UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY, CHENNAI 600 025

REGULATIONS - 2013

M.E. MULTIMEDIA TECHNOLOGY

I – IV SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8152	Advanced Data structures and Algorithm Analysis	3	0	0	3
2.	MM8101	Digital Media Processing	3	0	0	3
3.	MM8102	Multimedia Communication Networks	3	0	0	3
4.	MM8103	Multimedia Compression Techniques	3	0	0	3
5.	MA8160	Probability and Statistical Methods	3	1	0	4
6.	MM8163	Software Engineering Methodologies	3	0	0	3
PRACTICAL						
7.	MM8111	Data Structures and Algorithms Laboratory	0	0	3	2
8.	MM8112	Multimedia Processing Laboratory	0	0	3	2
		TOTAL	**18**	**1**	**6**	**23**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MM8201	Digital Image Processing Techniques	3	0	0	3
2.	MM8202	Web Programming and Design	3	0	0	3
3.	IF8253	GPU Architecture and Programming	3	0	0	3
4.	MM8251	Multimedia Databases	3	0	0	3
5.	MM8252	Video Analytics	3	0	0	3
6.		Elective I	3	0	0	3
PRACTICAL						
7.	MM8211	GPU Programming Laboratory	0	0	3	2
8.	MM8212	Web Programming and Design Laboratory	0	0	3	2
		TOTAL	**18**	**0**	**6**	**22**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MM8301	3D Modeling and Rendering	3	0	0	3
2.		Elective II	3	0	0	3
3.		Elective III	3	0	0	3
PRACTICAL						
4.	MM8311	Project Work Phase I	0	0	12	6
5.	MM8312	Technical Seminar and Report writing	0	0	2	1
		TOTAL	**9**	**0**	**14**	**16**

SEMESTER IV

SL. NO.	COURSE CODE		L	T	P	C
PRACTICAL						
1	MM8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL NO OF CREDITS: 73

LIST OF ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	MM8001	Agent Based Modeling	3	0	0	3
2.	MM8002	Applied Cryptography and Network Security	3	0	0	3
3.	MM8003	Audio Video Broadcasting System	3	0	0	3
4.	MM8004	Biometrics	3	0	0	3
5.	MM8005	Computer Graphics	3	0	0	3
6.	MM8006	Medical Image Processing Techniques	3	0	0	3
7.	MM8007	Multimedia Information Storage and Retrieval	3	0	0	3
8.	MM8008	Pattern Recognition	3	0	0	3
9.	MM8009	Visualization Techniques	3	0	0	3
10.	IF8071	Artificial Intelligence	3	0	0	3
11.	IF8072	Compiler Design	3	0	0	3
12.	IF8073	Computer Vision	3	0	0	3
13.	IF8074	Data Warehousing and Data Mining	3	0	0	3
14.	IF8075	Digital Signal Processing	3	0	0	3
15.	IF8076	Embedded Computing System Design	3	0	0	3
16.	IF8077	Human Computer Interaction	3	0	0	3
17.	IF8079	Information Retrieval	3	0	0	3
18.	IF8080	Service Oriented Architecture	3	0	0	3
19.	IF8081	Soft Computing	3	0	0	3
20.	IF8082	Software Quality and Testing	3	0	0	3
21.	IF8084	Adhoc and Sensor Networks	3	0	0	3
22.	IF8251	Advanced Operating Systems	3	0	0	3
23.	IF8252	Cloud Computing Technologies	3	0	0	3
24.	IF8254	Mobile and Pervasive Computing	3	0	0	3
25.	MM8071	Digital Video Processing	3	0	0	3

IF8152 ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations.
- To learn the usage of graphs and strings and its applications.
- To select and design data structures and algorithms that is appropriate for problems.
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING 9

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion- B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Binomial Heaps: Binomial Trees and Binomial Heaps – Operations on Binomial Heaps

UNIT III GRAPHS & STRINGS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm; Maximum Flow: Flow Networks – The Ford-Fulkerson method – Maximum Bipartite Matching; String Matching: The Native String-Matching Algorithm – The Knuth-Morris-Pratt Algorithm

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy – Huffman Codes

UNIT V NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems

TOTAL: 45 PERIODS

OUTCOMES:

- Design data structures and algorithms to solve computing problems.
- Become familiar with the specification, usage, implementation and analysis of hierarchical data structures and algorithms.
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
- Apply suitable design strategy for problem solving.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Prentice-Hall.
2. Robert Sedgewick and Kevin Wayne, "Algorithms", Fourth Edition, Pearson Education.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Donald E Knuth, "Art of Computer Programming-Volume I- Fundamental Algorithms", Third edition, Addison Wesley, 1997.

MM8101 DIGITAL MEDIA PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To provide an introduction to the fundamental principles and techniques in multimedia signal processing.
- To provide an overview of the current multimedia standards and technologies.
- To provide details about representation and computing algorithms of multimedia.
- To review latest trends and future technologies.

UNIT I FUNDAMENTALS OF MULTIMEDIA SIGNALS 9

Introduction To Multimedia – Continuous time (analogue) - Discrete time and digital signals - Introduction to signal processing as applied to speech, music and multimedia - 2D signals – Sampling in 2D – Sampling theorem – 2D processing of Analog signals - Sampling theory – Aliasing and the effect of quantization - 'Sample and hold' reconstruction - Sampling rate conversion and oversampling to simplify analogue filters - Overall design of digital systems for processing speech, music and multimedia.

UNIT II TEXT AND AUDIO 9

Text types – Font – Unicode standard – Image types – Image processing – Standards – Specification – Device independent color models – Gamma correction – File format - Audio acoustics – Characteristics of sound – Elements of audio system – Microphone – Amplifier – Loudspeaker – Audio mixer – Digital audio – MIDI – Graphics – Components of graphics system, Coordinate system – Plotter.

UNIT III GRAPHICS AND ANIMATION 9

Introduction to 2D and 3D Graphics – Surface characteristics and texture – Lights – Animation key frames and Tweening techniques – Principles of animation – 3D animation – File formats**.**

UNIT IV VIDEO 9

Video Signals– Analog video - Digital Video– Signal transmission – Signal formats – Broadcasting standards – Digital video standards – PC video – Video file formats.

UNIT V MULTIMEDIA TOOLS AND DEVELOPMENT 9

Authoring tools – 3D modeling and animation tools – Image editing tools – sound editing tools – Digital movie tools – Plug in and delivery vehicles - Multimedia application development - Authoring – Metaphors – Testing – Report writing – Documentation – Case study – Web Application – Console Application – Distributed Application – Mobile Application.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic algorithms related to multimedia components.
- Familiar with the open source tools for processing multimedia components.
- Design and implement some basic multimedia applications in Internet.
- Critically analyze the role of multimedia components in Internet related applications.

REFERENCES:

1. John Woods, “Multidimensional Signal, Image and Video Processing and Coding”, Elsevier, 2012.
2. Ralf Steinmetz, Klara Nahrstedt, “Multimedia Computing: Communications and Applications” Pearson Education, 2002.
3. Mark S. Drew, Ze– Nian Li, “Fundamentals of Multimedia”, PHI, 2009.
4. Deitel & Deitel “Internet & World Wide Web How to Program”, Fourth Edition Prentice Hall, 2008.
5. S.W. Smith, "Scientist and Engineer's Guide to Digital Signal Processing” California Tech. Publishing, 2nd edition., 1999.

MM8102 MULTIMEDIA COMMUNICATION NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To understand the Multimedia Communication Models.
- To analyze the Guaranteed Service Model.
- To study the Multimedia Transport in Wireless Networks.
- To solve the Security issues in multimedia networks.
- To explore real– time multimedia network applications.

UNIT I MULTIMEDIA COMMUNICATION MODELS 9

Architecture of Internet Multimedia Communication– Protocol Stack– Requirements and Design challenges of multimedia communications– Multimedia distribution models– Unicasting, Broadcasting and Multicasting.

UNIT II GUARANTEED SERVICE MODEL 9

Multicast routing– PIM– Best effort service model and its limitations– QoS and its metrics– Queuing techniques– WFQ and its variants– RED– QoS aware routing – Call Admission Control– RSVP– Policing and Traffic Shaping algorithms– QoS architectures.

UNIT III MULTIMEDIA TRANSPORT 9

End to end solutions– Multimedia over TCP– Significance of UDP– Multimedia Streaming– Audio and Video Streaming– Interactive and non Interactive Multimedia– RTSP– RTP/RTCP – SIP– H.263.

UNIT IV MULTIMEDIA OVER WIRELESS NETWORKS 9

End to end QoS Provisioning – QoS enhancements – Call Admission Control – QoS Management – Multimedia support in 3G & 4G networks – Location Based Multimedia Service System.

UNIT V MULTIMEDIA NETWORK SECURITY AND APPLICATIONS 9

Security threats in Multimedia Communication – Digital Rights Management Architecture – DRM for Mobile Multimedia – Architectures, Requirements and Design Challenges of real time Multimedia Network Applications – Case Study – VoIP – Video Conferencing – Military Surveillance – Interactive TV – Video on Demand – Smart Phone.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Deploy the right multimedia communication models.
- Apply QoS to multimedia network applications with efficient routing techniques.
- Solve the security threats in the multimedia networks.
- Develop the real– time multimedia network applications.

REFERENCES:

1. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, “Introduction to Multimedia Communications Applications, Middleware, Networking”, John Wiley and Sons, 2006.
2. Jean Warland, Pravin Vareya, “High Performance Networks”, Morgan Kauffman Publishers, 2002.
3. William Stallings, “High Speed Networks and Internets Performance and Quality of Service”, 2nd Edition, Pearson Education, 2002.
4. Aura Ganz, Zvi Ganz, Kitti Wongthawaravat, ‘Multimedia Wireless Networks Technologies, Standards and QoS’, Prentice Hall, 2003.
5. Mahbub Hassan and Raj Jain, “High Performance TCP/IP Networking”, Pearson Education, 2004.
6. Shiguo Lian, “Multimedia Communication Security Recent Advances”, Nova Science Publishers, 2008.

MM8103 MULTIMEDIA COMPRESSION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic ideas of compression algorithms related to multimedia components – Text, speech, audio, image and Video.
- To understand the principles and standards and their applications with an emphasis on underlying technologies, algorithms, and performance.
- To appreciate the use of compression in multimedia processing applications
- To understand and implement compression standards in detail.

UNIT I FUNDAMENTALS OF COMPRESSION 9

Introduction To multimedia – Graphics, Image and Video representations – Fundamental concepts of video, digital audio – Storage requirements of multimedia applications – Need for compression – Taxonomy of compression Algorithms – Elements of Information Theory – Error Free Compression – Lossy Compression.

UNIT II TEXT COMPRESSION 9

Huffman coding – Adaptive Huffman coding – Arithmetic coding – Shannon Fano coding – Dictionary techniques – LZW family algorithms.

