastructures, Trusted Computing – Attestation. Communications Security - Protocol Design Principles, IP Security, IPsec and Network Address Translation, SSL/TLS, Extensible Authentication Protocol. Network Security - Domain Name System (DNS), DNS cache poisoning, Network defense tools: Firewalls, VPNs, Intrusion Detection, and filters, A Security Evaluation of DNSSEC with NSEC3, Distributed Firewalls. Web Security - Authenticated Sessions, Code Origin Policies, Cross-Site Scripting, Cross-Site Request Forgery, JavaScript Hijacking, Web Services Security.

UNIT IV Forensics Analysis 08 Hours

Forensic Analysis Fundamentals, Applying the Scientific Method to Digital Forensics, Uses of Digital Forensic Analysis, Data Gathering and Observation, Hypothesis Formation, Evaluating Hypotheses, Conclusions and Reporting. Cyber stalking, Violent Crime and Digital Evidence, Digital Evidence as Alibi.

UNIT V Electronic Data Discover and Intrusion Investigation 08 Hours

Introduction to Electronic Discovery, Identification of Electronic Data, Forensic Preservation of Data, Data Processing, Production of Electronic Data. Intrusion investigation - Introduction, Methodologies, Preparation, Case Management and Reporting, Common Initial Observations, Scope Assessment, Collection, Analyzing Digital Evidence, Feeding Analysis Back into the Detection Phase.

UNIT VI Digital Forensics 08 Hours

Windows Forensic Analysis – NTFS Overview, Forensic Analysis of the NTFS Master File Table (MFT), Metadata, Artifacts of User Activities, Deletion and Destruction of Data, Windows Internet and Communications Activities, Windows Process Memory, BitLocker and Encrypting File System (EFS). UNIX Forensic Analysis – Boot Process, Forensic Duplication Consideration, File Systems, User Accounts, Artifacts of User Activities. Network Investigations - Overview of Protocols, Evidence Preservation on Networks, Collecting and Interpreting Network Device Configuration, Forensic Examination of Network Traffic. Mobile Network Investigations - Mobile Network Technology, Investigations of Mobile Systems, Types of Evidence, Where to Seek Data for Investigations, Interception of Digital Evidence on Mobile Networks.

Text Books:

1. Dieter Gollmann, “Computer Security”, 3rd edition, Wiley Publication.
2. Egohan Casey, “Handbook of Digital Forensics and Investigation”, ELSEVIER-Academic Press, 2010. ISBN 13: 978-0-12-374267-4

Reference Books:

1. Ross J. Anderson, “Security Engineering: A Guide to Building Dependable Distributed Systems”, Wiley Publication.
2. Nina Godbole, Sunit Belapure, “Cyber Security”, Wiley Publication.
3. Bill Nelson, Amelia Phillips, Christopher Steuart, Cengage Learning, “Guide to Computer Forensics & Investigation”, Fourth Edition, ISBN 13 : 978-1-43-549883-9.

514408: CLOUD AND DATA TECHNOLOGIES

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 04 Hours/Week	04	In-Semester : 50 Marks
		End-Semester : 50 Marks

Prerequisites:

1. Computer Networks
2. Operating Systems
3. Basic Linear algebra and Probability.

Course Objectives:

1. To gain through knowledge of cloud computing and data science.
2. To have vendor neutral understanding of cloud computing from an industry perspective.
3. Understand the architecture and concepts of cloud.
4. To learn the fundamentals of various cloud computing mechanisms.
5. Analyze data draw valid conclusions using appropriate data science techniques
6. Learn the fundamentals of data analytics and the data science.
7. Apply statistical methods and machine learning algorithms to make sense out of data sets.

Course Outcomes:

By the end of the course, students should be able to

1. Analyze and solve industry-related problems with cloud computing and data science.
2. Identify appropriate cloud architecture design choices when solving real-world cloud computing problems.
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Develop in depth understanding of the key concepts in data science and business analytics.
5. Apply principles of Data Science for the analysis of business problems using cloud.
6. Analyze data, test claims, and draw valid conclusions using appropriate statistical methodology.
7. Familiarize with MapReduce, Pregel and Hadoop to solve real-world problems.

UNIT – I Review Of Cloud Computing 08 Hours

Understanding Cloud Computing, Fundamental Concepts and Models, Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology, Fundamental Cloud Security: Basic Terms and Concepts, Threat Agents, Cloud Security Threats

UNIT – II Cloud Computing Mechanisms 08 Hours

Cloud Infrastructure Mechanisms, Specialized Cloud Mechanisms: Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-Per-Use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi-Device Broker, State Management Database, Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System, Cloud Security Mechanisms.

UNIT – III Cloud Computing Architecture 08 Hours

Fundamental Cloud Architectures, Advanced Cloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture, Specialized Cloud Architectures. Working with Clouds: Cloud Delivery Model Considerations, Cost Metrics and Pricing Models, Service Quality Metrics and SLAs.

UNIT IV Data Science 08 Hours

Definition of Data Science, Data Analytic Thinking, Statistical Inference, Exploratory Data Analysis, and the Data Science Process, Algorithms: Machine Learning Algorithms, Linear Regression, k-Nearest Neighbors (k-NN), k-means, Spam Filters, Naive Bayes, and Wrangling, Logistic Regression, Time Stamps and Financial Modeling.

UNIT V Data Extraction and Visualization 08 Hours

Extracting Meaning from Data, The Kaggle Model, Data Visualization and Fraud Detection, Data Science and Risk, Lessons Learned from Data Competitions: Data Leakage and Model, Data Engineering: MapReduce, Pregel, and Hadoop, Next-Generation Data Scientists, Hubris, and Ethics.

UNIT VI Big Data Technologies and Cloud Computing 08 Hours

Big data problems, The dialectical relationship between Cloud computing and big data, Big data technologies, Models and Techniques for Cloud-Based Data Analysis, Big data and analytics on the cloud: Architectural factors and guiding principles.

Text Books:

1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, First Edition, ISBN No. 789332535923, 9332535922.
2. Cathy O'Neil, Rachel Schutt, Doing Data Science, O'Reilly, First Edition, ISBN No. 9781449363871.

Reference Books:

1. Domenico Talia, Paolo Trunfio, Fabrizio Marozzo, Data Analysis in the Cloud Models, Techniques and Applications, Elsevier, First Edition, ISBN No. 780128028810.
2. Wenhong Dr. Tian, Yong Dr. Zhao, Optimized Cloud Resource Management and Scheduling, Elsevier, First Edition, ISBN No. 9780128014769.
3. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, First Edition, ISBN No. 9789381269237, 9381269238.
4. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, First Edition, ISBN No. 9781259029950, 1259029956.

5. Foster Provost & Tom Fawcett, Data Science for Business, O'Reilly, First Edition, ISBN No. 9789351102670.
6. Joel Grus, Data Science from Scratch, O'Reilly, First Edition, ISBN No. 9789352130962.
7. David Dietrich, Barry Heller, Beibei Yang and Others, Data Science and Big Data Analytics, Wiley, First Edition, ISBN No. 9788126556533.
8. Seema Acharya and Subhashini Chellappan, Big Data and Analytics, Wiley, First Edition, ISBN No. 9788126554782.

514409: INFORMATION TECHNOLOGY ORIENTED OPERATIONS RESEARCH

Index

Teaching Scheme:
Lectures: 04 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Applied Mathematics Including Calculus And Linear Algebra.
2. Calculus-Based Probability/Statistics

Course Objectives:

1. Understand the need of using Operations Research.
2. Identify and Characterize Situations in which Linear Programming technique can be applied.
3. Derive feasible and optimal solution for Transportation and Assignment Problem.
4. Apply various methods to select and execute various optimal strategies to win the game.
5. Understand and Apply Dynamic Programming model in solving a decision problem.
6. Construct network diagrams with single and three time estimates of activities involved in the project.

