

**ANNA UNIVERSITY, CHENNAI**  
**UNIVERSITY DEPARTMENTS**  
**M.E. MULTIMEDIA TECHNOLOGY**  
**REGULATIONS – 2015**  
**CHOICE BASED CREDIT SYSTEM**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :**

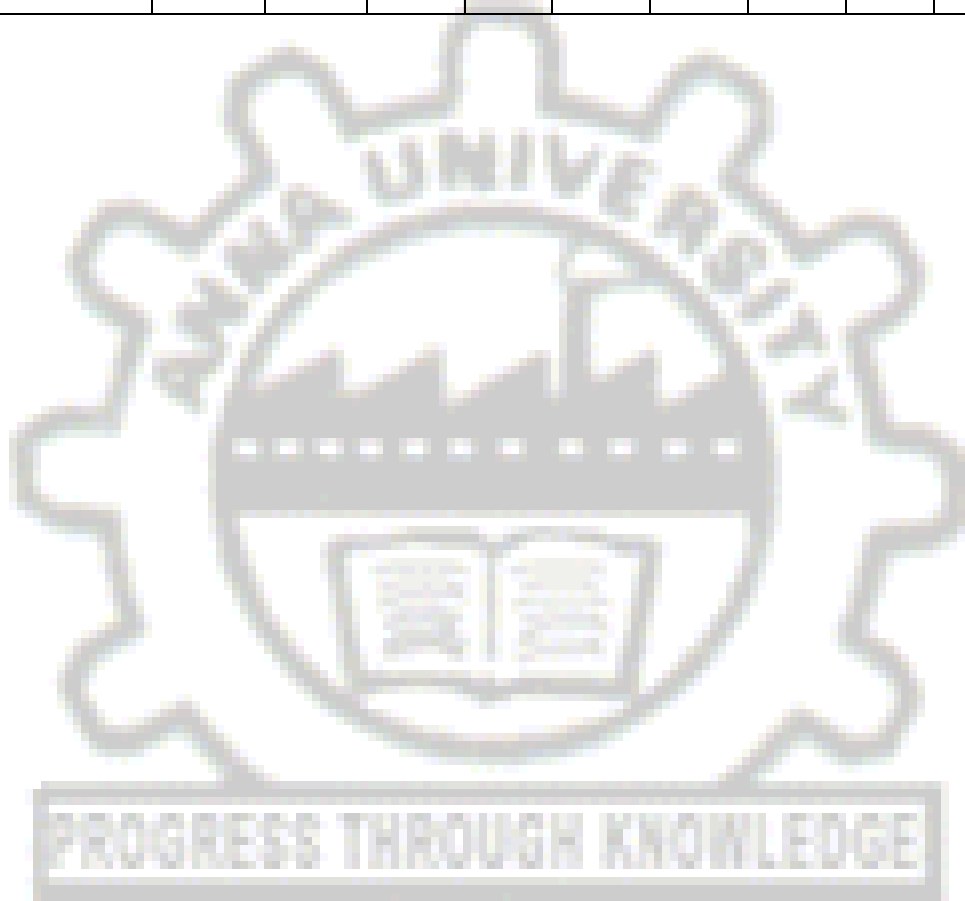
- I. To prepare students to excel in research or to succeed in Information Technology Profession by adapting to the rapid advances in new emerging technologies through rigorous post graduate education.
- II. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve real world problems of Industries, Businesses and society.
- III. To train students with good scientific and engineering knowledge so as to comprehend, analyze, design, and create novel products and novel IT services.
- IV. To inculcate students in solving real time problems through IT knowledge and with attention to team work, effective communication skills, and critical thinking.
- V. To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, learning and teamwork for a successful professional career

**PROGRAMME OUTCOMES (POs):**

**On successful completion of the programme,**

1. Graduates will demonstrate creative thinking and abilities needed for multimedia education.
2. Graduates will knowledge of mathematics, science and engineering.
3. Graduates will demonstrate an ability to identify, formulate and exhibit problem solving skills.
4. Graduates will demonstrate creative abilities to make applications exhibit more user friendliness by incorporating multimedia capabilities.
5. Graduate will demonstrate an ability to do research by designing and conducting experiments, analyze and interpret multimedia data individually as well as part of multi-disciplinary teams.
6. Graduates will demonstrate an ability to design a system, component or process as per needs and specifications of the customers and society needs.
7. Graduates will demonstrate an ability to prepare short films and documentaries to showcase their knowledge of multimedia tools.
8. Graduate will demonstrate skills to use multimedia tools and to create creative web sites for IT services.
9. Graduates will demonstrate knowledge of professional, ethical, legal, security and social issues and responsibilities.
10. Graduate will be able to communicate effectively in both verbal and written form.

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
I	✓	✓	✓	✓	✓	✓				
II	✓	✓	✓	✓	✓	✓				
III			✓	✓	✓	✓				
IV							✓	✓	✓	✓
V		✓	✓		✓	✓	✓		✓	



			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
YEAR 1	SEM 1	Probability and Statistical Methods		✓	✓		✓					
		Advances in Data Structures and Algorithms		✓	✓	✓	✓	✓				
		Advanced Computer Graphics and Animation	✓			✓		✓	✓	✓		
		Advanced Databases		✓	✓		✓					
		Multimedia Communication Networks	✓	✓	✓			✓				
		Digital Image Processing and Pattern Recognition	✓	✓	✓	✓	✓					
		Computer Graphics and Animation Laboratory	✓							✓	✓	
	SEM 2	3D Game Modeling and Rendering	✓	✓	✓	✓			✓			✓
		Web Design and Programming	✓	✓		✓			✓		✓	✓
		Software Engineering and Project Management	✓						✓			
		Speech and Audio Processing	✓	✓	✓	✓			✓			
		Video Processing and Analytics	✓	✓	✓	✓			✓			
		Elective I										
Web Programming and Design Lab			✓		✓	✓		✓				
YEAR 2	SEM 1	Multimedia Compression Techniques	✓	✓				✓				
		Elective II										
		Elective III										
		Elective IV										
		Project Work Phase I		✓		✓		✓	✓	✓		✓
	Technical Seminar and Report Writing										✓	✓
	SEM 2	Project Work Phase II		✓		✓			✓		✓	✓

PROGRESS THROUGH KNOWLEDGE

**UNIVERSITY DEPARTMENTS**  
**ANNA UNIVERSITY: CHENNAI- 600 025**  
**REGULATIONS – 2015**  
**M.E.MULTIMEDIA TECHNOLOGY**  
**I TO IV SEMESTERS OF CURRICULA AND SYLLABI**