UNIT III IMAGE COMPRESSION 9

Image Compression Fundamentals –– Compression Standards – JPEG Standard – Sub band coding – Wavelet Based compression – Implementation using Filters – EZW, SPIHT coders – JPEG 2000 standards – JBIG and JBIG2 standards.

UNIT IV AUDIO COMPRESSION 9

Audio compression Techniques – μ law, A Law commanding – Frequency domain and filtering – Basic sub band coding – Application to speech coding – G.722 – MPEG audio – Progressive encoding – Silence compression, Speech compression – Formant and CELP vocoders.

UNIT V VIDEO COMPRESSION 9

Video compression techniques and Standards – MPEG video coding MPEG– 1 and MPEG – 2 video coding MPEG– 3 and MPEG– 4 – Motion estimation and compensation techniques – H.261 Standard – DVI technology – DVI real time compression – Current Trends in Compression standards.

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic compression algorithms.
- Familiar with the use of MATLAB and its equivalent open source environments.
- Design and implement some basic compression standards.
- Critically analyze different approaches of compression algorithms in multimedia related mini projects.

REFERENCES:

1. Khalid Sayood, “Introduction to Data Compression”, Morgan Kauffman Harcourt, Fourth Edition, 2012.
2. David Solomon, “Data Compression – The Complete REFERENCE:”, Fourth Edition, Springer Verlog, 2006.
3. Yun Q.Shi, Huifang Sun, “Image and Video Compression for Multimedia Engineering, Algorithms and Fundamentals”, CRC Press, 2003.
4. Mark S. Drew, Ze– Nian Li, “Fundamentals of Multimedia”, PHI, 2009.

MA8160 PROBABILITY AND STATISTICAL METHODS L T P C
3 1 0 4

OBJECTIVES:

- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES 9+3

Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial – Poisson – Geometric – Uniform – Exponential – Gamma and Normal distributions – Functions of a Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY 9+3

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation – Curve fitting by Principle of least squares – Regression Lines.

UNIT IV TESTING OF HYPOTHESES 9+3

Sampling distributions – Type I and Type II errors – Tests based on Normal, t, 2 and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 9+3

Random Vectors and Matrices – Mean vectors and Covariance matrices – Multivariate Normal density and its properties – Principal components Population - principal components – Principal components from standardized variables.

TOTAL 45+15:60 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Acquire the basic concepts of Probability and Statistical techniques for solving mathematical problems which will be useful in solving Engineering problems.

REFERENCES:

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Thomson and Duxbury, 2002.
2. Richard Johnson, “Miller & Freund’s Probability and Statistics for Engineer”, Prentice – Hall, Seventh Edition, 2007.
3. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, Pearson Education, Asia, Fifth Edition, 2002.
4. Gupta S.C. and Kapoor V.K, ”Fundamentals of Mathematical Statistics”, Sultan and Sons, 2001.
5. Dallas E Johnson, “Applied Multivariate Methods for Data Analysis”, Thomson and Duxbury press, 1998.

MM8163 SOFTWARE ENGINEERING METHODOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To provide information about wider engineering issues that form the background to developing complex, evolving (software– intensive) systems
- To plan a software engineering process to account for quality issues and non– functional requirements
- To employ a selection of concepts and techniques to complete a small scale analysis and design in mini projects
- To impart knowledge to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management

UNIT I SOFTWARE PRODUCT AND PROCESS 9

Introduction – Software Engineering Paradigm – Verification – Validation – Life Cycle Models – System Engineering – Business Process Engineering Overview – Product Engineering Overview – Agile Methods – Open source software development.– Current trends

UNIT II SOFTWARE REQUIREMENTS 9

Systems Engineering – Analysis Concepts – Functional and Non– Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data, Functional and Behavioral Models – Structured Analysis and Data Dictionary.

UNIT III DESIGN CONCEPTS AND PRINCIPLES 9

Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

UNIT IV TESTING 9

Taxonomy of Software Testing – Types of software Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based on Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Measures And Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement mini projects incorporating the basic principles of software engineering.
- Familiar with the basic concepts of software design, implementation.
- Familiar with software testing of simple mini projects.
- Familiar with the Rational Rose and its equivalent open source tools for understanding basic software engineering concepts.
- Design and implement some basic cost estimation models.
- Critically analyze and apply software project management principles in simple projects.

REFERENCES:

1. Ian Sommerville, “Software engineering”, Pearson Education Asia, Nineth Edition, 2010.
2. Roger S. Pressman, “Software Engineering – A practitioner’s Approach”, Seventh Edition, Tata McGraw– Hill, 2009.
3. Watts S.Humphrey,”A Discipline for Software Engineering”, Pearson Education, 2008.
4. James F.Peters and Witold Pedrycz, ”Software Engineering, Engineering Approach”, Wiley– India, 2007.
5. Stephen R.Schach, “Software Engineering”, Seventh Edition, Tata McGraw– Hill, 2006.
6. Ivar Jacobson, “Object Oriented Software Engineering”, Pearson Education, 1992
7. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Third Edition, Narosa publications, 2011.

MM8111 DATA STRUCTURES AND ALGORITHMS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To develop skills in design and implementation of data structures and their applications.
- To learn and implement linear, non linear and tree data structures.
- To learn Set ADT and Graph data structures and its applications.
- To study, implement and analyze different sorting techniques.

The following experiments should be practiced

1. Abstract Data type Implementation of List, Stack and Queues.
2. Tree ADT
3. Tries Implementation
4. Set ADT– Bit Vector Implementation
5. Graph Representations
6. Graph Traversals
7. Shortest Path Implementation
8. Spanning Tree Implementation
9. Sorting Algorithms
10. Implementation of Algorithms using Dynamic Programming, Backtracking

OUTCOMES:

Upon Completion of the course, the students should be able to

- Design and implement basic and advanced data structures extensively.
- Design algorithms using graph structure and various string matching algorithms to solve real– life problems.
- Design and Develop efficient algorithms with minimum complexity.

TOTAL: 45 PERIODS

MM8112 MULTIMEDIA PROCESSING LABORATORY L T P C
0 0 3 2

COURSE OBJECTIVES:

- To explore the various multimedia editing tools like Photoshop/EQV/MATLAB, Audacity, Garageband, iMovie and OpenCV.
- To explore media processing tools.

The following experiments should be practiced

1. Image color/contrast balancing and Enhancement using Photoshop/ MATLAB MATLAB.
2. Image compositing using Photoshop / MATLAB.
3. Applying special effects using Photoshop / MATLAB.
4. Music composing using Garage Band/ Audacity/ MATLAB.
5. Audio editing using Garage Band/Audacity/ MATLAB.
6. Video Preproduction works
   a. Storyboarding Concepts
   b. Animatics
7. Creation of 2D Animation using Flash/ Director.
8. Creation of 3D Animation using 3Ds Max/Maya.
9. Video Editing using iMovie/ Final cut Pro/ Adobe Premiere.
10. Multimedia Applications using open CV.
11. Mini Project.

OUTCOMES:

Upon Completion of the course, the students should be able to

- Process media elements using various multimedia tools.
- Create 2D and 3D animations.
- Build multimedia applications.

TOTAL: 45 PERIODS

MM8201 DIGITAL IMAGE PROCESSING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts and algorithms of digital image processing.
- To familiarize the student with the image processing environments like Matlab and its equivalent open source Image processing environments.
- To expose the student to a broad range of image processing techniques and issues and their applications, and to provide the student with practical experience using them.
- To appreciate the use of image processing in current technologies and to expose the students to real– world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Elements of visual perception, Steps in Image Processing Systems – Digital Imaging System – Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – Colour images and models – Image Operations – Arithmetic, logical, statistical and spatial operations.

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9

Spatial Domain – Gray level Transformations - Histogram Processing Spatial Filtering – Smoothing and Sharpening - Frequency Domain Filtering in Frequency Domain – DFT– FFT– DCT– Smoothing and Sharpening filters – Homomorphic Filtering– Noise models– Constrained and Unconstrained restoration models.

UNIT III IMAGE SEGMENTATION AND IMAGE FEATURE ANALYSIS 9

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Features – Textures – Boundary representations and Descriptions– Component Labeling – Regional descriptors and Feature Selection Techniques.

UNIT IV MULTI RESOLUTION ANALYSIS AND MORPHOLOGICAL PROCESSING 9

Multi Resolution Analysis Image Pyramids – Multi resolution expansion – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets - Image Morphology - Binary and Gray level morphology operations – Erosion, Dilation, Opening and Closing operations – Distance transforms – Basic morphological operations.

UNIT V IMAGE PATTERN RECOGNITION AND CASE STUDIES 9

Statistical Classifiers – Clustering Algorithms – Hierarchical and Partitional clustering – Image classification and Recognition– Image Understanding – Case Studies in Biometrics, Video – Image Fusion – Steganography

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic image processing algorithms using MATLAB tools.
- Design an application that incorporates different concepts of Image Processing.
- Apply and explore new techniques in the areas of image enhancement, restoration, segmentation, compression, wavelet processing and image morphology.
- Critically analyze different approaches to implement mini projects.
- Explore the possibility of applying Image processing concepts in various domains.

REFERENCES:

1. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011.
2. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008.
3. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning 2011, India.
4. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2011.
5. Wilhelm Burger, Mark J Berge, “ Digital Image Processing An algorithmic Introduction using Java”, Springer,2008.

MM8202 WEB PROGRAMMING AND DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To understand the issues in the design of web application development.
- To learn the concepts of client side and server side technologies.
- To learn the concept of three tier application using MVC.
- To understand and learn the importance of java based security solutions.
- To learn the concepts of software components using EJB.

UNIT I WEB DESIGN BASICS 9

Web Engineering and application development – Introduction – Challenges and role of web engineering – Web design methods – Design issues – OOWS model driven approach – OOHDM – UML based web Engineering – Designing Multichannel Web Application – Designing web application with web ML and Web Ratio – Semantic web Information System – Quality evaluation and experimental web Engineering – Measuring and evaluating web application – Need for empirical Web engineering.

UNIT II CLIENT AND SERVER SIDE SCRIPTING 9

Web technology basics – HTML5 – Cascading Style Sheet – client side scripting – Java script – Java script objects – XML basics – DOM – SAX – XSL – AJAX – RSS – database connectivity – Server side scripting – Servlet – Servlet life cycle – Servlet based web application – JSP / PHP / ASP.NET – Case study.

UNIT II WEB APPLICATION DEVELOPMENT 9

Three tier architecture – Working with model view controller – JCP – J2EE – XML based APIs – Application servers – Presentation tier and EIS tier – Java Mail – JMS – Java transactions – JNDI – Java authentication and authorization services – Java cryptography.

UNIT IV COMPONENT BASED DEVELOPMENT 9

Service Tier and Data tier – EJB architecture – Session beans – Entity beans – Message driven beans – J2EE connector architecture – Web Services – J2EE Web Services – Patterns – Presentation, Service tier and Data tier patterns – J2ME – J2ME application development.