Course Outcomes:

By the end of the course, students should be able to

1. Recognize, classify, and use of various models for solving a problem under consideration.
2. Solve the LP problem by Graphical and Simplex Method.
3. Solve profit maximization Transportation and Assignment Problem.
4. Apply minimax and maximin principle to compute the value of the game.
5. Solve an LP problem using Dynamic Programming approach.
6. Calculate Project schedule and establish a time-cost trade-off for the completion of the project

UNIT – I Introduction to Operations Research 08 Hours

A Quantitative Approach to Decision Making, History, Definitions, Features, Approach to Problem Solving. Overview of OR Modeling Approach – Defining the Problem and Gathering Data, Formulating Mathematical Model, Deriving Solutions, Testing the Model, Preparing to Apply the Model, Implementation. Advantages of Model Building, Methods and Methodology of OR, Advantages, Opportunities, and Applications of OR. Basics of Linear Algebra and Probability Theory.

UNIT – II Linear Programming 08 Hours

Introduction, Structure of LP Model, Advantages, Limitations, Assumptions and Applications of LP, Guidelines for Model Formulation, Solving LP problems using Graphical and Simplex Method, Duality in LP.

UNIT – III Transportation and Assignment Problem 08 Hours

Mathematical Models of Transportation Problem, The Transportation Algorithm, Methods for Finding Initial Solution, Test for Optimality. Mathematical Models of Assignment Problem, Solution Methods of Assignment Problem.

UNIT IV Decision and Games Theory 08 Hours

Steps of Decision Making Process, Types of Decision Making Environment, Decision Making Under Uncertainty, Decision Making Under Risk, Decision Making with Utilities. Introduction to Games Theory: Two Person Zero Sum Games, Pure Strategies (Minimax and Maximin Principles): Games with Saddle Point, Mixed Strategies: Games without Saddle Point, The Rules of Dominance, Solution Method of Games without Saddle Point.

UNIT V Dynamic Programming 08 Hours

Introduction, Dynamic Programming Terminology, Developing Optimal Decision Policy, Dynamic Programming under Certainty, Dynamic Programming Approach for Solving Linear Programming Problem, Deterministic and Probabilistic Dynamic Programming.

UNIT VI Forecasting Models and Project Management (PERT and CPM) 08 Hours

Judgmental Techniques, Time Series, Forecasting Procedures for a Constant Level Model, A Forecasting Procedure for a Linear Trend Model, A Forecasting Procedure for a Constant Level with Seasonal Effect Model. Project Management: Introduction, Basic Difference between PERT and CPM, Phases of Project Management, PERT / CPM Network Components and Precedence Relationships, Critical Path Analysis.

Text Books:

1. J K Sharma, Operations Research: Theory and Applications, Trinity Press 5th Edition ISBN No. 9789350593363.
2. Frederick S. Hillier, Gerald Lieberman, Introduction to Operations Research, McGraw Hill, 6th Edition ISBN No. 0071139893.

Reference Books:

1. Gerald Lieberman, Operations Research: An Introduction, PHI, 9th Edition, ISBN No. 978-9332518223.
2. Gupta Prem Kumar and Hira D.S, Problems in Operations Research, S. Chand, ISBN No.978-8121909686.
3. Wayne L. Winston, Operations Research Applications and Algorithms, Cengage Learning, 4th Edition, ISBN No. 978-8131501900.
4. P Sankara Iyer, Operations Research, Sigma Series, TMH, 1st Edition, ISBN No.978-0070669024.

5144010A: ELECTIVE-II INTERNET ROUTING DESIGN

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 04

Examination Scheme: In-Semester : 50 Marks; End-Semester : 50 Marks

Prerequisites:

1. Computer networks

Course Objectives:

1. To study various routing protocols and routing algorithms used in inter-networking.
2. To understand router architectures and analysis of network algorithms.
3. To learn about the QoS parameters of routing protocols.

Course Outcomes:

By the end of the course, students should be able to

1. Understand the fundamentals and requirements for packet routing in computer communication networks.
2. Deal with the different routing protocols requires to be configured in real routers along with the framework of the concerned routing algorithms.
3. Gain knowledge about the internal architecture of routers.
4. Draw the interest towards the research in the routing platform.

UNIT – I Networking and Network Routing **08 Hours**

Introduction, Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology, Architecture, Network Management Architecture, Public Switched Telephone Network.

UNIT – II Routing Algorithms **08 Hours**

Shortest Path and Widest Path: Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Dijkstra's-Based Approach, Bellman–Ford-Based Approach, k-Shortest Paths Algorithm. OSPF and Integrated IS-IS: OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison BGP: Features, Operations, Configuration Initialization, phases, Message Format. IP Routing and Distance Vector Protocol Family: RIPv1 and RIPv2.

UNIT – III Routing Protocols **08 Hours**

Framework and Principles: Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing, Protocol, Link Cost.

UNIT IV Internet Routing and Router Architectures **08 Hours**

Architectural view of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability. Router Architectures: Functions, Types, Elements of a Router, Packet Flow, and Packet Processing: Fast Path versus Slow Path, Router Architectures and Routing Commands.

UNIT V IP Packet Filtering and Classification 08 Hours

Classification, Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for d Dimensions

UNIT VI Quality of Service Routing 08 Hours

QoS Attributes, Adapting Routing: A Basic Framework. Update Frequency, Information Inaccuracy, and Impact on Routing, Dynamic Call Routing in the PSTN, Heterogeneous Service, Single- Link Case, A General Framework for Source-Based QoS Routing with Path Caching, Routing Protocols for QoS Routing, QOSPF: Extension to OSPF for QoS Routing, ATM PNNI.

Text Books:

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking).
2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking).

Reference Books:

1. Quality of Service Routing, P. Van Mieghem, F. A. Kuipers, T. Korkmaz, M. Krunz, M. Curado ,E. Monteiro , X. Masip-Bruin ,J. Solé-Pareta , S. Sánchez-López, ISBN No. 978-3-540-20193-9.
2. Hardware Based Packet Classification for High Speed Internet Routers 1st , Kindle eBook by Chad R. Meiners, Alex X. Liu, Eric Torng.
3. Internet Routing Architectures (2nd Edition) (Networking Technology) 2nd, Kindle Edition by Sam Halabi.

5144010B: ELECTIVE-II USER EXPERIENCE DESIGN

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Fundamentals of Software Engineering Models
2. Software Engineering concepts

Course Objectives:

1. To provide an overview of Information Experience and its evolution.
2. To approach a Design problem beyond Usability and Usefulness.
3. To provide an understanding of how users experience the products and services.
4. To address issues and challenges for achieving a human-centered design process with regard to user experience design.
5. To introduce students to the critical elements of User Interface Design through Design Process, User Research and Research Deliverables.
6. To introduce Effective Usability Testing Principles for great User Experience.

Course Outcomes:

By the end of the course, students should be able to

1. Understand and reproduce Elements of User Experience Design in summarizing Information Experience.
2. Design and develop online services, from requirement gathering to production and testing with end users from design point of view.
3. Provide a perspective about how user research can be done fast and results can be presented effectively.
4. Develop, Analyze and Evaluate User centered application design.
5. Measure the effectiveness of Information Design through User Interaction and Data Visualization.
6. Apply Usability Testing Principles for testing design prototypes.

UNIT – I User Experience Design Overview 08 Hours

What is User Experience Design? Human Information Processing of everyday things, From Product Design to User Experience Design, User Experience and the Web, Cognitive Model, Mental Model

UNIT – II Elements of User Experience Design 08 Hours

Core Elements of User Experience, The Five Planes, Working of Core Elements of User Experience: The Strategy Plane, The Scope Plane, The Structure Plane, The Skeleton Plane, The Surface Plane, Applying The Core Elements.

UNIT – III Principles of User Experience Design Process 08 Hours

Definition, User Research, Transition: From Defining to Designing, Design Principles

UNIT IV User Experience Design Process: 08 Hours

Part-I: Definition and Research

Understanding the User Needs and Goals, Understanding the Business Goals, Usability and User Research, Creating Personas, Defining Scope and Requirements, Functional Specifications, Content Requirements, Prioritizing requirements

UNIT V User Experience Design Process: 08 Hours

Part-II: Design

Information Design and Data Visualization, Interaction Design, Information Architecture, Wire framing & Storyboarding, UI Elements and Widgets, Screen Design and Layouts.

UNIT VI User Experience Design Process: 08 Hours

Part-III: Prototype and Testing

Need for testing design, What is Usability Testing, Types of Usability Testing, Usability Testing Process, How to conduct Usability Test, Performance Metrics, Report Findings and Recommendations.