**SEMESTER I**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA7159	Probability and Statistical Methods	FC	4	4	0	0	4
2.	IF7151	Advances in Data structures and Algorithms	PC	3	3	0	0	3
3.	MM7151	Advance Computer Graphics and Animation	PC	3	3	0	0	3
4.	MM7101	Advanced Databases	PC	3	3	0	0	3
5.	MM7102	Multimedia Communication Networks	PC	3	3	0	0	3
6.	MM7152	Digital Image Processing and Pattern Recognition	PC	3	3	0	0	3
<b>PRACTICALS</b>								
7.	MM7111	Computer Graphics and Animation Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>23</b>	<b>19</b>	<b>0</b>	<b>4</b>	<b>21</b>

**SEMESTER II**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MM7201	3D Game Modeling and Rendering	PC	3	3	0	0	3
2.	MM7204	Web Design and Programming	PC	3	3	0	0	3
3.	MM7202	Software Engineering and Project Management	PC	3	3	0	0	3
4.	MM7203	Speech and Audio Processing	PC	3	3	0	0	3
5.	MM7252	Video Processing and Analytics	PC	3	3	0	0	3
6.		Elective I	PE	3	3	0	0	3
<b>PRACTICALS</b>								
7.	MM7211	Web Programming and Design Lab	PC	4	0	0	4	2
<b>TOTAL</b>				<b>22</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>20</b>

**SEMESTER III**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MM7351	Multimedia Compression Techniques	PC	3	3	0	0	3
2.		Elective II	PE	3	3	0	0	3
3.		Elective III	PE	3	3	0	0	3
4.		Elective IV	PE	3	3	0	0	3
<b>PRACTICALS</b>								
5.	MM7311	Technical Seminar and Report writing	EEC	0	0	0	2	1
6.	MM7312	Project Work Phase I	EEC	12	0	0	12	6
<b>TOTAL</b>				<b>12</b>	<b>12</b>	<b>0</b>	<b>14</b>	<b>19</b>

**SEMESTER IV**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>PRACTICALS</b>								
1.	MM7411	Project Work Phase II	EEC	24	0	0	24	12
<b>TOTAL</b>				<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL NO. OF CREDITS:72**


PROGRESS THROUGH KNOWLEDGE

### FOUNDATION COURSES (FC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Probability and Statistical Methods	FC	4	4	0	0	4

### PROFESSIONAL CORE (PC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
2.		Advances in Data structures and Algorithms	PC	3	3	0	0	3
3.		Advance Computer Graphics and Animation	PC	3	3	0	0	3
4.		Advanced Databases	PC	3	3	0	0	3
5.		Multimedia Communication Networks	PC	3	3	0	0	3
6.		Digital Image Processing and Pattern Recognition	PC	3	3	0	0	3
7.		3D Game Modeling and Rendering	PC	3	3	0	0	3
8.		Web Design and Programming	PC	3	3	0	0	3
9.		Software Engineering and Project Management	PC	3	3	0	0	3
10.		Speech and Audio Processing	PC	3	3	0	0	3
11.		Video Processing and Analytics	PC	3	3	0	0	3
12.		Multimedia Compression Techniques	PC	3	3	0	0	3
13.		Computer Graphics and Animation Laboratory	PC	3	0	0	3	2
14.		Web Programming and Design Lab	PC	3	0	0	0	2

### PROFESSIONAL ELECTIVES (PE)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
15.	MM7003	Cloud Computing	PE	3	3	0	0	3
16.	MM7005	Media Security	PE	3	3	0	0	3
17.	MM7002	Biometrics	PE	3	3	0	0	3
18.	MM7004	Data Mining and Warehousing	PE	3	3	0	0	3
19.	MM7006	Multimedia Information Storage and Retrieval	PE	3	3	0	0	3
20.	MM7072	Visualisation Techniques	PE	3	3	0	0	3
21.	IF7072	Computer Vision	PE	3	3	0	0	3
22.	IF7022	Wireless and Sensor Networks	PE	3	3	0	0	3
23.	IF7021	Mobile and Pervasive Computing	PE	3	3	0	0	3

*Attested*

*Sobhan*  
**DIRECTOR**

24.	IF7074	Human Computer Interaction	PE	3	3	0	0	3
25.	MM7251	Medical Image Processing	PE	3	3	0	0	3
26.	IF7073	GPU Architecture and Programming	PE	3	3	0	0	3
27.	MM7001	Big Data Analysis	PE	3	3	0	0	3
28.	MM7008	Sound Engineering	PE	3	3	0	0	3
29.	IF7075	Mobile Application Development	PE	3	3	0	0	3
30.	MM7010	Web Development	PE	3	3	0	0	3
31.	MM7007	Software Development for Short film Development	PE	3	3	0	0	3
32.	MM7009	Virtual Reality	PE	3	3	0	0	3
33.	MM7071	Digital Video Processing	PE	3	3	0	0	3

### EMPLOYABILITY ENCHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Technical Seminar and Report writing	EEC	2	0	0	2	1
2.		Project Work (Phase I)	EEC	12	0	0	12	6
3.		Project Work (Phase II)	EEC	24	0	0	24	12

PROGRESS THROUGH KNOWLEDGE

**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.
- Outcomes:
- The course aims at providing the basic concepts of Probability and Statistical techniques for solving mathematical problems which will be useful in solving Engineering problems.

**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:**

- The course provides the basic concepts of Probability and Statistical techniques for solving mathematical problems which is useful in solving Engineering problems.

**REFERENCES:**

1. Jay L. Devore, "PROBABILITY AND STATISTICS FOR ENGINEERING AND THE SCIENCES", Thomson and Duxbury, Singapore, 2002.
2. Richard Johnson. "MILLER & FREUND'S PROBABILITY AND STATISTICS FOR ENGINEER", Prentice – Hall of India, Private Ltd., New Delhi, 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, New Delhi, 2001.
5. Dallas E Johnson et al., "APPLIED MULTIVARIATE METHODS FOR DATA ANALYSIS", Thomson and Duxbury press, Singapore, 1998.



**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 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- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

**UNIT III      GRAPHS****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.

**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 Reducibility – NP-Completeness Proofs – NP-Complete Problems.

**TOTAL: 45 PERIODS****OUTCOMES:**

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

- Design data structures and algorithms to solve computing problems.
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
- Apply suitable design strategy for problem solving

**REFERENCES:**

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
2. Robert Sedgewick and Kevin Wayne, “ALGORITHMS”, Fourth Edition, Pearson Education.
3. S.Sridhar, “Design and Analysis of Algorithms”, First Edition, Oxford University Press. 2014
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Third Edition, Prentice-Hall, 2011.

**OBJECTIVES:**

- To understand the basics of geometry processing.
- To understand the fundamentals of pipelined rasterization rendering of meshed objects and curved surfaces.
- To understand and work with advanced rendering methods such as radiosity.
- To design programs for advanced animation methods and
- To become proficient at graphics programming using OpenGL

**UNIT I INTRODUCTION 9**

Basics, Scope and Applications, Graphics Standards, Display systems, Image formation, Graphics Systems, Coordinate systems, Line-Drawing Algorithms, Parallel Line Algorithms, Circle drawing algorithms, Area Filling, Clipping Algorithms: Line and Polygon, Anti-aliasing.