UNIT V ADVANCED FRAMEWORKS 9

Understanding Struts – MVC framework – Struts control flow – Building mode, view and controller component – Hibernate – Architecture – understanding O/R mapping – Query language – Spring framework – Architecture – Case studies – Current trends.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

- Design and develop web applications using various models.
- Web application development using HTML and scripting technologies.
- Web application development using advanced features.
- Learn Security features supported in java.
- Develop web services using J2EE and related technologies.
- Design and develop applications using other frameworks.

REFERENCES:

1. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina, “Web Engineering Modelling and Implementing web Applications”, Springer, 2008.
2. Thomas Erl, “Service Oriented Architecture, Concepts, Technology, and Design”, Pearson, 2005.
3. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew “Java web Services Architecture”, Elsevier, 2003.
4. Black book – Java Server Programming (J2EE 1.4), Dreamtech Press, 2007.

IF8253 GPU ARCHITECTURE AND PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To understand the architecture of GPUs in order to program them effectively.
- To program using GPU programming frameworks.
- To optimize multimedia applications to run on GPUs.

UNIT I GPU ARCHITECTURES 9

Parallel Processors – Classification – Performance – Multimedia SIMD Architectures. GPU – NVIDIA Case Study – GPU Computational Structures – ISA – Memory Structures.

UNIT II CUDA 9

Introduction – CUDA Program Structure – Device memories – Data Transfer – Kernel Functions – CUDA Threads – Thread Organization – Synchronization & Scalability – CUDA memories – Performance.

UNIT III OPENCL BASICS 9

OpenCL Standard – Kernels – Host Device Iteration – Execution Environment – Memory Model – Basic OpenCL Examples.

UNIT IV OPENCL CONCURRENCY AND EXECUTION MODEL 9

OpenCL Synchronization – Kernels – Fences – Barriers – Queuing – Global Synchronization – Memory Consistency – Events – Host side memory model – Device Side memory Model.

UNIT V PERFORMANCE AND CASE STUDY 9

CPU / GPU Interaction – OpenCL on AMD – Memory Performance Consideration – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student will be able to

- Design multimedia applications using GPUs.
- Write Programs for GPUs using CUDA / OpenCL.
- Optimize programs to run on massive parallel architectures.

REFERENCES:

1. David B. Kirk, Wen – mei W. Hwu, "Programming massively parallel processors", Morgan Kauffman, 2010.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, " Heterogeneous computing with OpenCL", Morgan Kauffman, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
4. Wen– mei W. Hwu, "GPU Computing Gems", Morgan Kaufmann / Elsevier, 2011.

MM8251 MULTIMEDIA DATABASES L T P C
3 0 0 3

OBJECTIVES:

- To study issues concerning both the traditional and modern database systems and technologies for multimedia data management.
- To understand the basic concepts and techniques pertinent to multimedia databases.
- To learn about Image databases and Text/Document databases, Audio and Video databases.
- To study and use advanced technologies to develop web– based multimedia applications.

UNIT I INTRODUCTION 9

An introduction to Object oriented Databases - Multidimensional Data Structures - K d Trees, Point Quad trees, -The MX Quad tree - R Trees – Comparison of Different Data Structures.

UNIT II IMAGE DATABASES AND TEXT/DOCUMENT DATABASES 9

Raw Images - Compressed Image Representations - Image Processing Segmentation, Similarity based Retrieval – Alternative Image DB Paradigms – Representing Image DBs with Relations – Representing Image DBs with R Trees – Retrieving Images By Spatial Layout - Implementations Text/Document Databases - Precision and Recall – Stop Lists – Word Stems and Frequency Tables – Latent Semantic Indexing -TV Trees – Other Retrieval Techniques.

UNIT III VIDEO DATABASES AND AUDIO DATABASES 9

Video Databases - Organizing Content of a Single Video – Querying Content of Video Libraries – Video Segmentation – video Standards Audio Databases - A General Model of Audio Data – Capturing Audio Content through Discrete Transformation – Indexing Audio Data.

UNIT IV MULTIMEDIA DATABASES 9

Design and Architecture of a Multimedia Database – Organizing Multimedia Data Based on The Principle of Uniformity – Media Abstractions – Query Languages for Retrieving Multimedia Data – Indexing SMDSs with Enhanced Inverted Indices – Query Relaxation/Expansion – Web based multimedia applications.

UNIT V OBJECT MODEL AND SPATIAL DATABASES 9

Creating Distributed Multimedia Presentations Objects in Multimedia Presentations – Specifying Multimedia Documents with Temporal Constraints – Efficient Solution for Temporal Presentation Constraints – Spatial Constraints. Introduction to Spatial Databases – Spatial Concepts and Data Models – Spatial Query Language – Spatial Storage and Indexing.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student will be able to

- Provide a basic study of the development of fundamental database systems.
- Understand the most fundamental MDBMS concepts and techniques
- Acquire knowledge of Image databases, Text/Document databases, Audio and Video databases.
- Grasp the modern database technologies suitable for multimedia data management, and Apply some of the advanced technologies such as spatial databases to develop web based multimedia applications.

REFERENCES:

1. V.S. Subrahmanian," Principles of Multimedia Database Systems", Morgan Kauffman, 2nd Edition, 2013.
2. Shashi Shekhar, Sanjiv Chawla,"Spatial Databases", Pearson Education, 2002.
3. Lynne Dunckley,"Multimedia Databases An object relational approach", Pearson Education, 2003.
4. B.Prabhakaran, "Multimedia Database Systems", Kluwer Academic, 1997.

MM8252 VIDEO ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To learn various techniques for mining data streams.
- To acquire the knowledge of extracting information from surveillance videos.
- To learn Event Modelling for different applications.
- To understand the models used for recognition of objects in videos.

UNIT I INTRODUCTION TO BIG DATA AND DATA ANALYSIS 9

Introduction to Big Data Platform – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis Vs Reporting – Modern Data Analytic Tools – Data Analysis: Regression Modeling – Bayesian Modeling – Rule Induction.

UNIT II MINING DATA STREAMS 9

Introduction to Stream Concepts – Stream Data Model And Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream– Estimating Moments – Counting Oneness in a Window – Decaying Window – Real Time Analytics Platform(RTAP) Applications – Case Studies.

UNIT III VIDEO ANALYTICS 9

Introduction – Video Basics – Fundamentals for Video Surveillance – Scene Artifacts – Object Detection and Tracking: Adaptive Background Modelling and Subtraction – Pedestrian Detection and Tracking – Vehicle Detection and Tracking – Articulated Human Motion Tracking in Low Dimensional Latent Spaces.

UNIT IV BEHAVIOURAL ANALYSIS AND ACTIVITY RECOGNITION 9

Event Modelling – Behavioural Analysis – Human Activity Recognition – Complex Activity Recognition – Activity modeling using 3D shape - Video summarization – shape based activity models – Suspicious Activity Detection.

UNIT V HUMAN FACE RECOGNITION AND GAIT ANALYSIS 9

Introduction: Overview of Recognition algorithms – Human Recognition using Face: - Face Recognition from still images – Face Recognition from video – Evaluation of Face Recognition Technologies – Human Recognition using gait: HMM Framework for Gait Recognition – View Invariant Gait Recognition – Role of Shape and Dynamics in Gait Recognition.

TOTAL: 45 PERIODS

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Work with surveillance videos for analytics.
- Design optimization algorithms for better analysis and recognition of objects in a scene.
- Model a framework for Human Activity Recognition.

REFERENCES

1. Michael Berthold, David J.Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.
4. Rama Chellappa, Amit K.Roy– Chowdhury, Kevin Zhou.S, “Recognition of Humans and their Activities using Video”, Morgan & Claypool Publishers, 2005.

MM8211 GPU PROGRAMMING LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To understand GPU programming frameworks and GPU program structures.
- To understand CPU– GPU interaction.
- To program GPUs using CUDA/OpenCL.
- To solve data parallel image processing and video processing tasks using GPUs.

LIST OF EXPERIMENTS:

Programming using CUDA/ OpenCL

1. Vector and Matrix operations such as addition, multiplication, dot product, etc.
2. Image manipulations such as image rotation, histogram, convolution etc.
3. Implementation of filters.
4. Implementation of compression and decompression algorithms.
5. Video processing tasks such as decompression, event identification, and enhancements.
6. Development of a complete application for some image/video processing domain.

TOTAL: 45 PERIODS

REFERENCES:

1. David B. Kirk, Wen– Mei W. Hwu, “Programming massively parallel processors”, Morgan Kauffman, 2010.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, “ Heterogeneous computing with OpenCL”, Morgan Kauffman, 2012.
3. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
4. Wen– mei W. Hwu, “GPU Computing Gems”, Morgan Kaufmann / Elsevier, 2011.

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Identify problems suitable for solving using GPUs.
- Breakdown a task for parallelism.
- Write programs for GPUs using CUDA / OpenCL.
- Design and optimize multimedia tasks to run on GPUs.
- Debug CUDA/OpenCL programs.

MM8212 WEB PROGRAMMING AND DESIGN LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To learn how to create a simple web page using html along with the usage of style sheets, lists, creation of tables with borders, padding and colors.
- To get acquainted with JavaScript and how to embed JavaScript in Html code.
- To construct dynamic server side web pages and integrate the Web application with many of the other Java 2 Enterprise Edition application server methodologies.
- To develop Java Enterprise Applications using EJB3 and other Java EE technology and J2ME.

The following experiments should be implemented

1. Web programming with HTML tags, CSS for styling, Page layout.
2. Develop web pages using JavaScript for client side programming and HTML forms.
3. Using The DOM and the JavaScript object models.
4. Website optimization crunching HTML, using CSS to replace HTML and light– weight graphics to speed up websites.
5. Creating XML file with XML DTD and XML schema, SAX, XSL.
6. Web site creation with PHP for server side programming for storing current date– time using cookies and for storing page views using sessions.
7. Web application development using Servlet/ PHP/ JSP/ ASP.NET.
8. Working with PHP and MySQL.
9. Constructing dynamic server– side web pages using JSF and integrate the Web application with many of the other Java2 Enterprise Edition application server methodologies such as Enterprise Java Beans, Java Mail, and SOAP.
10. Developing Java Enterprise Applications Using EJB3 Session beans, entity beans and message– driven beans.
11. Working with JNDI, JDBC, JMS.
12. Application development using J2ME.

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Develop Web application using HTML and scripting technologies.
- Acquire hands on experience on Web application development using advanced features.
- Design and develop dynamic server– side web pages.
- Develop web services using J2EE and related technologies.
- Design and develop applications using other frameworks.

TOTAL: 45 PERIODS

MM8301 **3D MODELING AND RENDERING** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basics of different geometrical shapes modeling.
- To appreciate the different aspects of visibility of an objects.
- To get an understanding of rendering real natural scene.
- To understand the concepts of radio city and kinematics in animation.