Text Books:

1. Jesse James Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, New Riders, Second Edition, ISBN No. 13: 978-0-321-68368-7.
2. Jeffrey Rubin, Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests, John Wiley and Sons, Second Edition, ISBN No. 9780470185483.

Reference Books:

1. Rex Hartson, Pardha Pyla, The UX book: process and guidelines for ensuring a quality user experience, Morgan Kaufmann, ISBN No. 9780123852410.
2. Tom Bulls, Bill Albert, Measuring The User Experience: Collecting, Analyzing and Presenting Usability Metrics, Elsevier Science, ISBN No. 9780124157811, 0124157815.
3. Russ Unger, Carolyn Chandler, A Project Guide to UX Design: For user experience designers in the field or in the making (Voices That Matter), New Riders (Pearson Education), Second Edition, ISBN No. 978-0-321-81538-5.
4. Theo Mandel, The Elements of User Interface Design, John Wiley and Sons.
5. Bill Buxton, Sketching User Experiences: Getting the Design Right and the Right Design Book, Morgan Kaufmann, ISBN No. 978-0-12-374037-3.

5144010C: ELECTIVE-II NATURAL LANGUAGE PROCESSING

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Systems programming
2. Theory of Computer Science
3. Artificial Intelligence

Course Objectives:

1. To learn the basics of Natural Language Processing and its applications.
2. To learn linguistics essentials and building blocks of Natural Language Processing.
3. To learn the techniques in natural language processing.
4. Be familiar with natural language understanding and generation.
5. To understand the information retrieval techniques.

Course Outcomes:

By the end of the course, students should be able to

1. Understand different building blocks of NLP.
2. Design algorithms for NLP problems.
3. Understand machine translation and its techniques.
4. Learn and use different tools for NLP.

UNIT – I Introduction to NLP 08 Hours

Study of Language, Applications of Natural Language Understanding, Level of Language analysis and representation. Background: Words, Simple Noun Phrases, verb phrases, Noun phrases, Adjective phrases, Adverbial phrases Phrase structure.

UNIT – II Linguistic Essentials 08 Hours

Language models: The role of language models, Simple N-gram models, estimating parameters and smoothing. Corpus based work: Tokenization, Marked up schemes Collocations: Hypothesis Testing, Mutual Information Statistical Inference: n- gram model, Statistical Estimators, Combing estimators.

UNIT – III Disambiguation 08 Hours

Disambiguation: Supervised & unsupervised learning, Supervised Disambiguation, Dictionary- Based Disambiguation , unsupervised Disambiguation, Word Sense Disambiguation (WSD): What is it, Need and algorithms of WSD such as Lesk's algorithm, Walker's algorithm Lexical Acquisition: Verb sub categorization, Attachment Ambiguity, Selection preferences , the role of Lexical Acquisition in statistical NLP.

UNIT IV Grammars and Parsing 08 Hours

Grammar formalisms and tree banks, Efficient parsing for context-free grammars (CFGs), Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Parsing: top down parser, Bottom up chart, Top Down Chart parsing, Markov models. POS Tagging: lexical syntax, Hidden Markov Model (Forward and Viterbi algorithms and EM training). Probabilistic Context Free Grammars: Probability of string, problems with the inside-outside Algorithm. Probabilistic parsing: Tree banks, parsing vs. language models, weakening assumptions of PCFGs.

UNIT V Semantic Interpretation 08 Hours

Semantics and logic form, Thematic roles, Speech acts and embedded sentences Ambiguity resolution: Semantic Networks, Statistical Semantic Preferences Semantic Driven Parsing Techniques, Machine Translation: What is it? Building blocks of MT, Basic issues in MT, MT approaches. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

UNIT VI Applications of NLP 08 Hours

Information Retrieval: Introduction, Indexing, IR Models, Evaluation and Failure Analysis, Natural Language Processing and Information Retrieval Sentiment Analysis and Subjectivity: The Problem of Sentiment Analysis, Sentiment and Subjectivity Classification, Feature-Based Sentiment Analysis MT Tools: Apache Open NLP, Stanford Parser, Shallow parser for Indian languages, POS taggers, Stemmers. MT Evaluation tools: BLEU, WER, NIST, GALE, GIST. Natural Language Toolkit: Python, ScalaNL, WEKA

Text Books:

1. James Allen, Natural language understanding, Pearson, Second Edition, ISBN No.0-8053-0334-0
2. Christopher D. Manning Hinrich Schiitze, Foundations of Statistical Natural Language Processing, The MIT Press, Second Edition, ISBN No. 0-262-13360-l.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, The MIT Press, Second Edition.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall, Second Edition.

5144010D: ELECTIVE-II IMAGE ANALYSIS AND INTERPRETATION

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	04	In-Semester : 50 Marks
		End-Semester : 50 Marks

Prerequisites:

1. Image Processing, Mathematics.

Course Objectives:

1. To understand various Image Analysis and Interpretation techniques
2. To describe different methods of Feature generation, Representation, Description and Interpretation.
3. To Analyze & Interpret Images and use for various applications

Course Outcomes:

By the end of the course, students should be able to

1. To experimentally evaluate different image analysis algorithms and summarize the results.
2. To choose appropriate image processing methods for image filtering, image Restoration, image reconstruction, segmentation, classification and representation
3. To suggest a design of a computer vision system for a specific problem applications.

UNIT – I Introduction to Image Processing System 08 Hours

Digital Image Fundamentals- Introduction, Sources of Images, Classification of Images, Elements of Image Processing System, Image Modeling – Sampling, Quantization and Representing Digital Images, color Image processing, color Models. Image Preprocessing – Enhancement in spatial domain: Power Law Transformation, Contrast Stretching and Histogram processing, Enhancement using Arithmetic /Logic operations. Spatial domain Filters- Smoothing, Sharpening.

UNIT – II Feature Generation 08 Hours

Introduction, Basis Vectors and Images , K-L transformation, Singular Value Decomposition Independent Component Analysis, Non–Negative Matrix Factorization, Non- linear Dimension Reduction, Haar Transform, Multi resolution Interpretation, Image Transformations and Modelling Application. Feature Extraction: Spatial Feature Extraction, Transform Feature Extraction.

UNIT – III Image Analysis 08 Hours

Basic image analysis: signal theory, filtering, image enhancement, image reconstruction, classification, representation. Data Structure for Image Analysis: Levels of image data representation, Traditional image data structures, Hierarchical data structures; Image Segmentation: Point, Line and edge detection, Thresholding, Region Based Segmentation, Segmentation using morphological Watersheds, The Use of Motion in Segmentation.

UNIT IV Image Representation and Description 08 Hours

Boundary Representation, Region Representation, Moments Representation and Structure Representation, Shape Representation, Texture Representation, Use of Principal Components for Description.

UNIT V Statistical Decision Making and Vector Quantization 08 Hours

Statistical decision making: Bayesian theorem, Multiple features, conditionally independent features, Decision boundaries, Unequal cost of error, Vector Quantization. Introduction to sampling, quantization and sources of noise in images.

UNIT VI Applications 08 Hours

Case Study on: Bio Medical Image processing, Image Forensics: Finger print classification, Digital Watermarking for Images, Pattern Recognition, video processing.

Text Books:

1. Rafael C. Gonzalez and Richard E.Woods, Digital Image Processing, Pearson Prentice Hall, Second Edition.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education Private Limited.
3. Madhuri A. Joshi, Digital Image Processing An Algorithm Approach, PHI.

Reference Books:

1. Harley R. Myler, Arthur R. Weeks, The Pocket Handbook of Image processing algorithms in C, Prentice Hall, ISBN No. 0-13-642240-3.

5144010E: ELECTIVE-II ADVANCED COMPUTING INTELLIGENCE

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Mathematics
2. Data Mining Concepts
3. Machine Learning

Course Objectives:

1. To introduce the different Computational Intelligence Paradigms.
2. To explain the feed-forward neural networks and its learning methods
3. To explain feed-back neural networks and its learning methods.
4. To summarize the Evolutionary Computation and Swarm Intelligent Systems.
5. To interpret different hybrid intelligent systems
6. To discuss the different applications of Computational Intelligence

Course Outcomes:

By the end of the course, students should be able to

1. Interpret the importance of Computational Intelligence for solving the different problems
2. Select the appropriate type of neural network architecture and learning method.
3. Optimize the solutions by using different optimization techniques.
4. Evaluate the importance of different hybrid intelligent systems.
5. Formulate the solution to the different real world problems with the use of advanced computing techniques.