**UNIT II TRANSFORMATIONS 9**

Affine Transformations (2D & 3D): Translation, Rotation, Scaling, Reflection and Shearing; Hierarchical Modeling & viewing: The Camera Transformation – Perspective, orthographic and Stereographic views;

**UNIT III 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 – Reflections and Transparency – Boolean operations on Objects - its applications

**UNIT IV ADVANCED RENDERING TECHNIQUE 12**

Curves and Surfaces: Bezier, B-Splines and NURBS; Color models; Photorealistic rendering; Global Illumination; Ray tracing; Monte Carlo algorithm; Adding Surface texture- Texture Synthesis – Bump Mapping, Environmental mapping; Advanced Lighting and Shading,

**UNIT V ANIMATION 9**

Overview of Animation Techniques – Keyframing, Computer Animation; Motion capture and editing; forward/Inverse Kinematics; Deformation models; Facial animation. Raster methods – Design of animation sequences – animation techniques – Key-frame systems – motion specification – direct, dynamics – rigid body animation — radiosity – collision detection – Graphics file format – Opengl animation procedures

**TOTAL:45 PERIODS****OUTCOMES:****Upon completion of this course, the student will:**

- Analyze the fundamentals of 2D and 3D computer graphics.
- Discuss the basic algorithms commonly used in 3D computer graphics.
- Describe advanced computer graphics techniques and applications.
- Analyze computer graphics and solid modelling techniques for various applications.

**TEXT BOOKS:**

1. Donald D. Hearn, M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Prentice Hall, 2011.
2. Alan Watt and Mark Watt, "Advanced Animation and Rendering Techniques: Theory and Practice", Addison-Wesley, 1992
3. Foley, van Dam, Feiner, Hughes, "Computer Graphics Principles and Practice", Third Edition in C. Addison Wesley, 2014.
4. Edward Angel and Dave Shreiner, "Interactive Computer Graphics: A top-down approach with OpenGL", Sixth Edition Addison Wesley, 2012.
5. Rick Parent, "Computer Animation - Algorithms and Techniques", Third Edition Morgan Kaufman, 2012.

**OBJECTIVES:**

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
  - To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the basics and usage of Multimedia Databases.
- To learn emerging databases such as Mobile, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

**UNIT I PARALLEL AND DISTRIBUTED DATABASES 9**

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures - Query Languages - Functional Dependency - Normalization – Parallel Systems-Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems-Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

**UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 9**

Overview of Object Database concepts - Object-Relational features: Object Database extensions to SQL - The ODMG Object Model and the Object Definition Language ODL-Object Database Conceptual Design - Object Query Language OQL - Overview of C++ Language Binding in the ODMG Standard .

**UNIT III MULTI-DIMENSIONAL DATASTRUCTURES AND MULTIMEDIA DATABASES 9**

Multidimensional Data Structures - K-d Trees - Point Quad trees, - MX Quad tree - R Trees – Image Databases - Text/Document Databases - Video Databases - Audio Databases .

**UNIT IV INTELLIGENT DATABASES 9**

Design and Architecture of a Spatial Databases – Spatial Query Language – Multimedia Database- Multimedia Query Processing - Active Database Concepts and Triggers- Temporal Databases Concepts - Deductive Databases

**UNIT V EMERGING TECHNOLOGIES 9**

Mobile Databases - Data Warehousing - Data Mining - Association Rules - Clustering - Classification- Sequential Pattern Mining - Web Databases - Cloud Based Databases - Introduction to Big Data-Storage-Analysis.

**TOTAL: 45 PERIODS****OUTCOMES:**

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

- To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- To understand and critique on each type of databases.
- To design faster algorithms in solving practical database problems.
- To implement intelligent databases and various data models.

**REFERENCES:**

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2011.
2. C.J. Date, A.Kannan, S. Swamynathan, " Introduction to Database Systems", Eighth Edition, Pearson Education Asia,2006.

3. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education/Addison Wesley, 2010.
4. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers,2006.
5. V.S. Subrahmanian," Principles of Multimedia Database Systems", Morgan Kauffman, 2 nd Edition, 2013.

**MM7102**

**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 explore real-time multimedia network applications

**UNIT I MULTIMEDIA COMMUNICATION MODELS**

**9**

Common Multimedia applications - VoIP- Video Conferencing- Military Surveillance- Interactive TV- Video on Demand- Smart Phone - Requirements and Design challenges of multimedia communications-Architecture of Internet Multimedia Communication- Protocol Stack-H.323.

**UNIT II BEST EFFORT AND GUARANTEED SERVICE MODEL**

**9**

Best effort service model and its limitations-Resource allocation-Metrics-Max and Min fair sharing-Queuing-FIFO-Priority queue-Fair queue- Waited fair queue-Traffic policing-Token bucket-leaky bucket-Admission control-Packet classification and scheduling.

**UNIT III MULTIMEDIA ON IP NETWORKS**

**9**

QoS aware routing-RSVP-Integrated and Differentiated services-MPLS-Multicasting-IGMP-PIM-DVMRP

**UNIT IV TRANSPORT LAYER SUPPORT FOR MULTIMEDIA**

**9**

Multimedia over TCP-Significance of UDP- Multimedia Streaming- Audio and Video Streaming- Interactive and non Interactive Multimedia-RTP/RTCP-SIP-RTSP.

**UNIT V MULTIMEDIA QOS ON WIRELESS NETWORKS**

**9**

IEEE 802.11e, IEEE 802.16, 3G networks-UMTS, 3GPP, 4G networks-LTE-IMS.

**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
- Develop the real-time multimedia network applications

**REFERENCES:**

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A Systems Approach", Morgan Kaufmann Publishers, 2007.
2. James F. Kurose and Keith W. Ross, "Computer Networking-A Top-Down Approach Featuring the Internet", Pearson, 2012.
3. Mark Wuthnow, Jerry Shih, Matthew Stafford, "IMS: A New Model for Blending Applications", Auerbach Publications, 2009.
4. Mario Marques da Silva, "Multimedia Communications and Networking", CRC Press, 2012.

**OBJECTIVES:**

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

Image Transforms -Discrete and Fast Fourier Transform and Discrete Cosine Transform ,Spatial Domain - Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.

**UNIT III IMAGE SEGMENTATION AND MORPHOLOGY 9**

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Morphology: Binary and Gray level morphology operations - Erosion, Dilation, Opening and Closing Operations-Distance Transforms- Basic morphological Algorithms. Features – Textures - Boundary representations and Descriptions- Component Labeling – Regional descriptors and Feature Selection Techniques.