UNIT I MATHEMATICS FOR MODELING 9

Vector tools and polar coordinates – Vectors fundamentals– Representations of key geometric objects – Intersection of lines, planes and polygons - clipping algorithms – 2D and 3D Affine transformation – 3D Viewing – 3D rendering pipeline – Camera movements – Introduction to OpenGL programming – Geometric transformation and viewing – projection and perspective transformation.

UNIT II MODELING SHAPES 9

Introduction – solid modeling – polyhedra – Extruded shapes – tessellation – Mesh approximation of smooth objects – Bezier Curves – B splines – NURBS – Interpolation – Hierarchical and physical modeling – Hidden surface removal algorithms–
Curve and surface – Interactive graphics.

UNIT III SHADING AND ILLUMINATION MODELS 9

Shading models – Flat shading – Smooth shading – Reflections – Diffuse and specular reflection – Adding color – Antialiasing techniques – Dithering techniques – Creating more shades and color – Opengl – specular highlights – Spotlight – Blending – Reflections – Applying colors– Real world lights.

UNIT IV TEXTURE AND RENDERING 9

Procedural and Bitmaps Textures – Texture Mapping or Image – Bump Mapping – Environmental Mapping – Magnification and Minification - Minmapped Textures – Ray Tracing Techniques – Adding Textures on to Curved Surfaces – Tiling – Fractals – Texture Mapping.

UNIT V COMPUTER ANIMATION 9

Raster Methods – Design of Animation Sequences – Animation Techniques – Key Frame Systems – Motion Specification – Direct, Kinematics, Dynamics – Rigid Body Animation –— Radiosity – Collision Detection – Graphics File Format – Opengl Animation Procedures.

TOTAL 45 PERIODS.

REFERENCES:

1. F.S. Hill Jr., Stephen Kelly, “Computer Graphics Using OpenGL”, 3rd Edition, Persons Education/PHI Learing, 2007.
2. Donald Hearn, M. Pauline Baker, “Computer Graphics with OpenGL”, 3rd Edition, Pearson Education, 2012.

OUTCOMES:

Upon completion of the course, the students will be able to

- Design different polygons and real world objects.
- Apply rendering techniques to make objects more realistic.
- Apply lighting techniques to objects realism.
- Analyze and Design an animation game

MM8001 **AGENT BASED MODELING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the principles and fundamentals of designing agents.
- To analyze architecture design of different agents.
- To understand user interaction with agents.

UNIT I INTRODUCTION 9

Agents and Multi Agent Systems – Intelligent Agent – Advantages – concepts of Building Agent – Situated Agents – Proactive and reactive agents – Agent Environment – Social Agents – Agent Execution Cycle – Prometheus methodology – Guidelines for using Prometheus– Agent oriented methodologies– System Specification – Goal specification – Functionalities – Scenario Development – Interface Description – Checking for completeness and consistency.

UNIT II AGENT BASED MODELING AND NET LOGO BASICS 9

Modeling Cycle– Agent Based Modeling – Net Logo– Demonstration Program– Describing and formulating ABMs ODD Protocol – Virtual corridors– Implementing First Agent Based Model– Animation to Science– Analyzing the Model– Time series Results– Testing Your Program – Kinds of Error – Techniques for Debugging and Testing –Documentation of Tests.

UNIT III MODEL DESIGN CONCEPTS 9

Emergence Emergent Dynamics – Simulation Experiments and Behavior Space – Emergent Dynamics –Observation – Interface Displays – File output – Behavior Space as an Output Writer – Export Primitives and Menu Commands – Sensing Scope of Variables – Using Variables of other objects – Putting Sense to Work– Adaptive Behavior and Objectives – Prediction – Interaction – Scheduling –Stochasticity– Collectives.

UNIT IV PATTERN ORIENTED MODELING 9

Patterns for Model Structure– Steps in POM to Design Model Structure– Theory Development – Theory Development and Strong Interface in the Virtual Lab – Parameterization and Calibration – Parameterization of ABMs is Different– Parameterize Sub models – Calibration Concepts and Strategies

UNIT V MODEL ANALYSIS 9

Analyzing and Understanding ABMs – Additional Heuristics for Understanding ABMs – Statistics for Understanding – sensitivity, Uncertainty and robustness Analysis – Introduction – sensitive Analysis – Uncertainty Analysis – Robust Analysis – Implementation – Modeling Agent Behavior– ABM Gadgets.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to,

- Implement a architecture design for an agent.
- Implement communicative actions with agents.
- Use a tool to implement typical agents for different types of applications.

REFERENCES:

1. Lin Padgham and Michael Winikoff, “Developing Intelligent Agent System”, John Wiley, 2004.
2. Steven F. RailsBack and Volker Grimm “Agent Based and Individual Based modeling”, Princeton University press, 2012.

MM8002 APPLIED CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand security issues those arise in communication systems and web services.

UNIT I CLASSICAL TECHNIQUES 8

Classical Cryptography – The Shift Cipher – The Substitution Cipher – The Affine Cipher Cryptanalysis – Cryptanalysis of the Affine Cipher – Cryptanalysis of the Substitution Cipher – Cryptanalysis of the Vigenere Cipher – Shannon's Theory.

UNIT II ENCRYPTION STANDARDS 11

Block Cipher and the Advanced Encryption Standard– Substitution – Permutation Networks – Linear Cryptanalysis – Differential Cryptanalysis – The Data Encryption Standard – The Advanced Encryption Standard – Modes of Operation – Cryptography Hash Function – Hash Function and Data Integrity – Security of Hash Function –Iterated Hash Functions – Message Authentication Codes – Key Agreement Scheme– Diffie– Hellman Key agreement – Formal Analysis of Authentication and Key– Exchange Protocols – Secret Splitting and Secret Sharing.

UNIT III AUTHENTICATION 8

The RSA Cryptosystem and Factoring Integer – Introduction to Public –key Cryptography – Number theory – The RSA Cryptosystem, Other Attacks on RSA – The ELGamal Cryptosystem – Shanks' Algorithm – Finite Fields – Elliptic Curves over the Reals – Elliptical Curves Modulo a Prime, Signature Scheme – Digital Signature Algorithm.

UNIT IV NETWORK SECURITY 9

Real time Communication Security: Session Key Establishment – Perfect Forward Secrecy– PFS– Foilage – Denial –of– Service– Clogging Protection – Endpoint Identifier Hiding _ Data Stream Protection – Negotiating Crypto Parameters – IPSec: AH and ESP – Internet Key Exchange – ISAKMP – SSL/TLS.

UNIT V APPLICATIONS 9

E– Mail Security – Privacy Enhanced Mail – S/MIME/ PGP– Secure Electronic Transaction – Digital Cash – Introduction to Intrusion Detection – Firewalls.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Understand the basic security algorithms required by any computing system.
- Aware of the security challenges and issues that may arise in any system.
- Design any secure system.

REFERENCES:

1. Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006.
2. Kaufman, R. Perlman, and M. Speciner, "Network Security: Private Communication in a Public World, 2nd ed., Prentice Hall.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, First Edition, 2006.
5. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007.

MM8003 AUDIO VIDEO BROADCASTING SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about the Standards in the real world service creations.
- To know about new generation set top boxes, hand held devices, and PC add in cards.
- Understand MPEG– 2 System Standards.

UNIT I INTRODUCTION TO BROADCASTING 9

Frequency bands – Propagation and Modulation– Radio and Television Transmission System– Transmitting Antennas and Systems – RF System Maintenance – Test Equipments – Audio Test and Measurements – Video Signal Measurement and Analysis.

UNIT II DATA BROADCASTING 9

Introduction to Data Broadcasting– Data Broadcasting System Overview and Architecture– Mpeg 2 Transport Basics– Data Categorization– Service Description Frame work – Synchronized Streaming Encapsulation – Data Piping Protocol.

UNIT III DESIGN AND INSTALLATION OF VIDEO AND AUDIO SYSTEMS 9

Basics of Television – Analog Video Fundamentals – Digital Video Fundamentals – Analog Audio fundamentals – Digital Audio Fundamentals – Data Multiplexing – Transition to DTD.

UNIT IV AUDIO VIDEO STREAMING 9

Introduction to streaming Media – Video Encoding – Audio Encoding – Preprocessing –Stream Serving – Web Casting –Media Players– Applications for Streaming Media – Content Distribution.

UNIT V ALGORITHMS AND INTERFACES 9

Color Introduction to Luma and Chroma – Introduction to Component SDTV – Introduction to HDTV – Digital Video Interfaces – Filtering and Sampling – Image Digitization and Reconstructions – Perceptions and Visual Activity – DeInterlacing – DV Compressions – Digital Television Standards.

TOTAL: 45 PERIODS

REFERENCES

1. David Austerberry,"The technology of video and audio streaming", Elsevier, 2nd Edition, 2005.
2. Richards. S Chernock, Regis J.cainon, Micheal A. Dolan, John R.Mick JR," Data Broadcasting – Understanding the ATCS Data Broadcasting Standerds", Tata Mcgraw Hill, 2001.
3. Charles Poynton – Morgan Kaufman Publishers,"Digital Video and HDTV Algorithm and Interfaces", Charles Poynton – Morgan Kaufman Publishers, 2007.
4. Jerry C. Whitaker,"Standard Handbook of Broadcast Engineering", McGraw Hill Publications, 2005.
5. Michael Robin and Michel Poulin, "Digital Television Fundamentals – Design and Installation of Video and Audio Systems", Tata McGraw Hill, Second Edition, 2000.

OUTCOMES:

- To Implement the Standards in the real world service creations.
- To work with new generation set–top boxes, hand held devices, and PC add in cards.
- To design various video streaming techniques.

MM8004 **BIOMETRICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basic ideas and principles in biometrics.
- To understand the basic concepts of statistical data analysis for validating the biometrics projects.
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like Open CV.
- To appreciate the use of biometrics Industrial applications and to understand the role of biometrics in modern security environment.
- To understand and implement more advanced topics in current research literature.
- To understand the role of multi– biometrics.

UNIT I BIOMETRICS FUNDAMENTALS 9

Introduction – Benefits of biometric security – Verification and identification – Basic working of biometric matching – Accuracy – False match rate – False non– match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions.

UNIT II FINGER AND FACIAL SCAN 9

Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness - Types of algorithms used for interpretation - Facial Scan – Features – Components – Operation (Steps) – Competing facial Scan technologies – Strength – weakness.

UNIT III IRIS AND VOICE 9

Iris Scan – Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness - Voice Scan – Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

UNIT IV PHYSIOLOGICAL BIOMETRICS 9

Other physiological biometrics – Hand scan – Retina scan – AFIS (Automatic Finger Print Identification Systems) – Behavioral Biometrics – Signature scan – Keystroke scan - Multimodalities and combining biometrics for improving performance.

UNIT V BIOMETRICS APPLICATION DEVELOPMENT 9

Biometrics Application – Biometric Solution Matrix – Bio privacy – Comparison of privacy factor in different biometrics technologies – Designing privacy sympathetic biometric systems - Biometric standards – (BioAPI , BAPI) – Biometric middleware - Biometrics for Network Security - Statistical measures of Biometrics.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic biometrics related algorithms.
- Familiar with the use of MATLAB and its equivalent open source environments.
- Design and implement industrial applications that incorporates different concepts of biometrics.
- Critically analyze different approaches to implement mini projects in industrial environment and in security related projects.