UNIT – I Introduction to Computational Intelligence 08 Hours

Cognitive Computing**:** Foundation of Cognitive Computing, its uses, AI as the foundation of Cognitive Computing, Elements of Cognitive System, Cognitive Applications, Design Principles of Cognitive System. Introduction to Computational Intelligence, from conventional AI to computational Intelligence, Computational Intelligence Paradigms: Artificial Neural Networks, Fuzzy System, Genetic Algorithms and Evolutionary Programming, Swarm Intelligent Systems.

UNIT – II Neural Networks - Basic Concepts 08 Hours

Biological Neurons and artificial neuron models, Classification of Artificial Neural Networks, Perceptron Networks and its limitations, Multi-Layer Feed Forward Neural Networks and Error Back propagation Learning Algorithm, Performance issues in Error Back Propagation algorithm, Fast Learning Algorithms.

UNIT – III Advanced Neural Networks 08 Hours

Kohonen Neural Networks, Hopfield Networks, Boltzmann Machines, Radial Basis Function networks, Adaptive Resonance Theory, Support Vector Machines. Spikes Neuron Models and Networks.

UNIT IV Fuzzy Logic and Hybrid Techniques 08 Hours

Fuzzy Set Theory: Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems Hybrid Techniques: Neuro-Fuzzy Systems, Adaptive Neuro-Fuzzy Inference System (ANFIS), Fuzzy Genetic Algorithms.

UNIT V Evolutionary Computation and Swarm Intelligent System 08 Hours

Genetic Algorithms (GAs) and Evolutionary Programming: Introduction to GA, Genetic Algorithms, Procedures of GAs, Working of GAs. Applicability of GAs, Evolutionary Programming, Working of Evolutionary Programming Swarm Intelligent System**:** Introduction to Swarm Intelligence, Background of Swarm Intelligent systems, Ant Colony System, Working of Ant Colony Optimization, Ant Colony Optimization for TSP, Unit Commitment Problem, Particle Swarm Intelligent System, Artificial Bee Colony System, Cuckoo Search Algorithm.

UNIT VI Applications of Computational Intelligence 08 Hours

Soft Computing in Database and Information management(R3 pp 295-309), Application of Fuzzy Techniques to Autonomous Robots(R3 pp 313-324), Computational intelligence in Industrial application(R3 pp 1143-1155), Knowledge discovery in Bioinformatics(R3 pp 1211-1220).

Text Books:

1. S. P. Simon, N. P. Padhye, Soft Computing with Matlab Programming, OXFORD UNIVERSITY PRESS, 1st Edition, ISBN No. 978-0-19-945542-3.
2. Cognitive Computing and Big Data Analytics, John Wiley and Sons.

Reference Books:

1. Andries P. Engelbrecht, Computational Intelligence: An Introduction, PHI, 2nd Edition ISBN No. 978-0-470-03561-0.
2. J.-S. R. Jang, C.-T. Sun, E. Mizutani, Neuro-fuzzy and Soft Computing A Computational Approach to Learning and Machine Intelligence, PHI, 2nd Edition, ISBN-978-81-203-2243-1
3. Kacprzyk,Pedrycz Editors, Springer Handbook of computational intelligence, Springer series, ISBN-13: 978-3662435045.

5144010F: ELECTIVE-II ADVANCED WEB PROGRAMMING

Index

Teaching Scheme:
Lectures: 05 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Software engineering concepts.
2. Knowledge of Java programming.
3. Knowledge of DBMS and Networking.

Course Objectives:

1. To understand the concepts, principles, strategies, and methodologies of Web applications and development
2. To design and construct webapp.
3. To understand the Web deployment processes
4. To understand the current of web technologies
5. To understand webapp testing.
6. To understand content management system.

Course Outcomes:

By the end of the course, students should be able to

1. Apply the concepts, principles and methods of Web engineering;
2. have a sufficient theoretical knowledge and analytical skills to develop Web applications
3. Design and develop website using current Web technologies
4. Demonstrate web deployment process
5. Use webapp testing methods.
6. Demonstrate the use of CMS.

UNIT – I Web Engineering Introduction 08 Hours

Web Engineering, The Components of Web Engineering, Web Engineering Best Practices, A Web Engineering Process, Analysis Modelling for WebApps, The Content Model, The Interaction Model.

UNIT – II Web Design, Construction And Deployment 08 Hours

WebApp Design, Construction, Construction Principles Concepts, Deployment, Construction and the Use of Components, Component-Level Design Guidelines.

UNIT – III Web Technologies 08 Hours

HTML and DHTML, DHTML with CSS, JavaScript, PHP, MySQL, PHP My Admin.

UNIT IV Jsp, Servelets And Web Services 08 Hours

JSP, JSP tags, A simple servlet, life cycle of servlet, anatomy of servlet, javax.servlet package, Generic servlet, Http Servlet. XML, Relationship between HTML, SGML and XML, web personalization, Semantic web, Semantic Web Services, Ontology.

UNIT V WebApp Testing 08 Hours

Testing Concepts, Content Testing, User Interface Testing, Navigation Testing, Configuration Testing, Security Testing, Performance Testing.

UNIT VI Content Management Systems 08 Hours

Introduction to CMS, advantages using CMS, CMS development tools: Word press, Drupal, Joomla. Word press: content and conversion, directory, file structure, local working, component administration, core, loop, data management, Word press as CMS, Word press in enterprise.

Text Books:

1. Roger S. Pressman, David Lowe, Web Engineering, Tata Mcgraw Hill Publication, Sixth Edition, ISBN No. 978-0073523293.
2. Achyt Godbole, Atul Kahate, Web Technologies, McGraw Hill, Second Edition, ISBN No.9383286571.
3. Steven M. Schafer, HTML, XHTML and CSS, Wiley India Edition, Fourth Edition, ISBN No. 978-81-265-1635-3.

Reference Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB Publication, Fourth Edition, ISBN No. 978-8183330084.
2. Jason Hunter, Java Servlet Programming, O'reilly Publication, Second Edition, ISBN No. 978-0-596-00040-0.
3. Jim Keogh, J2EE: The Complete Reference, Tata McGraw Hill Pulishing Company, First Edition, ISBN No. 978-0-07-052912-0.
4. Brad Williams, David Damstra, Hal Stern, Professional WordPress: Design and Development, Wrox publications, Third Edition, ISBN No. 978-1-118-98724-7.
5. Ralpha Moseley, M.T. Savaliya, Developing Web Applications, Wrox publications, Second Edition, ISBN No. 978- 81-265-3867-6.
6. Kogent Learning Solutions Inc, Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Dreamtech Press, 2009, ISBN No. 8177229974.
7. Gerti Kappel, Birgit Proll, Web Engineering, John Willey and Sons Ltd, Third Edition, ISBN No. 978-81-265-2162-3.
8. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya, J2EE Architecture, an illustrative gateway to enterprise solutions: concept to Application Design and deployment, Tata McGraw Hill Publishing Company, ISBN No. 978-0070621633.
9. Stephanie Leary, WordPress for Web developers: An introduction to web professionals, Apress Publications, Second Edition, ISBN No. 978-1-4302-5867-4.
10. Dr. Hiren Joshi, Web Technology and Application Development, DreamTech, ISBN No. 978-93-5004-088-1.

5144011: SEMINAR-I

Index

Teaching Scheme:	Credits	Examination Scheme:	
Lectures: 04 Hours/Week	05	Term work	: 50 Marks
		Oral/ Presentation	: 50 Marks

The students will deliver a seminar on state-of-art topic of current interest in Information Technology, Computer Science and Engineering field. The student is expected to study and review at least five research papers from IEEE, ACM, Springer journals/transactions, reviewed international conferences related to a topic he/she has chosen for seminar. The seminar guide shall maintain a progressive record of seminar such as discussion agenda, weekly outcomes achieved, corrective actions and comments on the progress report as per the plan submitted by the student etc. and should be produced at the time of examination/presentation. The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/Institute during practical sessions. The evaluation of the seminar would be carried out as per the Rules and Regulations for M.E. Programs under faculty of Engineering effective from June 2013.