**UNIT IV INTRODUCTION TO PATTERN RECOGNITION 9**

Component Labeling - Image Features - Textures - Boundary representations and descriptions - Regional descriptors - Feature selection and Feature dimensionality reduction. Image Classification and Recognition- Statistical Classifiers \_ Clustering Algorithms - Hierarchical and Partitional clustering

**UNIT V IMAGE PATTERN RECOGNITION CASE STUDIES 9**

Image Understanding – Case Studies in Biometrics, Video Processing, Image Fusion - Image Security - Steganography and Watermarking - Stereo vision - Visual Effects - Image compositing

**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 implements mini projects
- Explore the possibility of Applying image processing concepts in various domains



**REFERENCES:**

1. S.Sridhar, "Digital Image Processing", Oxford University Press, 2011, New Delhi.
2. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008, New Delhi.
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 International Edition,2008.

**MM7111                      COMPUTER GRAPHICS AND ANIMATION LABORATORY                      L T P C**  
**0 0 4 2**

**OBJECTIVES:**

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

**EXERCISES :**

1. Image color/contrast balancing and Enhancement using Photoshop
2. Image compositing using Photoshop
3. Applying special effects using Photoshop
4. Music composing using GarageBand/ Audacity
5. Audio editing using Garageband/Audacity
6. Video Preproduction works
  - a. Storyboarding Concepts
  - b. Animatics
7. Creation of 2D Animation using Flash/ Director
8. Creation of 3D Animation using 3dsmax/Maya
9. Video Editing using iMovie/ Final cut Pro/ Adobe Premiere
10. Case Study on Open CV
11. Mini Project

**TOTAL: 60 PERIODS****OUTCOMES:**

Upon the completion the course

- The students should be able to implement small projects using Photoshop and Audacity
- The students should be able to manipulate the images and audio files using Photoshop and Audacity

**MM7201                      3D GAME MODELING AND RENDERING                      L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- Understand the basics of Computer Graphics.
- Understand the fundamentals of modeling and rendering.
- Understand and work with Gaming software's.
- Design real time games

**UNIT I MATHEMATICS FOR MODELING 9**

Vector tools and polar co-ordinates – 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 & viewing – projection & perspective transformation

**UNIT II CHARACTER MODELING AND SHADING 9**

Introduction – solid modeling – polyhedra – Extruded shapes – tessellation - Mesh approximation of smooth objects – Bezier Curves – B-splines – NURBS – Interpolation - Hierarchical and physical modeling – curve & surface – Interactive graphics, Shading models – Flat shading – smooth shading – Reflections – Diffuse and specular reflection - Adding color - Antialiasing techniques – Dithering techniques - creating more shades and color – specular highlights – spotlight – blending – reflections – applying colors- real world lights- OpenGL

**UNIT III GAME DESIGN PRINCIPLES 9**

Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

**UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9**

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

**UNIT V GAME DEVELOPMENT 9**

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**Upon completion of this course, the student will:**

- Analyze the fundamentals of 2D and 3D animation
- Model a character with suitable actions.
- Analyze the game design principle.
- Discuss about gaming platforms and frame works.
- Design a interactive game.

**REFERENCES:**

1. F.S. Hill Jr., Stephen Kelly, “Computer Graphics Using OpenGL”, 3<sup>rd</sup> Edition, Persons Education/PHI Learning, 2007.
2. Donald Hearn , M. Pauline Baker, “ Computer Graphics with OpenGL”, 3<sup>rd</sup> Edition, Pearson Education, 2012.
3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical approach to Real-Time Computer Graphics” Morgan Kaufmann, 2<sup>nd</sup> Edition, 2006.
4. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 1st edition, 2011.
5. Mike Mc Shaffrfy, “Game Coding Complete”, Third Edition, Charles River Media, 2009.
6. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3<sup>rd</sup> edition, 2009.
7. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, Prentice Hall 1st edition, 2006.
8. Roger E. Pedersen, “Game Design Foundations”, Edition 2, Jones & Bartlett Learning, 2009.
9. Scott Rogers, “Level Up!: The Guide to Great Video Game Design”, Wiley, 1st edition, 2010.

**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
- To learn the concept of other framework

**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 III 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

**OUTCOMES:****The student should be able to work with**

- Design and development of web applications using various models
- Web application development using HTML and scripting technologies
- Web application development using advanced features
- Security features supported in java
- Developing web services using J2EE and related technologies
- Design and development of 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.

**MM7202                      SOFTWARE ENGINEERING AND PROJECT MANAGEMENT                      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 – S/W 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 S/W 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**

*Attested*  
*Sobhan*  
**DIRECTOR**  
 Centre For Academic Courses  
 Anna University, Chennai-600 025.

**OUTCOMES:**

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

- Implement mini projects incorporating the basic principles of software engineering.
- Describe the basic concepts of software design, implementation.
- Test software of simple mini projects.
- Analyze 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", Nineth Edition, Pearson Education Asia, 2010.
2. Roger S. Pressman, "Software Engineering – A practitioner's Approach", Seventh Edition, Tata McGraw-Hill International Edition, 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.

**MM7203**

**SPEECH AND AUDIO PROCESSING**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- To provide an introduction to the fundamental principles and techniques in Audio processing.
- To provide an overview of Audio enhancement
- To provide details about Audio compression techniques
- To review latest trends and future technologies in speech processing.

**UNIT I DIGITAL AUDIO**

**9**

Basics of Digital Audio - Digitization of Sound,Quantization and Transmission, Auditory Perception, Electroacoustics, Mixers; Basic audio processing - Sampling, Normalisation, Noise Reduction, audio processing, Analysis window sizing, Visualisation: Digital Audio Principles - Digital and Analog Recording, A/D and D/A Converter, Direct Stream Digital (DSD), Resolution of an Audio Signal, Pitch Shifting and Time Stretching, Audio Data Reduction.

**UNIT II SPEECH PROCESSING**

**9**

Speech - Speech production, Characteristics of speech, Speech understanding; Speech communications - Quantisation, Parameterisation, Pitch models, Analysis-by-synthesis; Speech Technologies - Speech Coding, Text-to-Speech Synthesis, Early Knowledge-Based Text-to-Speech (TTS) Synthesis, Unit-Selection Synthesis, Statistical Parametric Synthesis, Speech Recognition.

**UNIT III MUSICAL SOUND SYNTHESIS AND MIDI**

**9**

Acoustic Instruments, Sound Synthesis in Music,MIDI Principles - Hardware aspects, Structure of MIDI Messages, General MIDI, MIDI-to-Wav Conversion, Scalable Polyphonic MIDI (SPMIDI), RMID and XMF Files, SAOL and SASLin MPEG 4 Structured Audio, MIDI over USB, MIDI over IEEE 1394.