REFERENCES:

1. Samir Nanavati, Michael Thieme, Raj Nanavati “Biometrics - Identity Verification in a Networked World”, John Wiley and Sons, 2002.
2. Anil K. Jain, Arun A. Ross and Karthik Nandakumar, “Introduction to Biometrics”, Springer, 2011.
3. James L. Wayman, Anil K. Jain, Davide Maltoni, and Dario Maio, “Biometric Systems Technology, Design and Performance Evaluation”, Springer, 2004.
5. Stan Z. Li and Anil K. Jain, “Handbook of Face Recognition”, 2005.

MM8005 **COMPUTER GRAPHICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the mathematics behind graphics.
- To understand creation and manipulation of 2D and 3D graphic objects.
- To know the various coloring models.
- To gain an in-depth knowledge about fractals and their creation.

UNIT I INTRODUCTION TO GRAPHICS 9

Introduction – Design and Drawing, pictures storage and display– Basic Graphics Pipeline - Bitmap and Vector Based Graphics – Attributes of output primitives – Line, Circle and Ellipse drawing algorithms and other Conics.

UNIT II TRANSFORMATION AND PROJECTION 9

Two dimensional Geometric transformation –Transformation matrix – Camera view port – Introduction to viewing – viewing pipeline – viewing transformation – Perspective and Orthogonal viewing – Parallel and Perspective projections – Objects in Homogeneous Coordinates - Three dimensional object representation – Polygons, Visualization of data sets – Visible surface identification – Three Dimensional Transformations - Two Dimensional Clipping – Polygon Clipping –Clipping in Three Dimensions – Text Clipping.

UNIT III COLOUR MODELS AND SHADING OBJECTS 9

Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation – Raster – Key frame – Graphics programming using OPENGL – Basic graphics primitives – Drawing three dimensional objects – Drawing three dimensional scenes - Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows of objects – Building a camera in a program – Creating shaded objects – Rendering texture – Drawing Shadows.

UNIT IV CURVE AND SURFACE DESIGN 9

Curved lines – Splines – Quadric Surfaces,– Parametric Curve Design – Spline Curve Representation – Bezier Curves – B– Spline Curves – Surface Design – Bilinear Surfaces – Ruled Surfaces – Developable Surfaces – Coons Patch – Sweep Surfaces –Surface of Revolution – Quadric Surfaces – Constructive Solid Geometry – Bezier Surfaces – B– Spline Surfaces – Subdivision Surfaces – Visible Surfaces – Introduction to visible and hidden surfaces – Coherence for visibility – Extents and Bounding Volumes, Back Face Culling, Painter's Algorithm – Z– Buffer Algorithm – Floating Horizon Algorithm – Roberts Algorithm.

UNIT V FRACTALS 9

Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects – Its applications.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Create 2D and 3D graphical objects.
- Model the various techniques involved in 3D graphic design.
- Apply various shading and color models over three dimensional objects.

REFERENCES:

1. Donald Hearn, Pauline Baker, "Computer Graphics – C Version", Pearson Education, 2012.
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics – Principles and practice", Pearson Education, second edition, 2007.
3. F.S. Hill, "Computer Graphics using OPENGL", Pearson Education, 2003.
4. D F Rogers,"Mathematical Elements for Computer Graphics", Tata– McGraw Hill. 2008.
5. Edward Angele,"Interactive Computer Graphics, A top– down approach with OpenGL" Addisen Wesley, 2007.
6. G Farin,"Curves and Surfaces for Computer Aided Geometric Design", Academic Press, 2007.

MM8006 MEDICAL IMAGE PROCESSING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To provide information about various medical imaging modalities.
- To understand the basic concepts of image enhancement, image restoration, morphological image processing, image segmentation, feature recognition in medical images.
- To provide information about classification and image visualization in medical image processing projects.
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Image perception - MTF of the visual system - Image fidelity criteria – Image model – Image sampling and quantization – Two dimensional sampling theory – Image quantization – Optimum mean square quantizer – Image transforms – 2D DFT and other transforms.

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9

Image Enhancement operations – Image noise and modeling - Image restoration – Image degradation model – Inverse and Weiner filtering – Geometric transformations and correction.

UNIT III IMAGE REGISTRATION AND VISUALIZATION 9

Rigid body visualization – Principal axis registration – Interactive principal axis registration – Feature based registration – Elastic deformation based registration – Image visualization – 2D display methods – 3D display methods – virtual reality based interactive Visualization.

UNIT IV IMAGE ANALYSIS AND CLASSIFICATION 9

Image segmentation – Pixel based, Edge based, Region based segmentation - Active contour models and Level sets for medical image segmentation – Image representation and analysis – Feature extraction and representation – Statistical, Shape, Texture feature - Statistical image classification.

UNIT V RECONSTRUCTION AND CASE STUDY 9

Mathematical Preliminaries and Basic Reconstruction Methods – Image reconstruction in CT scanners – MRI – fMRI – Ultra sound imaging – 3D Ultra sound imaging - Nuclear, Medical Imaging modalities – SPECT– PET – Molecular Imaging.

TOTAL 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic medical image processing algorithms.
- Familiar with the use of MATLAB and its equivalent open source tools.
- Design and implement image processing applications that incorporate different concepts of medical Image Processing.
- Critically analyze different approaches to implement mini projects in medical domain.
- Explore the possibility of applying Image processing concepts in modern hospitals.

REFERENCES:

1. Atam P.Dhawan, “Medical Image Analysis’, Wiley Interscience Publication, NJ.
2. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011.
3. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008.
4. Geoff Dougherty, “Digital Image Processing for Medical Applications”, Cambridge University Press, 2010.
5. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning, 2011.
6. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
7. Alfred Horowitz, ‘MRI Physics for Radiologists – A Visual Approach’, Second Edition, Springer Verlag Network, 1991.

8. Kavyan Najarian and Robert Splerstor," Biomedical signals and Image processing", CRC – Taylor and Francis,2006.
9. John L.Semmlow," Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc.2004.

MM8007 MULTIMEDIA INFORMATION STORAGE AND RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- To compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- To outline the structure of queries and media elements.
- To critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

UNIT I MULTIMEDIA STORAGE 9

Introduction To Multimedia Storage Devices Compact Disc – Construction Details – Recording and Reproducing Data From CD, CDROM - DVD Technology – Specifications of DVD - Introduction to Visual Information Retrieval – Content Based Interactivity – Representation of Visual Contents – Similarity Models – Indexing Models – Data Models and Knowledge Structures – Visual Information Retrieval at Work – Introduction To Ad– Hoc Search Boolean Retrieval.

UNIT II TEXTUAL INFORMATION RETRIEVAL 9

Textual Information Retrieval Fundamentals of IR – Search structure – Text analysis and indexing – Clustering of Documents – Index Construction – Text Representation – Evaluation – Retrieval models - Vector space – Probabilistic models – Statistical language models – Structured Documents – Inference Network – Personalized and topic sensitive Page Rank – Query classification – Federated Search – Document clustering –Collaborative filtering.

UNIT III IMAGE RETRIEVAL 10

Image Retrieval by Color Similarity Representation of Color Stimuli – Representation of Image Color Properties – Color based Retrieval – Image Retrieval by Texture Similarity - Representation of Texture Properties, Space based Models – Frequency based Models – Texture Signatures – Image Retrieval by Shape Similarity - Shape Representation – Shape through Features – Multi scale Shape Description – Shape Based Retrieval –Feature based Methods – Image Retrieval by Spatial Relationships - Representation of Spatial Indexes – Object based Representation - Relation based Representation – Metric Relationships (Distance, Orientations) – Querying and Retrieval by Spatial Relationships.

UNIT IV MUSIC AND VIDEO RETRIEVAL 9

Content Based Music Retrieval - Symbolic Representation for Music information retrieval – Melody Segmentation – Melodic similarity – Music indexing – Query and Retrieval and content analysis - Content Based Video Retrieval - Video Segmentation into Shots – Video Segmentation into Shot Aggregates – Video Annotation – Accessing Video Content – Content based video indexing and retrieval techniques – Video scene analysis.

UNIT V RETRIEVAL METRICS 8

Average recall and average precision - Harmonic mean - Evaluation of a search engine – Relevance Issue – Kappa Measure – Quality versus Quantity, possible factors which influence outcome of a search – Grandfield Experimental Study.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of the course the student can able to

- Learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- Outline the structure of queries and media elements.
- Critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

REFERENCES:

1. Blanken, H.M., de Vries, A.P., Blok, H.E., Feng, L. "Multimedia Retrieval Data– Centric Systems and Applications", Springer, 2007.
2. Zhang, Y.J. "Semantic Based Visual Information Retrieval", IGI Global, 2006.
3. Tse, P.K.C. "Multimedia Information Storage and Retrieval Techniques and Technologies", IGI Global, 2008.
4. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schutze "Introduction to Information Retrieval", Cambridge University Press. 2008.
5. Bimbo, A., "visual Information Retrieval", Morgan Kaufmann, 1999.
6. Maybury, M., "Intelligent Multimedia Information Retrieval", MIT Press, 1997.
7. Subrahmanian, V. and Jajodia, S., "Multimedia Database Systems", Springer, 1996.
8. Smeulders, A. and Jain, R., "Image Database and Multimedia Search, World Scientific", 1997.

MM8008 PATTERN RECOGNITION L T P C

3 0 0 3

OBJECTIVES:

- To know about Supervised and unsupervised Learning.
- To study about feature extraction and structural pattern recognition.
- To explore different classification models.
- To understand Fuzzy Pattern Classifiers and Perception.

UNIT I PATTERN CLASSIFIER 9

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT II CLUSTERING 9

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

UINT III FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION 9

KL Transforms – Feature selection through functional approximation – Binary selection -Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation. .

UNIT IV HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE 9

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

UNIT V RECENT ADVANCES 9

Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Classify the data and identify the patterns.
- Extract feature set and select the features from given data set.

REFERENCES:

1. M. Narasimha Murthy and V. Susheela Devi, “Pattern Recognition”, Springer 2011.
2. S.Theodoridis and K.Koutroumbas, “Pattern Recognition”, 4th Ed., Academic Press, 2009.
3. Robert J.Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., New York, 1992.
4. C.M.Bishop,“Pattern Recognition and Machine Learning”, Springer, 2006.
5. R.O.Duda, P.E.Hart and D.G.Stork, “Pattern Classification”, John Wiley, 2001.
7. Andrew Webb, “Stastical Pattern Recognition”, Arnold publishers, London, 1999.

MM8009 VISUALIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the importance of data visualization.
- To know the different types of visualization techniques.
- To create various visualizations.

UNIT I INTRODUCTION 9

Introduction – Issues – Data Representation – Data Presentation – Common Mistakes in design.