5144012: LAB PRACTICE-II

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 04 Hours/Week	04	Term-work : 50 Marks
		Oral/ Presentation : 50 Marks

The concerned faculty member should frame minimum two assignments having sufficient complexity based on the subjects **Cyber Security and Forensics, Cloud and Data Technologies & Information Technology Oriented Operations Research** Students should prepare a journal which will include necessary architecture/design, algorithm and its analysis, test cases, mathematical model etc. The assessment of the assignment should be carried out continuously throughout the semester and the record for the same should be produced at the time of examination. The evaluation will be done by a pair of examiners appointed by Savitribai Phule Pune University.

SEMESTER-III

5144013: MOBILE AD-HOC NETWORKS

Index

Teaching Scheme:
Lectures: 04 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Discrete Mathematics
2. Computer Networks

Course Objectives:

1. To study the Mobile adhoc networks and its applications
2. To study the routing algorithm in mobile adhoc network
3. To study the transport protocols used in mobile adhoc network
4. To study the security mechanism used in mobile adhoc network
5. To understand the quality of service for mobile adhoc network

Course Outcomes:

By the end of the course, students should be able to

1. To understand the routing algorithm used mobile adhoc network
2. To understand the Transport protocol of mobile adhoc network
3. To understand the security mechanism used in mobile adhoc network
4. To understand the quality of service.

UNIT – I Introduction of Ad Hoc Network 08 Hours

Introduction-Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum - Radio Propagation Mechanisms - Characteristics of the Wireless Channel - IEEE 802.11a,b Standard – Origin Of Ad hoc: Packet Radio Networks - Technical Challenges - Architecture of PRNETs - Components of Packet Radios – Ad hoc Wireless Networks -What Is an Ad Hoc Network? Heterogeneity in Mobile Devices - Wireless Sensor Networks - Traffic Profiles - Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Challenges Facing Ad Hoc Mobile Networks-Ad hoc wireless Internet

UNIT – II Ad Hoc Routing Protocols 08 Hours

Introduction - Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks - Classifications of Routing Protocols -Table-Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand Approaches - Ad Hoc On- Demand Distance Vector Routing (AODV) - Dynamic Source Routing (DSR) - Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) - Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP)

UNIT – III Multicast Routing In Ad Hoc Networks 08 Hours

Introduction - Issues in Designing a Multicast Routing Protocol - Operation of Multicast Routing Protocols - An Architecture Reference Model for Multicast Routing Protocols - Classifications of Multicast Routing Protocols - Tree-Based Multicast Routing Protocols- Mesh-Based Multicast Routing Protocols - Summary of Tree-and Mesh-Based Protocols - Energy-Efficient Multicasting - Multicasting with Quality of Service Guarantees - Application-Dependent Multicast Routing - Comparisons of Multicast Routing Protocols

UNIT IV Transport Layer 08 Hours

Introduction - Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks - Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks - Classification of Transport Layer Solutions - TCP over Ad Hoc Wireless Networks - Other Transport Layer Protocols for Ad Hoc

UNIT V Security Protocols 08 Hours

Wireless Networks - Security in Ad Hoc Wireless Networks - Network Security Requirements - Issues and Challenges in Security Provisioning - Network Security Attacks - Key Management - Secure Routing in Ad Hoc Wireless Networks

UNIT VI QoS and Energy Management 08 Hours

Introduction - Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad Hoc Wireless Networks –Introduction - Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes

Text Books:

1. Siva Ram Murthy C. and B.S. Manoj “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR,2004
2. Toh C.K., Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR ,2001

Reference Books:

1. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000
2. Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks ISBN: 978-0-470-09510-2, Wiley.
3. Kazem Sohraby, Daniel Minoli, Taieb Znati Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley.

5144014: ADVANCED OPERATING SYSTEMS

Index

Teaching Scheme:
Lectures: 04 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Operating System

Course Objectives:

1. To study the fundamentals of OS and DOS
2. To understand the concept of Inter-process communication in distributed OS
3. To understand the synchronization in distributed OS
4. To understand the resource management distributed OS
5. To study and understand the recent type of advanced OS (Mobile OS)

Course Outcomes:

By the end of the course, students should be able to

1. Understand the general concept of OS and DOS.
2. Understand and apply inter-process communication in the distributed OS
3. Understand the synchronization in distributed OS.
4. Understand the resource management distributed OS.
5. Study and understand the recent type of advanced OS (Mobile OS)

UNIT – I Introduction to OS and Distributed OS 08 Hours

A simple OS – structure, processes, address spaces and threads, managing processes, loading programs into processes, Basic concepts: context switching – procedures, threads, system calls, interrupts. Distributed computing systems fundamentals: Introduction to Distributed computing systems, Models, Popularity. Distributed computing system, Design issues of Distributed operating system, distributed computing environment.

UNIT – II Message Passing and Remote Procedure Calls 08 Hours

Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Buffering, Multi-datagram Messages, Process Addressing, Failure handling. RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. Parameter-Passing semantics, call semantics, Communication protocols for RPC's, Client- Server Building, Exception handling.

UNIT – III Distributed Shared Memory 08 Hours

General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency models, Replacement strategy, Thrashing.

UNIT IV Synchronization and Resource management in DS 08 Hours

Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock in the distributed systems, Election Algorithms. Resource Management: Features of global scheduling algorithm, Task assignment approach, Load-balancing and Load approach.

UNIT V Distributed File Systems 08 Hours

Features of good DFS, File models, File Accessing models. File- Sharing Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic Transactions, Design Principles.

UNIT VI Mobile Operating System 08 Hours

Mobile O.S.: Introduction, Kernel design in Mobile OS, Scheduling in Mobile OS, File systems on mobile phones, I/O in Mobile OS, Case study: Symbian or Android.

Text Books:

1. Thomas W. Doeppner, Operating Systems in Depth, Wiley India, First Edition, ISBN No. 978-81-2653709-9.
2. Dr. P. K. Sinha, Distributed Operating Systems: Concepts and Design, PHI, Second Edition, ISBN No. 978-0780311190.
3. Michael J. Jipping, Smartphone Operating System Concepts with Symbian OS: A Tutorial Guide, John Wiley & Sons, ISBN No. 978-0-470-06523-5.

Reference Books:

1. Mukesh Singhal and Niranjan Shivaratri, Advanced Concepts In Operating System, Tata McGraw-Hill Education, ISBN No. 978-0070575721.
2. G.Coulouris, J. Dollimore, T. Kindberg & G. Blair, Distributed Systems concepts and design, Addison Wesley, Fifth Edition, ISBN No. 978-0-13-214301-1.

5144015A: ELECTIVE-III INTERNET OF THINGS AND SOFTWARE DEFINED NETWORKS

Index

Teaching Scheme: Lectures: 05Hours/Week

Credits 05

Examination Scheme:
In-Semester : 50Marks
End-Semester : 50Marks

Prerequisites:

1. Computer Network Technology.
2. Basics Of Internet of Things

Course Objectives:

1. To study Basic wireless Technologies in IoT
2. To study Security issues in IoT
3. To explore Identity management models
4. To study research, innovation and applications in IoT
5. To study fundamentals of SDN
6. To study the applications of SDN

Course Outcomes:

By the end of the course, students should be able to

1. Understand Basic wireless Technologies and security issues in IOT
2. Understand Identity management models.
3. Understand access control in IoT context.
4. Gain the knowledge of research opportunities in IoT.
5. Understand fundamentals of SDN.
6. Understand advances and applications in SDN.