**UNIT IV STEREO AND SURROUND SOUND****9**

Two-Channel Stereo - Principles of Loudspeaker Stereo and Binaural or Headphone Stereo, Loudspeaker Stereo Over Headphones and Vice Versa, Two-Channel Signal Formats and Microphone techniques, Binaural Recording and 'Dummy Head' Techniques, Spot microphones and Two-Channel Panning Laws. Surround Sound - Three Channel Stereo, Four Channel Surround, 5.1-Channel Surround, and other Multichannel Configurations. Surround Sound Systems, Matrixed Surround Sound Systems Digital Surround Sound Formats, Dolby Digital, DTS, Ambisonics, Surround Sound Monitoring, Surround Sound Recording Techniques, Multichannel Panning Techniques.

**UNIT V MPEG Audio Compression and formats****9**

Basic Audio Compression Techniques- ADPCM in Speech Coding, G.726 ADPCM, Vocoders; MPEG Audio Compression - Psychoacoustics, MPEG Audio. Digital Audio Formats and Interchange - Audio File Formats for Digital and Disk formats, Interconnecting Digital Audio Devices

**TOTAL: 45 PERIODS****OUTCOMES:**

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

- Implement basic algorithms related to Audio Compression.
- Analyze audio compression formats.
- Critically analyze the role of surround sound in modern technologies.

**TEXT BOOKS**

1. Francis Rumsey & Tim McCormick "Sound and Recording ", Sixth Edition, Year 2009, Focal Press, Elsevier Ltd.
2. Ian McLoughlin "Applied Speech and Audio Processing With MAT LAB Examples" Cambridge University Press, Cambridge, New York, Melbour, Year 2009.
3. Ville Pulkki and Matti Karjalainen "Communication Acoustics an Introduction to Speech, Audio and Psychoacoustics", John Wiley & Sons Ltd, Year 2015.
4. Ze-Nian Li and Mark S. Drew "Fundamentals of Multimedia", PHI Learning Pvt. Ltd, Year 2010.

**MM7252****VIDEO PROCESSING AND ANALYTICS****L T P C  
3 0 0 3****OBJECTIVES:**

- To have a better knowledge about videos
- To enrich students with data analytics
- To understand the video content analysis
- To expose the student to various applications and case studies of Video analytics.

**UNIT I VIDEO FUNDAMENTALS****9**

Basic concepts and Terminology-Monochrome Analog video – Color in Video – Analog video standards – Digital video basics – Analog-to Digital conversion – Color representation and chroma sub sampling – Digital video formats and standards Video sampling rate and standards conversion.

**UNIT II VIDEO SEGMENTATION AND VIDEO FEATURES 9**  
Fundamentals of Motion Estimation – Optical flow - Pixel Video Features - colour, shape features, Textural features - Feature selection and Dimensionality Reduction .

**UNIT III INTRODUCTION TO ANALYTICS 9**  
Big-Data - Descriptive data analysis - Analytic Processes and Tools - Regression - Classification - Clustering algorithms - Validation - Multimodal approach to Image and Video data mining - Probabilistic semantic mode - Model based annotation and video mining.

**UNIT IV VIDEO CONTENT ANALYSIS AND ANALYTICS 9**  
Introduction- Detecting Shot Boundaries in Video – Parsing a Video into Semantic Segments – Video Indexing and Abstraction for Retrievals – Affective Video Content Analysis - Automatic Video Trailer Generation - Video database - Video categorization - Video query categorization

**UNIT V EMERGING TRENDS 9**  
Object Segmentation and Tracking in the Presence of Complex Background – Video Inpainting – Video Summarization – Forensic video analysis

**TOTAL:45 PERIODS**

**OUTCOMES:**

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

- Discuss video processing fundamentals
- Analyze video features
- Formulate various application of video processing

**REFERENCES:**

1. Oges Marques, Practical Image and Video Processing Using MATLAB, Wiley-IEEE Press, 2011.
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, 2007.
3. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

**MM7211 WEB PROGRAMMING AND DESIGN LABORATORY L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To learn how to create a simple web page using html along with the usage of style sheets, lists, creation or 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 Java2 Enterprise Edition application server methodologies
- To develop Java Enterprise Applications using EJB3 and other Java EE technology and J2ME.

**EXERCISES:**

1. Web programming with HTML tags, CSS for styling, Page layout
2. Develop webpages 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, JavaMail, 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.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

Web application development using HTML and scripting technologies.

- Hands on experience on Web application development using advanced features.
- Design and development of dynamic server-side web pages.
- Develop web services using J2EE and related technologies
- Design and development of applications using other frameworks

**MM7351**

**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 –  $\mu$ law, A-Law companding – 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 Kaufman Harcourt India, Third Edition, 2010.
2. David Solomon, "Data Compression – The Complete Reference", Fourth Edition, Springer Verlag, New York, 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.

MM7003

## CLOUD COMPUTING

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 familiarise 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 – Egs of IaaS providers - PaaS – Egs. Of PaaS providers - SaaS – Egs. 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 – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open nebula, OpenStack.

**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

**TEXT BOOKS :**

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things by Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.
2. Cloud Computing: Implementation, Management, and Security by John W.Rittinghouse and James F.Ransome : CRC Press 2010

**REFERENCES:**

1. Cloud Computing, A Practical Approach by Toby Velte, Anthony Velte, Robert Elsenpeter: TMH, 2009
2. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice (O'Reilly)) by George Reese: O'Reilly
3. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
4. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer.

PROGRESS THROUGH KNOWLEDGE

**MM7005****MEDIA 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 BASICS OF CRYPTOGRAPHY****8**

Classical Cryptography-The Shift Cipher, The Substitution Cipher, The Affine Cipher Cryptanalysis Techniques - Encryption Evaluation metrics - Histogram Deviation - orthogonal Frequency Division Multiplexing - OFDM model - OFDM Limitations.

**UNIT II DIGITAL WATERMARKING 12**

Digital Watermarking - Digital Steganography - Differences between Watermarking and Steganography - A Brief History of Watermarking – Classification in Digital Watermarking - Least-Significant-Bit Substitution - Discrete Fourier Transform (DFT) - Discrete Cosine Transform - Discrete Wavelet Transform - Random Sequence Generation - The Chaotic Map - Error Correction Code - Set Partitioning in Hierarchical Tree

**UNIT III DIGITAL WATERMARKING TECHNIQUES 8**

Spatial-Domain Watermarking - Frequency-Domain Watermarking - The Fragile Watermark - The Robust Watermark - Watermarking Attacks and Tools - Image Processing Attacks - Geometric Transformation - Cryptographic Attack Protocol Attacks - Watermarking Tools

**UNIT IV INTRODUCTION TO DIGITAL STEGANOGRAPHY 7**

Types of Steganography - Applications of Steganography - Embedding Security and Imperceptibility - Examples of Steganographic Software

**UNIT V STEGANALYSIS 10**

An Overview - The Statistical Properties of Images - The Visual Steganalytic System - IQM-Based Steganalytic System - Learning Strategies -The Frequency-Domain Steganalytic System - An Overview of the GA-Based Breaking Methodology -The GA-Based Breaking Algorithm - Complexity Analysis

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- The students would have understood the basic security algorithms required by any computing system.
- The students may be now aware of the security challenges and issues that may arise in any system.
- The students will now be able to design any secure system.