UNIT II FOUNDATIONS FOR DATA VISUALIZATION 9

Visualization stages – Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing – Power of visual perception– Types of Data– Visualization and data objects.

UNIT III COMPUTER VISUALIZATION 9

Non– Computer Visualization – Computer Visualization Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Interacting with visualization.

UNIT IV MULTIDIMENSIONAL VISUALIZATION 9

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – Web Works – Data Mapping Document Visualization – Workspaces.

UNIT V CASE STUDIES 9

Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Compare various visualization techniques.
- Design creative visualizations.
- Apply visualization over different types of data.

REFERENCES:

1. Colin Ware, “Information Visualization Perception for Design” Morgon Kaufmann Publishers, 2nd edition, 2004.
2. Robert Spence “Information visualization – Design for interaction”, Pears Education, 2nd Edition, 2007.
3. Stephen Few, “Information Dashboard Design – The Effective Visual Communication of Data” O'Reilly, 1st Edition, 2006.
4. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, “Readings in Information Visualization Using Vision to think”, Morgan Kaufmann Publishers.

IF8071 ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

OBJECTIVES:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To enable Problem– solving through various searching techniques.
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To apply AI techniques primarily for machine learning, vision, and robotics.

UNIT I INTRODUCTION 9

Introduction to Artificial Intelligence – Intelligent Agents – Agents and environments – Good behavior – The nature of environments – Structure of agents – Problem Solving – Problem solving agents – Agent Architectures and Hierarchical Control – Agents – Agent Systems – Hierarchical Control – Embedded and Simulated Agents – Acting with Reasoning.

UNIT II SEARCHING TECHNIQUES 9

Searching for solutions – Uniformed Search Strategies – Avoiding repeated states – Searching with partial information – Informed Search and Exploration – Informed Search Strategies – Heuristic function – Local Search Algorithms and Optimistic Problems – Local Search in Continuous Spaces – Online Search Agents and Unknown Environments – Constraint Satisfaction Problems (CSP) – Backtracking Search and Local Search for CSPs – Structure of problems – Adversarial Search – Games – Optimal Decisions in Games – Alpha– Beta Pruning – Imperfect Real– Time Decisions – Games that Include an Element of Chance.

UNIT III KNOWLEDGE AND REASONING 9

Proposition Logic – First Order Predicate Logic – Unification – Forward Chaining – Backward Chaining – Resolution –Knowledge Representation – Ontological Engineering – Categories and Objects –Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information – Prolog Programming.

UNIT IV LEARNING 9

Probability basics – Bayes Rule and its Applications – Bayesian Networks – Exact and Approximate Inference in Bayesian Networks – Hidden Markov Models – Forms of Learning – Supervised Learning – Learning Decision Trees – Regression and Classification with Linear Models – Artificial Neural Networks – Nonparametric Models – Support Vector Machines – Statistical Learning – Learning with Complete Data – Learning with Hidden Variables– The EM Algorithm – Reinforcement Learning.

UNIT V AI PLANNING AND APPLICATIONS 9

AI Planning – Planning with State – Space Search – Partial Order Planning – Planning Graphs – Planning with Propositional Logic – Hierarchical Task Network Planning – Conditional Planning AI applications – Language Models – Information Retrieval – Information Extraction – Machine Translation – Machine Learning Symbol– Based – Machine Learning Connectionist – Machine Learning Social and Emergent Robots.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Gain knowledge in the goals and methods of Artificial Intelligence.
- Design intelligent computational agents.
- Gain knowledge through learning and that can be used both for problem solving and for reasoning.
- Improve problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming and machine learning.

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd edition, Pearson Education / Prentice Hall , 2010.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw– Hill, 2005.
3. Bratko, I., "Prolog Programming for Artificial Intelligence", Addison– Wesley Educational Publishers Inc; 4th edition, 2011.
4. David L. Poole, Alan K. Mackworth, "Artificial Intelligence Foundations of Computational Agents", Cambridge University Press, 2010.
5. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press; second edition, 2009.
6. Patrick H. Winston. "Artificial Intelligence", 3rd edition, Pearson Edition, 2006
7. Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI, 2006.
8. Nils J. Nilsson, "Artificial Intelligence A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
9. William F. Clocksin, and Christopher S. Mellish, "Programming in Prolog Using the ISO Standard", Fifth Edition, Springer, 2003.

IF8072 COMPILER DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To understand the optimization techniques used in compiler design.
- To be aware of the various computer architectures that support parallelism.
- To become familiar with the theoretical background needed for code optimisation.
- To understand the techniques used for identifying parallelism in a sequential program.
- To learn the various optimization algorithms.

UNIT I INTRODUCTION 9

Language Processors– The Structure of a Compiler – The Evolution of Programming Languages– The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics– The Lexical Analyzer Generator– Parser - Generator– Overview of Basic Blocks and Flow Graphs– Optimization of Basic Blocks– Principle Sources of Optimization.

UNIT II INSTRUCTION LEVEL PARALLELISM 9

Processor Architectures – Code – Scheduling Constraints – Basic Block Scheduling –Global Code Scheduling – Software Pipelining.

UNIT III OPTIMIZING FOR PARALLELISM AND LOCALITY – THEORY 9

Basic Concepts – Matrix Multiply An Example – Iteration Spaces – Affine Array Indexes – Data Reuse Array - Data dependence Analysis.

UNIT IV OPTIMIZING FOR PARALLELISM AND LOCALITY– APPLICATION 9

Finding Synchronization – Free Parallelism – Synchronization Between Parallel Loops – Pipelining – Locality Optimisations – Other Uses of Affine Transforms.

UNIT V INTERPROCEDURAL ANALYSIS 9

Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A Simple Pointer– Analysis Algorithm – Context Insensitive Interprocedural Analysis – Context Sensitive Pointer Analysis – Datalog Implementation by Binary Decision Diagrams.

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

- Design and implement techniques used for optimization by a compiler.
- Modify the existing data structures of an open source optimizing compiler.
- Design and implement new data structures and algorithms for code optimisation.
- Critically analyze different data structures and algorithms used in the building of an optimizing compiler.

REFERENCES:

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, "Compilers Principles, Techniques and Tools", Second Edition, Pearson Education, 2008.
2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures A Dependence–based Approach", Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.

IF8073 COMPUTER VISION L T P C
3 0 0 3

OBJECTIVES:

- To provide knowledge about computer vision algorithms.
- To understand the basic concepts of camera calibration, stereoscopic imaging and higher level image processing operations.
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like OpenCV.
- To appreciate the use of compute vision in Industrial applications and to understand the role of computer vision.
- To understand and implement more advanced topics in current research literature.

UNIT I FUNDAMENTALS OF VISION 9

Image formation – Camera models – Light and color – Linear filters and edges – Geometric vision – Camera calibration – Epipolar geometry – Measuring light – sources – shadows and shading.

UNIT II GEOMETRIC VISION 9

Linear filters – Multiple Views Geometry – Stereopsis – Two View and Multi View Stereo Structure from Motion – Recognition – Bags of Features – Affine Structure from Motion.

UNIT III VISION ALGORITHMS 9

Segmentation – Edge detection – Optical flow and Tracking – Feature extraction (corners and blobs) – Grouping and fitting – Hough transform – RANSAC and Alignment.

UNIT IV GEOMETRIC METHODS 9

Model Based Vision – Smooth Surfaces and their Outlines – Aspect Graphs and Range Data**.**

UNIT V HIGH LEVEL VISION 9

Classifiers – Finding templates – Geometric templates from spatial relations – Applications.

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic computer vision algorithms.
- Familiarize with the use of MATLAB and OpenCV environment.
- Design and implement industrial applications that incorporate different concepts of medical Image Processing.
- Critically analyze different approaches to implement mini projects in industrial environment.

REFERENCES

1. E.R.Davies,"Computer and Machine Vision",Elserier,4th edition, 2012
2. Computer Vision Algorithms and Applications Richard Szeliski, Springer International, 2011.
3. David Forsyth and Jean Ponce, "Computer Vision a Modern Approach", Prentice Hall, 2009.
4. Oliver Faugeras, "Three Dimensional Computer Vision– a geometric viewpoint", The MIT Press, 1993.
5. Richard Hartley and Andrew Zisserman, " Multiple View Geometry in Computer Vision", Cambridge, 2001.

IF8074 DATA WAREHOUSING AND DATA MINING L T P C
3 0 0 3

OBJECTIVES:

- To understand Data mining principles and techniques and introduce Data Mining as a cutting edge business intelligence.
- To expose the students to the concepts of Data Warehousing Architecture and Implementation.
- To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining.
- To identify Business applications and Trends of Data mining.

UNIT I DATA WAREHOUSE 8

Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

UNIT II DATA MINING & DATA PREPROCESSING 9

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING 8

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

UNIT IV CLASSIFICATION & PREDICTION 10

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V CLUSTERING 10

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

TOTAL : 45 PERIODS

REFERENCES:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008.
2. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007.

OUTCOMES:

Upon Completion of the course, the students will be able to,

- Evolve Multidimensional Intelligent model from typical system.
- Discover the knowledge imbibed in the high dimensional system.
- Evaluate various mining techniques on complex data objects.

IF8075 DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of signals and systems.
- To analyze various frequency transforms and to determine their use to DSP.
- To design and analyze various digital filters.
- To give exposure on musical sound processing and image processing.

UNIT I SIGNALS AND SYSTEMS 9

Basic elements of DSP – Concepts of Frequency in Analog and Digital Signals – Sampling Theorem – Discrete Time Signals - Systems – Analysis of Discrete Time LTI Systems – Z Transform – Convolution (Linear And Circular) – Correlation.

UNIT II DISCRETE FOURIER TRANSFORMS 9

Introduction to DFT – Properties of DFT – Filtering methods based on DFT – FFT Algorithms – Decimation in Time Algorithms - Decimation in Frequency Algorithms – Use of FFT in Linear Filtering.

UNIT III IIR FILTER DESIGN 9

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance – Bilinear transformation – Approximation of derivatives – (HPF, BPF, BRF) Filter design using frequency translation.

UNIT IV FIR FILTER DESIGN 9

Structures of FIR – Linear phase FIR filter – Filter design using windowing techniques - Frequency sampling techniques – Finite word length effects in digital Filters.

UNIT V SIGNAL PROCESSING 9

Multirate signal processing – Adaptive filter – Compression – Musical sound processing – Image enhancement.

TOTAL :45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

- Understand the basics of signals and systems.
- Analyze various frequency transforms and to determine their use to DSP.
- Design and analyze various digital filters.
- Gain exposure on signal processing like musical sound processing and image processing.

REFERENCES:

1. John G. Proakis and Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Fourth edition, Pearson education / Prentice Hall, 2007.
2. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second edition, Pearson Education / Prentice Hall, 2002.
3. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata McGraw Hill, fourth Edition, 2010.