UNIT – I WIRELESS TECHNOLOGIES FOR IoT 08 Hours

WPAN Technologies for IoT/M2M (IEEE 802.15.6 WBANs IEEE 802.15 WPAN TG4j MBANs, ETSI TR 101 557, NFC, Dedicated Short-Range Communications (DSRC) and Related Protocols, Comparison of WPAN Technologies). Cellular and Mobile Network Technologies for IoT/M2M: Universal Mobile Telecommunications System, LTE. IPv6 technologies for the IoT: Address Capabilities, IPv6 Tunneling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6, Technical Approaches, Residential Broadband Services in an IPv6 Environment, Deployment Opportunities. MOBILE IPv6 TECHNOLOGIES FORTHE IoT: New IPv6 Protocol, Message Types, and Destination Option, Modifications to IPv6 Neighbor Discovery, Requirements for Various IPv6 Nodes, Correspondent Node Operation, HA Node Operation, Mobile Node Operation, Relationship to IPV4 Mobile IPv4 (MIP). IPv6 over low-power WPAN (6LoWPAN): 6LoWPANs Goals, Transmission of IPv6 Packets over IEEE 802.15.4 Building the internet of things with IPv6 and MIPv6- Daniel Minoli.

UNIT – II Security in IoT 08 Hours

Vulnerabilities of IOT, Security requirements, Challenges for a secure Internet of Things, Threat modeling, Threat analysis, Use cases and misuse cases, Activity modeling of threats, Security

Architecture, Security Model, Attacks Modeling, Security attacks, Key Elements of IOT Security, Security Engineering for IOT Development : Building Security into design and Development, Secure Design, safety and security design, process and agreement, Technology Selection

IOT Security Life Cycle: Implementation and integration, IOT security CONOPS document, Network and security integration, Operations and Maintenance, Managing identities, roles and attributes, security monitoring, Penetration testing, compliance monitoring, asset and configuration management, incident management, forensics, Dispose, secure device disposal, data purging, inventory control,, data archiving and record management.

UNIT – III Identity Management Models For IOT 08 Hours

Different Identity Management Models, Identity Models: User Centric, Device Centric and Hybrid

Trust management Life Cycle, Identity and Trust, Web Of Trust Model, Access control, Access control in IoT context, Different access control schemes, Capability-based access control, Concept of capability, Identity-based capability structure, Identity-driven capability-based access control, Security evaluation and performance analysis, Security evaluation, Performance Evaluation.

UNIT IV IOT Strategies and Innovations 08 Hours

IOT Strategic Research and Innovation Directions, IOT Smart-X Applications, Processes, Data Management, Device level Energy Issues, Standardization, IOT protocol convergence, Message Queue Telemetry Transport (MQTT), Constrained Applications Protocol (CoAP), Advanced Message Queueing Protocol (AMQP), JAVA Message Service API(JMS), Data Distribution Service (DDS), Representational State Transfer (REST), Extensible Message and Presence Protocol(XMPP).

UNIT V Introduction to SDN 08 Hours

History and Evolution of SDN: Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Evolution of Switch and Control Planes. Data Center Innovation, Data Center Needs, Fundamental Characteristics of SDN, SDN Operation, SDN Devices, SDN Controller, SDN Applications, Alternate SDN Methods.

UNIT VI Advances and Application In SDN 08 Hours

SDN Applied to the WAN, Example: MPLS LSPs in the Google WAN , Service Provider and Carrier Networks , SDN Applied to SP and Carrier Networks , Example: MPLS-TE and MPLS VPNsSDN Applied to Mobile Networks, network functions virtualization vs SDN, Application Types: Reactive, Proactive, External, Internal, History of SDN Controller, A simple reactive Java Application.

Text Books:

1. Daniel minoli, Building the Internet of Things with Ipv6 and Mipv6, WILEY, ISBN No. 978-1-118-47347-4.
2. Paul Goransson, Chuck Black, Timouthy Culver, Software Defined Network- A comprehensive Approach, Elsevier, ISBN No. 978-0-12-804555-8.

Reference Books:

1. Brian Russell, Drew Van Duren, Practical Internet of Things Security, PACKT, ISBN No.978-1-75588-963-9.
2. Ovidiu Vermesan, Peter Friess, Internet of Things- From Research and Innovation to Market Deployment, Rivers Publication, ISBN No.978-87-93102-94-1.

5144015B: ELECTIVE-III ENTERPRISE APPLICATION INTEGRATION AND MANAGEMENT

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Software Engineering
2. Software Architecture

Course Objectives:

1. To focus on the basics and benefits of EAI with Integration Models.
2. To highlight on the importance and applications of EAI and Middleware Interfaces.
3. To present the association of EAI and various Information Systems scenario.
4. To focus on the Integration of Business Processes and Enterprise Application on various software platforms.
5. To apply and strengthen the integration of EAI and Design Patterns.
6. To apply and extensify the practical implementation of EAI and XML services.

Course Outcomes:

By the end of the course, students should be able to

1. Learn the basics of EAI and Integration Models.
2. Inculcate the importance of EAI and Middleware Integration.
3. Learn the various EAI and Information Systems integration.
4. Focus on EAI and Business Process Integration on Software Platforms.
5. Apply the EAI and Design patterns integration.
6. Apply the EAI and XML integration through Web based applications.

UNIT – I Introduction to EAI — 08 Hours

EAI, Levels of EAI: Data, Method, User Interface and Application Interface, Benefits of EAI, Barriers to EAI, Integration Models: Data, Functional, Message Oriented Middleware, Transaction Oriented Middleware, Distributed Object Technologies, Implementing and Integrating Packaged Applications—The General Idea.

UNIT – II EAI and Middleware — 08 Hours

Message Brokers—The Preferred EAI Engine, Process Automation and EAI, Message Broker Architecture, Transaction Processing Monitors, An Introduction to EAI and Middleware, RPCs, Messaging, and EAI, Database-Oriented Middleware and EAI, Java Middleware and EAI, Enterprise JavaBeans Architecture, Java Based Middleware Standards and Application Integration: J2EE Architecture, Components.

UNIT – III EAI and Information Systems — 08 Hours

Information systems evaluation, Enterprise application integration: scope, impact and classification, intra-organizational application integration, inter-organizational application integration, hybrid application integration, Case Study: EAI and WFMS.

UNIT IV Business Process Integration-Oriented Application Integration 08 Hours

BPIOAI: Definition, Implementation, Tools & Approaches, Process Modeling, BPIOAI and Application Integration, Compatibility between different software platforms for enterprise application development, Business process modeling and optimization based on integrated software systems and workflow analysis, Information Oriented Application Integration, Service Oriented Application Integration.

UNIT V Enterprise Application Patterns 08 Hours

Design Patterns, Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioral Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns.

UNIT VI EAI AND XML 08 Hours

EAI and XML, Integration Solutions, XML enabled standards, Web Services: SOAP, UDDI and WSDL, XML Encryption, XML Signature, XSLT, XSLT for B2B Application Integration, XSLT: Processors, Transformation and Applications, ebXML and EAI, ebXML: Components, Architecture, Business Process Modeling.

Text Books:

1. William A. Ruh, Francis X. Maginnis and William J. Brown, Enterprise Application Integration, A Wiley Tech Brief.
2. David S. Linthicum, Enterprise Application Integration, Addison-Wesley Information Technology Series).
3. David S. Linthicum, Next Generation Application Integration: From Simple Information to Web Services, Addison Wesley Pub Date: August 15, ISBN: 0-201-84456-7 Pages: 512.
4. http://www.eai.ittoolbox.com.
5. http://www.javaworld.com/javaworld/jw-08-2002/jw-0809eai.html (Enterprise application integration using J2EE).

Reference Books:

1. S. Duke, P. Makey, N. Kiras, Application Integration Management Guide: Strategies and Technologies, Butler Group Limited, Hull, UK.
2. J. Morgenthal, B. La Forge, Enterprise Application Integration with XML and Java, in: C. Goldfarb (Ed.), Open Information Management, Prentice-Hall, Englewood Cliffs, NJ, USA.
3. D. Avison, G. Fitzgerald, Information Systems Development: Methodologies, Techniques, and Tools, McGraw Hill, London, UK.
4. Martin Fowler, Patterns of Enterprise Application Architecture, 2003, Addison-Wesley Professional, ISBN10: 0321127420 ISBN-13: 9780321127426.
5. Fred A. Cummins, Enterprise Integration: An Architecture for Enterprise Application and Systems Integration, Wiley, ISBN-10: 0471400106 ISBN-13: 978-0471400103.