**REFERENCES**

1. Digital Watermarking and Steganography: Fundamentals and Techniques, Frank Shih, CRC Press, 2014.
2. Image Encryption: A Communication Perspective, Fathi E. Abd El-Samie, HossamEldin H. Ahmed, Ibrahim F. Elashry, Mai H. Shahieen, Osama S. Faragallah, El-Sayed M. El-Rabaie, Saleh A. Alshebeili, CRC Press, 2013.
3. Douglas R. Stinson, "CRYPTOGRAPHY THEORY AND PRACTICE", Third Edition, Chapman & Hall/CRC, 2006
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, First Edition, 2006.

**MM7002**

**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 OpenCV
- 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

**TEXT BOOKS :**

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

**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 MINING & DATA WAREHOUSING 8**

Introduction to KDD process – Knowledge Discovery from Databases - 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 PREPROCESSING & ASSOCIATION RULE MINING 9**

Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

**UNIT III 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 – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Selection.

**UNIT IV 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.

**UNIT V APPLICATIONS 8**

Multimedia data indexing & Retrieval – Content analysis & classification in image & video - Clustering applications to images – Mining frequent events from video – Data mining approached to Music.

**TOTAL: 45 PERIODS****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.

**REFERENCES:**

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, 2. Elsevier, Reprinted 2008.
2. Multimedia Data Mining and Knowledge Discovery, Valery A. Petrushin , Latifur Khan, Springer, 2007
3. Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

**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 FUNDAMENTAL MEDIA UNDERSTANDING 9**

Introduction – Media Types – Media Understanding – Description of Audio, Visual spectral and Video - Storage networks, storage medium.

**UNIT II TEXT RETRIEVAL AND MUSIC 9**

Text Information retrieval: Information retrieval system-catalog and indexing – automatic indexing – term clustering – User search Techniques- Information Visualization- Fundamentals - Instantaneous Features - Intensity - Tonal Analysis - Musical Genre, Similarity and Mood

**UNIT III IMAGE RETRIEVAL 9**

content-based image retrieval; techniques; feature extraction; integration; similarity; feature INDEXING; interactive retrieval; MPEG-7 standard

**UNIT IV VIDEO RETRIEVAL 9**

Content Based Video Retrieval - Video Parsing – Video abstraction and Summarization– Video Content Representation, Indexing and retrieval –Video Browsing Schemes–Example of Video Retrieval Systems

**UNIT V RETRIEVAL METRICS AND MODERN IR 9**

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. Introduction- parallel IR – Distributed IR – trends and research Issue.

**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. 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. (Eds.), Recommender Systems Handbook. 1<sup>st</sup> Edition., 2011,
3. Brusilovsky, Peter et.al. The Adaptive Web: Methods and Strategies of Web Personalization. Berlin: Springer, 2007.

**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.

**TEXT BOOKS:**

1. Colin Ware, "Information Visualization Perception for Design" Morgan Kaufmann Publishers, 2004, 2nd edition.
2. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007
3. Stephen Few, "Information Dashboard Design-The Effective Visual Communication of Data": O'Reilly Media Publisher, 1st Edition 2006

**REFERENCE:**

1. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers.

**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 computer 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 and Representation, Intensity and Range Images – Camera models – Camera parameters – Camera models – Light and colour – Image Noise – Image Filtering (spatial domain) - Mask-based filtering - Image Smoothing , Sharpening.

**UNIT II IMAGE FEATURES****9**

Image Features – Point and Line Detection – Hough Transform – Edge Detection – Corner Detection – Harris Detector – Textures - Deformable Contours – Features Reduction – Principal Component analysis – Feature Descriptors – SIFT and SURF.

**UNIT III CAMERA CALIBRATION AND STEREO GEOMETRY****9**

Camera Parameters – Intrinsic and Extrinsic parameters – Direct Parameter Calibration – Extraction from Projection matrix, Stereopsis – Correspondence Problem –RANSAC and Alignment - Epipolar Geometry

**UNIT IV MOTION DETECTION AND SHAPE FROM CUES****9**

Motion field of rigid objects – Notation of Optical flow – Estimating motion field – Estimation Motion Field – Horn and Schunck algorithm – Lucas and Kanade Algorithm – Using and Evaluation of Motion field – Shape from Shading and shape from Texture Model based Vision, smooth surfaces and their outlines, Aspect graphs and Range data.

**UNIT V HIGH LEVEL VISION****9**

Interpretation trees, Invariants – Appearance and Shape based Classification – 3D object modeling – Matching from Intensity Data – Matching from Range Data – Visual Recognition – AdaBoost and Random Decision Forests.

**TOTAL : 45 PERIODS****OUTCOMES:****Upon Completion of the course, the students should be able to**

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

**REFERENCES:**

1. Introductory Techniques for 3-D Computer Vision, Prentice Hall, 1998.
2. Concise Computer Vision: An Introduction into Theory and Algorithms, ReinhardKlette, 2014, Springer-Verlag London
3. Computer Vision: Algorithms and Applications Richard Szeliski, Springer International, 2011.
4. Computer Vision: a Modern Approach, David Forsyth and Jean Ponce, Prentice Hall, 2009.
5. Multiple View Geometry in Computer Vision, Richard Hartley and Andrew Zisserman, Cambridge, 2001.
6. E.R.Davies, "Computer and Machine Vision", Elsevier, 4<sup>th</sup> edition, 2012.



**OBJECTIVES:**

- To understand the basics of Ad-hoc & 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 Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks

**UNIT I****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****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****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****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****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 Adhoc 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**

- To conversant with Ad-hoc and sensor networks, protocols and standards.
- To establish a Sensor network environment for different type of applications

**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.Toth, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.

5. Erdal Çayırıcı , Chunming Rong, "Security in Wireless Ad Hoc and Sensor Networks", John Wiley and Sons, 2009
6. Walteneagus 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

**IF7021**

**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 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.

IF7074

**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

Humans – 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.

### TEXT BOOKS:

1. Human Computer Interaction, 3rd Edition Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Prentice Hall, 2004.
2. Research Methods in Human-Computer Interaction , Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Wiley, 2010.

### REFERENCES:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

**MM7251**

**MEDICAL IMAGE PROCESSING**

**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 BIO-MEDICAL IMAGE PREPROCESSING

9

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

## UNIT III MEDICAL IMAGE RECONSTRUCTION

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.