IF8076 EMBEDDED COMPUTING SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To understand the architecture of embedded processor, microcontroller and peripheral devices.
- To interface memory and peripherals with embedded systems.
- To study the embedded network environment.
- To understand challenges in Real time operating systems.
- To study, analyze and design applications on embedded systems.

UNIT I EMBEDDED PROCESSORS 9

Embedded Computers – Characteristics of Embedded Computing Applications –Challenges in Embedded Computing system design – Embedded system design process – Formalism for System Design – Structural Description – Behavioural Description – ARM processor – Intel ATOM Processor.

UNIT II EMBEDDED COMPUTING PLATFORM 9

CPU Bus configuration – Memory devices and interfacing – Input/output devices and interfacing – System Design – Development and Debugging – Emulator – Simulator –JTAG Design Example Alarm Clock - Analysis and Optimization of performance, Power and Program size.

UNIT III EMBEDDED NETWORK ENIVIRONMENT 9

Distributed Embedded Architecture – Hardware and Software Architectures – Networks for embedded systems – I2C – CAN Bus – SHARC link supports – Ethernet – Myrinet – Internet – Network Based design – Communication Analysis – System Performance Analysis – Hardware Platform Design – Allocation and Scheduling – Design Example Elevator Controller.

UNIT IV REAL TIME CHARACTERISTICS 9

Clock driven Approach – Weighted Round Robin Approach – Priority driven Approach – Dynamic Versus Static systems – Effective release times and Deadlines – Optimality of the Earliest deadline first (EDF) algorithm – Challenges in validating timing constraints in Priority Driven Systems – Off line Versus On line Scheduling.

UNIT V SYSTEM DESIGN TECHNIQUES 9

Design Methodologies – Requirement Analysis – Specification – System Analysis and Architecture Design – Quality Assurance – Design Examples - Telephone PBX – Ink jet printer – Personal Digital Assistants – Set top Boxes.

TOTAL 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

- Understanding of different architectures of embedded processor, microcontroller and peripheral devices.
- Interfacing memory and peripherals with embedded systems.
- Be familiar with embedded network environment.
- Understanding challenges in Real time operating systems.
- Design and analyze applications on embedded systems.

REFERENCES:

1. Wayne Wolf, “Computers as Components Principles of Embedded Computing System Design”, Morgan Kaufman Publishers, 2012.
2. Jane.W.S. Liu, “Real– Time systems”, Pearson Education Asia, 2004.
3. C. M. Krishna and K. G. Shin, “Real Time Systems”, McGraw Hill, 1997.
4. Frank Vahid and Tony Givargis, “Embedded System Design A Unified Hardware/Software Introduction”, John Wiley and Sons, 2002 .
5. Andrew N Sloss, D. Symes, C. Wright, ”Arm system developers guide”, Morgan Kauffman/ Elsevier, 2006.

IF8077 HUMAN COMPUTER INTERACTION L T P C
3 0 0 3

OBJECTIVES:

To learn the principles and fundamentals of human computer interaction (HCI)

- To analyze HCI theories, as they relate to collaborative or social software.
- To Establish target users, functional requirements, and interface requirements for a given computer application.
- To understand user interface design principles, and apply them to designing an interface.
- To learn user interface designs through usability inspection and user models
- To know the applications of multimedia on HCI.

UNIT I DESIGN PROCESS 9

Human Information process – Computer Information Process – Differences and Similarities between them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive systems – Usability – Paradigm shift – Interaction design basics – Design Process – Scenarios – Users need –Complexity of design.

UNIT II DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS 9

Software Process – Usability engineering – Issue based Information systems – Iterative design practices – Design rules – Maximum usability – Principles, Standards and guidelines – Design Patterns – Programming Tools – Windowing systems – Interaction tool kit – User Interface management system – Evaluation techniques – Evaluation design – Evaluating implementations – Observational Methods.

UNIT III MODELS 9

Universal design principles – Multimodal systems – User Support – Presentation and Implementation Issues – Types – Requirements – Approaches – Cognitive model – Hierarchical model – Linguistic model – Physical and device models – Sociotechnical models – Communication and Collaboration models – Task models – Task analysis and design.

UNIT IV EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI 9

Basic Design structure – Single independent variable – Multiple independent variable – Factorial design – Split plot design – Random errors – Experimental procedure – Statistical analysis – T tests – Analysis of Variance test – Regression – Chi Square test – Survey – Probabilistic sampling – Non probabilistic sampling – Developing survey questions.

UNIT V THEORIES 9

Dialogue notations and design – Dialogue need – Dialogue design notations – Graphical – Textual – representing dialogue – Formal descriptions – Dialogue analysis – System models – Interaction models – Relationship with dialogue – Formalisms – Formal notations – Interstitial behavior – Virtual reality – Modeling rich interaction – Status Event analysis – Properties – Rich contexts – Sensor based systems – Groupware – Applications – Ubiquitous computing – Virtual reality.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Interpret the contributions of human factors and technical constraints on human– computer interaction.
- Evaluate the role of current HCI theories in the design of software.
- Apply HCI techniques and methods to the design of software.
- Categorize and carefully differentiate various aspects of multimedia interfaces.
- Design and develop issues related to HCI for real application.

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser,”Research Methods in Human Computer Interaction,” Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant, “Designing the User Interface: strategies for Effective Human Computer Interaction”, Addison– Wesley, 5th Edition, 2009.

IF8079 INFORMATION RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of Information Retrieval with pertinence to modeling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search.
- To understand the concepts of digital libraries.

UNIT I INTRODUCTION 9

Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.

UNIT II PREPROCESSING 9

Basic Tokenizing - Indexing and Implementation of Vector Space Retrieval - Simple tokenizing – stop word removal and stemming – Inverted Indices –Efficient processing with sparse vectors – Query Operations and Languages - Relevance feedback – Query expansion – Query languages.

UNIT III METRICS 9

Experimental Evaluation of IR Performance metrics Recall, Precision and F measure – Evaluations on benchmark text collections - Text Representation - Word statistics – Zipf's law – Porter stemmer - Morphology – Index term Selection using thesauri -Metadata and markup languages- Web Search engines – spidering – metacrawlers – Directed spidering – Link analysis shopping agents.

UNIT IV CATEGORIZATION AND CLUSTERING 9

Text Categorization and Clustering - Categorization algorithms - Naive Bayes – Decision trees and nearest neighbor- Clustering algorithms - Agglomerative clustering – k Means – Expectation Maximization (EM) - Applications to information filtering – Organization and relevance feedback.

UNIT V EXTRACTION AND INTEGRATION 9

Recommender Systems - Collaborative filtering - Content based recommendation of documents and products - Information Extraction and Integration - Extracting data from text – XML – semantic web – Collecting and integrating specialized information on the web.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Analyze the Web content structure.
- Design an efficient search engine.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze," Introduction to Information Retrieval" , Cambridge University Press, 2008.
2. Ricci, F. Rokach, L. Shapira, B. Kantor, P.B. "Recommender Systems Handbook" 1st Edition, 2011.
3. Brusilovsky, Peter, "The Adaptive Web Methods and Strategies of Web Personalization", Springer, 2007.

IF8080 SERVICE ORIENTED ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To understand various architectures for application development.
- To learn the importance of SOA in Application Integration.
- To learn web service and SOA related tools.

UNIT I SOA BASICS 9

Software Architecture – Types of IT Architecture – SOA Evolution – Key components – perspective of SOA – Enterprise wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.

UNIT II SOA ANALYSIS AND DESIGN 9

Service oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML - WS for .NET – Service integration with ESB – Scenario – Business case for SOA – Stakeholder Objectives – Benefits of SPA – Cost Savings.

UNIT III SOA GOVERNANCE 9

SOA implementation and Governance – Strategy – SOA development – SOA governance – Trends in SOA – Event driven architecture – Software s a service – SOA technologies – Proof–of– concept – Process orchestration – SOA best practices.

UNIT IV SOA IMPLEMENTATION 9

SOA based integration – Integrating existing application – Development of web services – Integration – SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding.

UNIT V APPLICATION INTEGRATION 9

JAX –WS 2.0 client side/server side development – Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA– Related software – Integration through service composition (BPEL) – case study – current trends.

OUTCOMES:

Upon Completion of the course, the students will be able to

- Compare different IT architecture.
- Analyse and design SOA based applications.
- Implement web service and realization of SOA.
- Implement RESTful services.
- Design and implement SOA based Application Integration using BPEL.

REFERENCES:

1. Shankar Kambhampaly, "Service –Oriented Architecture for Enterprise Applications", Wiley 2008.
2. Mark D. Hansen, "SOA using Java Web Services", Practice Hall, 2007.
3. Waseem Roshen, "SOA– Based Enterprise Integration", Tata McGraw– HILL, 2009.

IF8081 **SOFT COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the key aspects of soft computing and neural networks.
- To study fuzzy logic components.
- To gain insight onto Neuro Fuzzy modeling and control.
- To know about the components and building block hypothesis of Genetic algorithm.
- To gain knowledge in machine learning through Support vector machines.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Machine Learning Basics.

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA – Building block hypothesis – Representation – Fitness measures – Genetic operators – GA based machine learning.

UNIT III NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions– Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V NEURO FUZZY MODELING 9

Adaptive Neuro Fuzzy Inference Systems – Coactive Neuro Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro Fuzzy Control – Case studies.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Discuss on machine learning through Neural networks.
- Develop a Fuzzy expert system.
- Model Neuro Fuzzy system for clustering and classification.
- Develop Genetic Algorithm and Support vector machine based machine learning system.

REFERENCES:

1. Jyh– Shing Roger Jang, Chuen– Tsai Sun, Eiji Mizutani, “Neuro Fuzzy and Soft Computing”, Prentice Hall of India, 2003.
2. Kwang H.Lee, “First course on Fuzzy theory and applications”, Springer Verlag Berlin Heidelberg, 2005.
3. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic– Theory and Applications”, Prentice Hall, 1995.
4. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Education, 2003.
5. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 2007.
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7. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.

IF8082 SOFTWARE QUALITY AND TESTING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basics and necessity of Software testing.
- To introduce various testing techniques along with software production.
- To introduce the concepts of Software quality and its assurance.

UNIT I INTRODUCTION 9

Basics of Software Testing – Testing Principles – Goals – Testing Life Cycle– Phases of Testing– Test Plan(IEEE format) – Importance of testing in software production cycle.

UNIT II SOFTWARE TESTING METHODOLOGY 9

Software Test Plan– Components of plan – Types of technical reviews– Static and dynamic testing– software testing in spiral manner– Information gathering– Test planning– Test case design– Test development– Test coverage– Test evaluation– Prepare for next spiral– Conduct system test, Acceptance test– Summarize testing results.

UNIT III EMERGING SPECIALIZED AREAS IN TESTING 9

Test process assessment – Test automation assessment – Test automation framework – Nonfunctional testing – SOA testing – Agile testing – Testing center of excellence – Onsite/offshore model– Modern software testing tools.

UNIT IV SOFTWARE QUALITY IN PERSPECTIVE 9

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT V QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS 9

Role of Statistical methods in software quality – Transforming requirements into test cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA).