5144015C: ELECTIVE-III PRODUCT LIFE CYCLE MANAGEMENT

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 05

Examination Scheme: In-Semester : 50 Marks, End-Semester : 50 Marks

Prerequisites:

Software Engineering

Course Objectives:

1. To familiarize the students with the need, benefits and components of PLM.
2. To acquaint students with Product Data Management & PLM strategies.
3. To give insights into new product development program and guidelines for designing and
4. Developing a product.
5. To familiarize the students with Virtual Product Development.

Course Outcomes:

By the end of the course, students should be able to

1. Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
2. Illustrate various approaches and techniques for designing and developing products.
3. Apply product engineering guidelines / thumb rules in designing products for molding, machining, sheet metal working etc.
4. Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant.

UNIT – I Introduction to Product Lifecycle Management (PLM) 08 Hours

Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications. PLM Strategies: Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM

UNIT – II Product Design 08 Hours

Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process.

UNIT – III Product Data Management (PDM) 08 Hours

Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation

UNIT IV Virtual Product Development Tools 08 Hours

For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies .

UNIT V Integration of Environmental Aspects in Product Design 08 Hours

Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design

UNIT VI Life Cycle Assessment and Life Cycle Cost Analysis 08 Hours

Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis.

Reference Books:

1. John Stark, “Product Lifecycle Management: Paradigm for 21st Century Product Realization”,
2. Springer-Verlag, 2004. ISBN: 1852338105.
3. Fabio Giudice, Guido La Rosa, AntoninoRisitano, “Product Design for the environment-A life
4. cycle approach”, Taylor & Francis 2006, ISBN: 0849327229
5. SaaksvuoriAntti, ImmonenAnselmie, “Product Life Cycle Management”, Springer, Dreamtech,
6. ISBN: 3540257314
7. Michael Grieve, “Product Lifecycle Management: Driving the next generation of lean thinking”,
8. Tata McGraw Hill, 2006, ISBN: 0070636265

5144015D: ELECTIVE-III COMPUTER VISION AND VIDEO PROCESSING

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. Computer Graphics

Course Objectives:

1. To study basics of digital image processing
2. To study mathematics and algorithms for image processing
3. To study computer vision applications
4. To study pattern recognition algorithms for image processing
5. To study different classification algorithms used in image processing

Course Outcomes:

By the end of the course, students should be able to

1. survey image processing techniques, FOSS tools and related mathematics
2. write image processing programs with applying concepts using open source tools;
3. solve Image Processing problems using different pattern recognition algorithms
4. select an efficient classifier to solve the image processing problem

UNIT – I Basics of Digital Imaging 08 Hours

Image Acquisition, Sampling, Quantization, Difference in Monochrome and Multichrome imaging, concept of color spaces, point processing techniques, mask processing methods, image filtering, shape in images, edge detection, gradient operators- Roberts, Sobel, Prewitt, Canny, Slope magnitude method, morphological image processing, erosion, dilation, opening, closing, hit-n-miss transform, thinning, Top Hat transformation, Bottom hat transformation.

UNIT – II Image Representation and Region Analysis 08 Hours

Shape Descriptors-contour based, region based, Boundary based; Thresholding based segmentation, Watershed based Segmentation, Gray level Co-occurrence Matrix-energy, entropy, maximum probability, contrast, correlation; wavelets, wavelet Pyramids, Image matching, similarity measures, feature extraction in spatial domain, block truncation coding, feature extraction in transform domain, image transforms, energy based feature extraction

UNIT – III Computer Vision Applications 08 Hours

Image Fusion and Clustering- K-means, Vector Quantization, Hierarchical Clustering, Partitioned Clustering, Image Inpainting, Multisensor image fusion, character recognition, face recognition, Trademark databases, Medical Imaging, Signature Verification, Vehicular license plate Recognition, image and Video retrieval, Surveillance, Robotic vision, Panoramic view Construction.

UNIT IV Introduction to Pattern Recognition 08 Hours

Tree Classifiers-Decision Trees, Random Forests; Bayesian Decision Theory; Linear Discriminants Discriminative Classifiers-Separability, Perceptions, Support Vector Machines.

UNIT V Decision Theory 08 Hours

Parametric Techniques Generative Methods grounded in Bayesian Decision Theory: Maximum Likelihood Estimation, Bayesian Parameter Estimation, Sufficient Statistics; Non-Parametric Techniques- Kernel Density Estimators, Parzen Window, Nearest Neighbor Methods; Unsupervised Methods Exploring the Data for Latent Structure- Component Analysis and Dimension Reduction, principal Component Analysis.

UNIT VI Clustering 08 Hours

K-Means, Expectation Maximization, Mean Shift, Vector Quantization- Codebook generation Methods; Classifier Ensembles- Bagging, Boosting / AdaBoost; Graphical Models The Modern Language of Pattern Recognition and Machine Learning-Bayesian Networks, Sequential Models; Neural Networks.

Text Books:

1. Robert Haralick and Linda Shapiro, Computer and Robot Vision, Addison Wesley, Vol I & II.
2. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach, PHI.

Reference Books:

1. R Jain, R Kasturi, Machine Vision, McGraw Hill.
2. R. O. Duda, P. E. Hart, D. G. Stork, Pattern Classification, Wiley-Inter-science, John Wiley & Sons, Second Edition.
3. David G. Stork and Elad Yom-Tov, Computer Manual in MATLAB to accompany Pattern Classification, Wiley Inter-science.

5144015E: ELECTIVE-III GREEN ICT

Index

Teaching Scheme: Lectures: 05 Hours/Week

Credits 05

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks

Prerequisites:

1. The course assume no prior knowledge in this area.

Course Objectives:

1. To understand and Implement Green practices in Information and Communication Technologies.
2. To recognize the green devices and hardware
3. To comprehend how green ICT can help improve environmental Sustainability
4. To understand the impact of Green networking on ICT
5. To monitor and analyze energy consumption in Green Data Centers and Green Data Storage
6. To follow the regulations of Green ICT

Course Outcomes:

By the end of the course, students should be able to

1. Acquire fundamental knowledge of energy efficiency and green communications exploring the main challenges, mechanisms, and practice considering both wired and wireless systems.
2. Recognize the appropriate software and hardware for greening IT.
3. Understand different methodologies for sustainable software development.
4. Comprehend IT Infrastructure for green networking.
5. Analyze Energy Management in Green Data Centers and Green Data Storage.
6. Acquiring knowledge of laws, standards, and protocols in Green ICT.

UNIT – I Green Hardware and Software 08 Hours

Introduction: Environmental Concerns, and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT

Hardware: Life Cycle of a Device or Hardware, Reuse- Recycle and Dispose of, Processor Power States, Energy-Saving Software Techniques.

Software: Evaluating and Measuring Software Impact to Platform Power, Software Tools, Current Practices, Sustainable Software, Software Sustainability Attributes.

Software Sustainability Metrics: Modifiability and Reusability, Portability, Supportability, Performance, Dependability, Usability, Accessibility, Predictability, Efficiency, Project's Carbon Footprint

Sustainable Software Methodology: Collecting Metrics, Code Metrics Tools, Simplified Usability Study Platform Analysis, Existing Project Statistics, Defining Actions.

UNIT – II Green Data Centers and Data Storage 08 Hours

Green Data Centers: Energy Challenges, Data Centre IT Infrastructure: Servers, Networking, Storage, IT Platform Innovation, Data Centre Facility Infrastructure-Implications for Energy Efficiency: Power System, Cooling, Facilities Infrastructure Management, IT Infrastructure Management: Server Power, Consolidation, Virtualization, Green Data Centre Metrics

Green Data Storage: Storage Media Power Characteristics: Hard Disks, Magnetic Tapes, Solid-State Drives (SSDs), Energy Management Techniques for Hard Disks: State Transitioning, Caching, Dynamic RPM, System-Level Energy Management: RAID with Power Awareness, Power-Aware Data Layout, Hierarchical Storage Management, Storage Virtualization, Cloud Storage.