**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 and statistical image classification.

**UNIT V IMAGE REGISTRATIONS 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.

**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 incorporates 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 S.Sridhar, "Digital Image Processing", Oxford University Press, 2011, New Delhi.
2. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008, New Delhi
3. Geoff Dougherty, "Digital Image Processing for Medical Applications", Cambridge University Press, 2010.
4. Alasdair McAndrew, "Introduction to Digital Image Processing with Matlab", Cengage Learning 2011, India.
5. Anil J Jain, "Fundamentals of Digital Image Processing", PHI, 2006.
6. Alfred Horowitz, 'MRI Physics for Radiologists – A Visual Approach', Second
7. edition Springer Verlag Network, 1991.
8. Kavyan Najarian and Robert Splerstor, "Biomedical signals and Image processing", CRC – Taylor and Francis, New York, 2006
9. John L.Semmlow, "Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc., New York,2004

**IF7073****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 GPU COMPUTING AND CUDA****9**

Introduction – Parallel Programming Languages and models – Evolution of Graphic pipelines – GPGPUs - CUDA Program Structure – Device memories – Data Transfer – Kernel Functions

**UNIT III      CUDA DETAILS** **9**  
CUDA Threads – Thread Organization – Synchronization & Scalability – CUDA memories – Performance – Imaging Case study

**UNIT IV      OPENCL BASICS** **9**  
OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

**UNIT V      OPENCL CONCURRENCY & EXECUTION MODEL** **9**  
OpenCL Synchronization – Kernels – Fences – Barriers – Queueing – Global Synchronization – Memory Consistency – Events – Host side memory model – Device Side memory Model – Case study

**TOTAL:45 PERIODS**

**OUTCOMES:**

**At the end 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 massively parallel architectures.

**REFERENCES:**

1. David B. Kirk, Wen-mei W. Hwu, "Programming massively parallel processors", Morgan Kaufman, 2010.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, " Heterogeneous computing with OpenCL", Morgan Kaufman, 2012.
3. John L. Hennessy and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 5<sup>th</sup> edition, 2012.
4. J. Sanders and E. Kandrot, "CUDA by Example: An Introduction to General-Purpose GPU Programming", Addison Wesley, 2010.
5. Wen–mei W. Hwu, "GPU Computing Gems", Morgan Kaufmann / Elsevier, 2011.

**MM7001**

**BIG DATA ANALYTICS**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the applications using Map Reduce Concepts.
- To learn to use various techniques for mining data stream.
- To understand the various search methods and visualization techniques.
- To learn to analyze the big data using intelligent techniques.

**UNIT I      INTRODUCTION TO BIG DATA** **8**  
Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

**UNIT II      MINING DATA STREAMS** **9**  
Introduction To Streams 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 - Real Time Sentiment Analysis, Stock Market Predictions.

### UNIT III HADOOP

10

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

### UNIT IV HADOOP ENVIRONMENT

9

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

### UNIT V FRAMEWORKS

9

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

**TOTAL : 45 PERIODS**

#### OUTCOMES:

##### Work with big data platform

- The students will be able to Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Design efficient algorithms for mining the data from large volumes.
- Analyze the big data analytic techniques for useful business applications.
- Explore on Big Data applications Using Pig and Hive
- Discuss the fundamentals of various big data analysis techniques

#### REFERENCES:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
7. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
8. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
9. Da Ruan,Guoqing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer,2007
10. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications,2013
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

**OBJECTIVES:**

Implement 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****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.

**TEXT BOOKS:**

1. The technology of video and audio streaming 2nd edition David Austerberry 2005 ELSEVIER focal press
2. Data Broadcasting – Understanding the ATCS Data Broadcasting Standerds – Richards.S Chernock, Regis J.cainon, Micheal A. Dolan, John R.Mick JR Tata McGraw Hill -2001
3. Digital Video And HDTV Algorithm and Interfaces – Charles Poynton – Morgan Kaufman Publishers – 2007

**REFERENCES:**

- 1 standard Handbook of Broadcast Engineering – Jerry C. Whitaker – Mcgraw Hill Publications 2005
- 2.Digital Television Fundamentals - Design and Installtion of Video and Audio Systems - Mcgraw Hill Publications – Michael Robin And Michel Poulin - Second Edition, 2000.



**OBJECTIVES:**

- To learn the characteristics of mobile applications.
- To understand the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development and programming of mobile applications.

**UNIT I INTRODUCTION****9**

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

**UNIT II USER INTERFACE****9**

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

**UNIT III APPLICATION DESIGN****9**

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

**UNIT IV APPLICATION DEVELOPMENT****9**

Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

**UNIT V TOOLS****9**

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

**TOTAL:45 PERIODS****OUTCOMES:**

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

- To design and implement the user interfaces of mobile applications.
- To design the mobile applications that is aware of the resource constraints of the mobile devices.
- To develop advanced mobile applications that accesses the databases and the web.
- To develop useful mobile applications in the current scenario using Google Android and Eclipse simulator.

**REFERENCES:**

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "Programming Android", O'Reilly, 2011.
2. Reto Meier, Wrox Wiley, "Professional Android 2 Application Development", 2010.
3. Alasdair Allan, "iPhone Programming", O'Reilly, 2010.
4. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C", Wrox Wiley, 2010.
5. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and interactions", Wiley, 2009.

**OBJECTIVES:**

- Students will gain solid knowledge base to design, build, manage and deploy dynamic content for the web.
- This course focuses on the overall production process with particular emphasis on design elements involving layout, navigation and interactivity.
- The students will create effective web pages combining text, images and animation.

**UNIT I INTERNET TECHNOLOGY 9**

Introduction – Concepts – Architecture – Tools – Server Technology – Formats – Understanding the aspects of website designing – Mark-up Languages – HTML: Introduction, Structure of an HTML Document, HTML elements, Types of Attributes – Element Specific attributes, Global attributes, Event Handler Content Attributes, Custom data attributes – DHTML: Dynamic text, images, filters, animation.

**UNIT II STYLE AND FORMAT 9**

Web designing principles and concepts – Guidelines for good website designing – Usability Guidelines and standards – World Wide Web standards – Cascading Style Sheet (CSS) – Text formatting, styles, images, background, division, layers – Creating CSS templates.

**UNIT III WYSIWYG WEB DESIGN 9**

Web Designing using Dreamweaver CS6 – Tools – Concepts – Designing, templates – Activating your Webspace – Site Creation for Local and Remote Servers – Writing HTML and JavaScript in Dreamweaver to create forms – Tables – Graphics and animation in web design – Importing Flash and other multimedia Files – Previewing in browser – Uploading your site.

**UNIT IV DATABASE CONCEPTS 9**

Introduction to database: Database management, Database Systems concept and history, Logical and physical organization of data, database models, and data independence – Relational databases concepts – Embedding database languages in general programming languages – Introduction to Structured Query Language and its elements.