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course the students can able to

- Apply various software testing methodologies on applications.
- Design quality software products.

REFERENCES:

1. William E.Lewis, "Software Testing and Continuous Quality Improvement", 3rd edition, Auerbach Publications, 2011.
2. Kshirasagar Naik, Priyadarshi Tripathy, "Software Testing and Quality Assurance – Theory and Practice", John Wiley & Sons publication, 2011.
3. Ron Patton, "Software testing", second edition, Pearson education, 2007.
4. Elfriede Dustin, Jeff Rashka, John Paul, "Automated Software Testing Introduction, Management, and Performance", Addison– Wesley,1999.

IF8084 ADHOC AND SENSOR NETWORKS L T P C
3 0 0 3

OBJECTIVES:

To understand the basics of Adhoc and Sensor Networks

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

UNIT I ADHOC NETWORKS FUNDAMENTALS & MAC PROTOCOLS 9

Fundamentals of WLANs – IEEE 802.11 Architecture – Self configuration and Auto configuration– Issues in Ad Hoc Wireless Networks – MAC Protocols for Ad Hoc Wireless Networks – Contention Based Protocols – TCP over Ad Hoc networks – TCP protocol overview – TCP and MANETs – Solutions for TCP over Ad Hoc Networks.

UNIT II ADHOC NETWORK ROUTING AND MANAGEMENT 9

Routing in Ad Hoc Networks – Introduction – Topology based versus Position based Approaches – Proactive, Reactive, Hybrid Routing Approach– Principles and issues – Location services – DREAM – Quorums based location service – Grid – Forwarding strategies – Greedy packet forwarding – Restricted directional flooding– Hierarchical Routing– Other routing protocols.

UNIT III SENSOR NETWORK FUNDAMENTALS & COMMUNICATION PROTOCOLS 9

Introduction – Architecture – Single node architecture – Sensor network design considerations – Energy Efficient Design principles for WSNs – Protocols for WSN – Physical Layer - Transceiver Design considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control issues – Routing Protocols – Mobile Nodes and Mobile Robots – Data Centric & Contention Based Networking – Transport Protocols & QOS – Congestion Control issues – Application Layer support.

UNIT IV SENSOR NETWORK MANAGEMENT & PROGRAMMING 9

Sensor Management – Topology Control Protocols and Sensing Mode Selection Protocols – Time synchronization – Localization and positioning – Operating systems and Sensor Network programming – Sensor Network Simulators.

UNIT V ADHOC AND SENSOR NETWORK SECURITY 9

Security in Ad Hoc and Sensor networks – Key Distribution and Management – Software based Anti tamper techniques – Water Marking Techniques – Defense against Routing Attacks – Secure Ad hoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Gain knowledge about Adhoc and sensor networks, protocols and standards.
- Establish a Sensor network environment for different type of applications.
- Provide different types of security environments depending upon the application requirements.

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
2. Holger Karl, Andreas willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons, Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
4. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
5. Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009.
6. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010.
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication In Wired and Wireless Networks", Springer, 2006.

IF8251 ADVANCED OPERATING SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of Operating system.
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.
- To know the components and management aspects of Real time, Mobile operating systems.

UNIT I OPERATING SYSTEM BASICS 9

Overview – Synchronization Mechanisms – Process and threads – Process scheduling – Deadlocks Detection – Prevention– Recovery – Models of Resources – Memory Management.

UNIT II DISTRIBUTED OPERATING SYSTEM 9

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File System – Design Issues – Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory – Issues in load Distributing – scheduling Algorithms – Synchronous and Asynchronous Check pointing and Recovery – Fault Tolerance – Two Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic model of Real time systems – Characteristics – Applications of Real time systems – Real time task scheduling – Handling Resource sharing – Mobile Operating Systems – Micro kernel design - Client Server Resource access – Processes and threads - Memory management – File system.

UNIT V CASE STUDIES 9

Linux system Design principles – Kernel modules - Process management – Scheduling - Memory Management – Input Output Management – File System – Inter process Communication - Windows XP Design Principles – System Components – Process and Thread Management – Memory Management – File System - Iphone Ios4 Architecture and SDK Framework – Media Layer – Services Layer – Core OS Layer – File System.

TOTAL :45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

- Gain an overview of process management and memory management of Operating system.
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system.
- Gain knowledge regarding distributed resource management.
- Outline the Real time, Mobile operating systems.

REFERENCES:

1. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw– Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley, 2004.
3. Andrew S.Tanenbaum, "Modern Operating System", Third Edition, Prentice Hall Inc., 2008.
4. Rajib Mall, "Real– Time Systems Theory and Practice", Pearson Education,2006.
5. H M Deital, P J Deital and D R Choffnes, "Operating Systems", Pearson Education, 2004.
6. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", 4 Edition, Payload media, 2011.

IF8252 CLOUD COMPUTING TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To understand the concept of cloud and utility computing.
- To understand the various issues in cloud computing.
- To familiarize themselves with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To be able to set up a private cloud.

UNIT I INTRODUCTION 8

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing REFERENCE: Architecture – IaaS – On demand provisioning – Elasticity in cloud – Examples of IaaS providers – PaaS – Examples of PaaS providers – SaaS – Examples of SaaS providers – Public, Private and Hybrid clouds.

UNIT II VIRTUALIZATION 9

Basics of virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU, Memory, I/O Devices – Desktop virtualization – Server Virtualization.

UNIT III CLOUD INFRASTRUCTURE 9

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

UNIT IV PROGRAMMING MODEL 10

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

UNIT V SECURITY IN THE CLOUD 9

Security Overview – Cloud Security Challenges – Software as a Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

TOTAL:45 PERIODS

OUTCOMES:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome “Cloud Computing Implementation Management and Security” CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing A Practical Approach”, Tata McGraw Hill, 2009.
4. James E. Smith, Ravi Nair, “Virtual Machines Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
5. Katarina Stanoevska Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”, Springer, 2010.

IF8254 MOBILE AND PERVASIVE COMPUTING L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of Mobile computing and Personal Computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To study about the underlying wireless networks.
- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms.

UNIT I INTRODUCTION 9

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New applications – Making legacy applications mobile enabled – Design considerations – Integration of Wireless and Wired Networks – Standards bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive devices.

UNIT II 3G AND 4G CELLULAR NETWORKS 9

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP.

UNIT III SENSOR AND MESH NETWORKS 9

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor data bases – Data Management in Wireless Mobile environments – Wireless Mesh Networks – Architecture – Mesh routers – Mesh clients – Routing – Cross Layer Approach – Security aspects of various layers in WMN – Applications of Sensor and Mesh networks.

UNIT IV CONTEXT AWARE COMPUTING 9

Adaptability – Mechanisms for Adaptation – Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of context – Role of Mobile middleware – Adaptation and agents – Service Discovery middleware.

UNIT V APPLICATION DEVELOPMENT 9

Three tier architecture – Model View Controller Architecture – Memory Management – Information Access Devices – PDAs and Smart Phones – Smart cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development on Android and iPhone.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course the student should be able to

- To deploy 3G networks.
- To develop suitable algorithms for 4G networks.
- To use sensor and mesh networks to develop mobile computing environment.
- To develop mobile computing applications based on the paradigm of context aware computing.

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing Technology, Applications and Service Creation”, 2nd ed, Tata McGraw Hill, 2010.
2. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley,2010.
3. Pei Zheng and Lionel M Li, ‘Smart Phone & Next Generation Mobile Computing’, Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein et al, ‘Fundamentals of Mobile and Pervasive Computing’, TMH, 2005.

5. Jochen Burthardt et al, 'Pervasive Computing Technology and Architecture of Mobile Internet Applications', Pearson Education, 2003.
6. Feng Zhao and Leonidas Guibas, 'Wireless Sensor Networks', Morgan Kaufmann Publishers, 2004.
7. Uwe Hansmaan et al, 'Principles of Mobile Computing', Springer, 2003.
8. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley,2010.
9. Stefan Poslad, "Ubiquitous Computing Smart Devices, Environments and Interactions", Wiley, 2009.

MM8071 DIGITAL VIDEO PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To provide an introduction to the fundamental principles and techniques in multimedia signal processing.
- To provide an overview of the current multimedia standards and technologies.
- To provide details about representation and computing algorithms of multimedia.
- To review latest trends and future technologies.

UNIT I FUNDAMENTALS OF VIDEO PROCESSING 9

Video Formation, Perception and Representation - Video Capture and Display – Principles of Color Video - Video Cameras – Video Display and Composite versus Component Models and Gamma Correction – Analog Video Raster – Progressive vs Interlaced scans – Characterization of Video Raster – Spatial and Temporal resolution – Signal Bandwidth.

UNIT II DIGITAL VIDEO 9

Multiplexing of Luminance – Chrominance and Audio – Digital Video – Notation – ITU– R.BT.601 Digital Video Format and Other Digital Video Formats and Applications - Digital Video Quality - Video Sampling – Basics of the Lattice Theory – Sampling of Video Signals over Lattices – Filtering Operations in Cameras and Display Devices – Camera Apertures – Display apertures.

UNIT III VIDEO SEGMENTATION AND VIDEO FEATURE ANALYSIS 9

Video Modeling – Camera Models – Pinhole Model – Object Model – Shape Model, Motion Model – Scene Model - Two Dimensional Motion Models – Definition and Notation - Two Dimensional Motion Models Corresponding to Typical Camera Motions – Two Dimensional Motion Corresponding to Three Dimensional Rigid Motion and Approximation of Projective Mapping.

UNIT IV MOTION ESTIMATION 9

Two Dimensional Motion Estimation – Optical Flow – Two Dimensional Motion versus Optical Flow - Optical Flow Equation and Ambiguity in Motion Estimation - General Methodologies – Motion Representation - Motion Estimation Criteria – Optimization Methods - Pixel Based Motion Estimation - Regularization Using the Motion Smoothness Constraints – Block Matching Algorithm – Exhaustive Block Matching Algorithm – Phase Correlation Method and ultiresolution Motion Estimation – General Formulation and Hierarchical Block Matching Algorithm.

UNIT V DIGITAL VIDEO ANALYSIS AND CASE STUDIES 9

Digital video analysis – Basic Algorithms – Object Tracking and analysis – Video classification and Recognition– Video Understanding – Case Studies in Object tracking.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic algorithms related to digital video.
- Familiarize with the MATLAB and its equivalent open source tools for processing video.
- Design and implement some basic video related applications in domains like biometrics, object traction and in Industrial environment.
- Critically analyze the role of video in modern technologies.

REFERENCES:

1. A. Murat Tekalp ,"Digital Video Processing", Pearson, 2010.
2. Alan Bovik C “The Essential Guide to Video Processing”, Academic Press Inc, 2009.
3. David Bull et al ,"Video Coding for Mobile Communications", Academic Press 2008.
4. Oge Marques ‘Practical Image and Video processing using Matlab”, IEEE Press, 2011.