UNIT – III Green Networks 08 Hours

Green Network and Management: The Challenge of NGN, Benefits of Energy-Efficient Networks, Objectives of Green Networking, Core Components in Green-Networking Technology

Objectives of Green Network Protocols: Energy-Optimizing Protocol Design, Bit Costs Associated with Network Communication Protocols, Objectives of Green Network Protocols

Green Cloud Computing: Cloud Computing and Energy Usage Model: A Typical Example, Features of Clouds Enabling Green Computing, Green Cloud Architecture.

UNIT IV Green Communication 08 Hours

Green Communication: Categorization, concepts, Green Telecom, Green Mobile, Green Future Internet, Energy Efficiency Metrics and Performance Tradeoffs and metrics of green communication.

Green Wireless Networks: Energy efficient Base stations, Network design and planning, Green Radio, Towards Delay Tolerant Cognitive Cellular Networks, Green MTC, M2M, Internet of Things, Energy Saving standardization in Mobile and Wireless Communication Systems, Energy Efficient Ethernet,Green Optical Networks, SDN-Enabled Energy-Efficient Network Management.

UNIT V Enterprise Green IT Strategy 08 Hours

Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy, Metrics and Measurements in Green Strategies, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Regional/City Level Information, Measuring the Maturity of Sustainable ICT.

Enterprise Green IT Readiness: Introduction, Background: Readiness and Capability, Development of the G-Readiness Framework, Measuring an Organization's G-Readiness.

UNIT VI Green IT Outlook: Laws, Standard, Protocols, Case Study 08 Hours

The Regulatory Environment and IT Manufacturers: RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment.

Standard: Non regulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Energy Efficient Standards for Wire line Communications, Social Movements and Greenpeace.

Green Network Protocols and Standards: Strategies to Reduce Carbon Emissions, Contributions from the EMAN Working Group, Contributions from Standardization Bodies, Context Detail to Drive Energy Efficiency.

Case Study: Sustainable Software Methodology, Data Centre Management Strategies, IaaS Provider.

Text Books:

1. San Murugesan, G.R. Gangadharan, Harnessing Green IT: Principles and Practices, Wiley, ISBN No.13:9788126539680.

Reference Books:

1. Konstantinos Samdanis, Peter Rost, Andreas Maeder, Michela Meo, Christos Verikoukis , Green Communications: Principles, Concepts and Practice, Wiley, , ISBN No.978-1-118-75926-4.
2. Ramjee Prasad, Shingo Ohmori, Dina Simunic, Towards Green ICT, River Publication, ISBN No.978-87-92329-34-9.

5144015F: ELECTIVE-III INSTITUTE ELECTIVE WITH INDUSTRY ASSOCIATION/INTERDISCIPLINARY ELECTIVE

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	05	In-Semester : 50 Marks End-Semester : 50 Marks

Institute / Department will interact with Industry or vice a versa to offer a need based topic and will prepare tentative contents of the syllabus and will get it approved from the BOS (Information Tech.)

Students of ME (Information Technology) can also select any subject from the list of open electives of other branches (Elective III only) provided that the concerned college has informed it to the BOS Chairman of IT and examination section of University of Pune well in time.

BOS (Information Technology) will declare the syllabus of such subject(s) before commencement of the Semester/Academic Year.

5144016 SEMINAR-II

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 04 Hours/Week	04	Term Work : 50 Marks
		Oral/ Presentation: 50 Marks

Prerequisites:

1. Current development in the selected field
2. Seminar I

Course Objectives:

1. To study recent research findings on important problems in the field of Information Technology.
2. To acquaint students with sources of literature in the field of Information Technology and Computer Engineering.
3. To provide an opportunity for students to review literature and personal communication.
4. To develop professional skills in the area of public speaking and an ability to present oneself before his/her peers with credibility.

Course Outcomes:

By the end of the course, students should be able to

1. Search for literature on the specific topic of his/her interest
2. Summarize the findings and gaps in the problem identified.
3. Use presentation tools for creating effective multimedia presentations

Introduction

The students will deliver a seminar on state-of-art topic of current interest in Information Technology, Computer Science and Engineering field preferably on elective subject. The student is expected to study and review at least five research papers from IEEE, ACM, Springer journals/transactions, reviewed international conferences related to a topic he/she has chosen for seminar.

The seminar guide shall maintain a progressive record of seminar such as discussion agenda, weekly outcomes achieved, corrective actions and comments on the progress report as per the plan submitted by the student etc. and should be produced at the time of examination/presentation.

Guidelines for Reviews

Faculty in-charge/ PG coordinator should conduct at-least three reviews in the semester to check the progress of the seminar.

Guidelines for Report Submission

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/Institute during practical sessions the seminar report (excluding preliminary pages like title page, certificate, index etc.) should not have more than 15 percent of plagiarism. The plagiarism report should be attached as the last page in the report.

5144017 PROJECT STAGE-I

Index

Teaching Scheme:	Credits	Examination Scheme:	
Lectures: 08 Hours/Week	08	Term work	: 50 Marks
		Oral/ Presentation	: 50 Marks

The project stage-I should include Motivation, Problem statement, survey of reputed journal and/or reviewed international conference papers (adequate in number) related to the problem selected (problem modeling and design using set theory, NP-Hard analysis, SRS, UML, Classes, Signals, Test scenarios and other necessary, problem specific UML, software engineering documents, project plan).

Student should publish at least one paper in reviewed International Journal having ISSN Number and preferably with Citation Index II or International Journal recommended by the guide of the project or reputed reviewed conferences. The term work should include the paper published, reviewer's comments and certificate of presenting the paper in the conference organized/sponsored by the Board of Studies in Information Technology. The guides should maintain a progressive record of the project work such as discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students etc. and should be produced at time of examination.

SEMESTER-IV

5144018 SEMINAR-III

Index

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 05 Hours/Week	05	Term Work : 50 Marks
		Oral / Presentation : 50 Marks

Prerequisites:

1. Current development in the selected field
2. Project Stage I.
3. Seminar I, Seminar II

Course Objectives:

1. To study recent research findings on important problems in the field of Information Technology.
2. To acquaint students with sources of literature in the field of Information Technology and Computer Engineering.
3. To provide an opportunity for students to review literature and personal communication.
4. To develop professional skills in the area of public speaking and an ability to present oneself before his/her peers with credibility.

Course Outcomes:

By the end of the course, students should be able to

1. Search for literature on the specific topic of his/her interest
2. Summarize the findings and gaps in the problem identified
3. Describe the summary and list key (most essential) ideas of the reviewed papers.
4. Use presentation tools for creating effective multimedia presentations

Introduction

The students will deliver a seminar on state-of-art topic of current interest in Information Technology, Computer Science and Engineering field preferably on elective subject. Students can take topic related to their dissertation but should not be exactly same as their dissertation topic.

The student is expected to study and review at least five research papers from IEEE, ACM, Springer journals/transactions, reviewed international conferences related to a topic he/she has chosen for seminar.

The seminar guide shall maintain a progressive record of seminar such as discussion agenda, weekly outcomes achieved, corrective actions and comments on the progress report as per the plan submitted by the student etc. and should be produced at the time of examination/presentation.

Guidelines for Reviews

Faculty in-charge/ PG coordinator should conduct at-least three reviews in the semester to check the progress of the seminar.

Guidelines for Report Submission

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/Institute during practical sessions.

The seminar report (excluding preliminary pages like title page, certificate, index etc.) should not have more than 15 percent of plagiarism. The plagiarism report should be attached as the last page in the report.

5144019 PROJECT STAGE-II

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Teaching Scheme:	Credits	Examination Scheme:
Lectures: 20 Hours/Week	20	Term Work : 150 Marks
		Oral/ Presentation : 50 Marks

The student will select an appropriate Technology, implant a detailed design prepared in project stage-I, test it manually and/or using tools, obtain desired results, discuss performance in terms of improvement with existing known algorithms and comparative graphs to support the conclusions drawn. Student should publish at least one paper in reviewed International Journal having ISSN Number and preferably with Citation Index II or reviewed International Journal recommended by the guide of the Dissertation or reviewed reputed international conference. The term work shall include the paper published, reviewer's comments and certificate of presenting the paper in the conference organized/sponsored by the Board of Studies in Information Technology. The guides should maintain a progressive record of the project work such as discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students etc. and should be produced at time of examination. A maximum number of students assigned to a guide should not be more than Eight (8).