**UNIT V INTERACTIVE INTERNET TOOLS 9**

Introduction to Interactive internet tools – New media technology – Blogs – Podcasts – Photo and video networks – Social media – Video sharing sites – Video Streaming – Webinar – Webcast – RSS Feeds – Wikis – Mashups – QR Codes – Widgets – Online applications.

**TOTAL: 45 PERIODS****OUTCOMES:**

- To make the students appreciate the importance of knowing web designing and development.
- To acquaint the students with the basics of designing and developing a dynamic website.
- To enable the students to create a website and use different interactive internet tools.

**TEXT BOOKS:**

1. Jeffrey Zeldman and Ethan Marcotte. Designing with Web Standards (3rd Edition), New Riders Publications, 2011.
2. R. Lavanya. HTML 5, Ane Books Publisher, New Delhi, 2011.
3. David Sawyer McFarland. Dreamweaver CS6: The Missing Manual, O'Reilly Media Inc, 2012.
4. Ramez Elmasri and Shamkant Navathe. Fundamentals of Database Systems (6th Edition), Pearson Publishers, 2011.

**REFERENCES:**

1. Jon Duckett. HTML and CSS: Design and Build Websites, John Wiley and Sons Publisher, 2011.
2. Nigel Chapman and Jenny Chapman. Digital Media Tools, Nigel John Wiley and Sons Publisher, 2011.

**OBJECTIVES:**

- Students will be guided by the faculty, in a step by step procedure in making a
- Documentary of their topic.
- At the end of the course, students will produce a documentary as part of their assessment.

**UNIT I GRAMMAR OF DOCUMENTARIES 9**

Origins and History of Documentary Films – Introduction to Narrative and Non-narrative Filmmaking – Elements of documentaries – Aesthetics & Authorship – Documentary theory & Issue of representation, types of documentaries – Approaches in Science – Nature filmmaking – Ethnographic Documentary filmmaking – Creative approaches – Case Studies.

**UNIT II DEVELOPING THE STORY – PREPRODUCTION 9**

Understanding story, story basics, finding the story – Developing story ideas, story structure, time on screen, researching for documentaries, kinds of information, finding people as sources, information management, choosing a subject – Visual scope and visual evidence, permissions, funding, pitching your ideas – Proposals, elements of proposals, resources for writing proposals, attracting funding – Ethics in documentary filmmaking.

**UNIT III SHOOTING THE STORY – PRODUCTION 9**

Treatment, unscripted and scripted documentaries, planning, and collecting the material – adapting the script, ways to tell a story – Interviews, recce, use of talents, re-enactments, reconstruction & docudrama. Choosing the team, bringing together right people, working together, getting the right camera & equipments, camerawork, producing, directing, directing the crew. Shooting, lighting, location sound, problems & issues.

**UNIT IV BUILDING THE STORY – POST PRODUCTION 9**

Building the story in the editing table, working with an editor – Crafting the story, Finding your style – The paper edit, reviewing the footage, assembling of rushes, editing the footages, applying effects, transition – Adding sound effects and music, special effects dubbing, rerecording – Narration – Voiceover, using Music, titles and graphics – Colour exposure and colour correction – Credits & acknowledgements.

**UNIT V PROJECT – PRACTICE & SCREENING 9**

Project involving the production and direction of an individually or group authored documentary film, accompanied by a research dossier, a proposal and a treatment. The students will also ensure the exhibition of their films for reviews

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- At the end of the course, students will be able to gain adequate skills to produce a documentary for broadcast.
- Students will be able to apply principles of factual program production in their future productions

**TEXTBOOKS:**

1. Genevieve Jolliffe and Andrew Zinnes. The Documentary Film Makers Handbook: A Guerilla Guide, Continuum International Publishing Group, New York, 2006.
2. Louise Spence and Vinicius Navarro. Crafting Truth: Documentary Form and Meaning, Rutgers University Press, New Brunswick, N.J., 2011.
3. Andy Glynne. Documentaries and How to Make Them, Kamera Books, Harpenden, Herts, 2012.



## REFERENCES:

1. Barry Hampe. Making Documentary Films and Videos: A Practical Guide to Planning, Filming, and Editing Documentaries, Henry Holt and Company, 2007.
2. Alan Rosenthal. Writing, Directing, and Producing Documentary Film, SIU Press, 2007.
3. Clifford Thurlow. Making Short Films: The Complete Guide from Script to Screen (2nd Edition), Oxford International Publishers, 2008.
4. Michael Rabiger. Directing the Documentary, Focal Press, 2004.
5. James R. Martin. Create Documentary Films, Videos, and Multimedia: A Comprehensive Guide to Using Documentary Storytelling Techniques for Film, Video, the Internet and Digital Media Nonfiction Projects (Films Cinema), Real Deal Press, 2010.

**MM7009**

**VIRTUAL REALITY**

**L T P C**  
**3 0 0 3**

## OBJECTIVES:

- To impart the fundamental aspects, principles of virtual reality technology
- To gain knowledge about applications of virtual reality

### UNIT I INTRODUCTION

**9**

Introduction to Virtual Reality – Definition – Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality - Components of VR System - Input Devices – 3D Position Trackers -Performance Parameters – Types of Trackers - Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices. Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

### UNIT II VR ARCHITECTURE

**9**

Computing Architectures of VR – Rendering Principle – Graphics and Haptics Rendering –PC Graphics Architecture – Graphics Accelerators – Graphics Benchmarks – Workstation Based Architectures – Sun Blade 1000 Architecture – SGI Infinite Reality Architecture – Distributed VR Architectures – Multipipeline Synchronization – Collocated Rendering Pipelines – Distributed Virtual Environments.

### UNIT III VR MODELING

**9**

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

### UNIT IV VR PROGRAMMING

**9**

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D - GHOST – People Shop – Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society.

### UNIT V VR APPLICATIONS

**9**

Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization.

**TOTAL: 45 PERIODS**

## OUTCOMES:

At the end of the course the student should be able to

- To Discuss the basic concepts of Virtual reality
- Develop the Virtual Reality applications in different areas
- Design of various modeling concepts.
- To expose the concept of Virtual Reality Programming with toolkits.

## REFERENCES:

1. Grigore C. Burdea, Philip Coiffet, "Virtual Reality Technology", 2nd Edition, Wiley India, 2006.
2. John Vince, "Introduction to Virtual Reality", Springer-Verlag Ltd., 2004.
3. William R.Sherman, Alan B.Craig :Understanding Virtual Reality – Interface, Application, Design",The Morgan Kaufmann Series, 2003.

MM7071

DIGITAL VIDEO PROCESSING

L T P C  
3 0 0 3

## OBJECTIVES:

To provide an introduction to the fundamental principles and techniques in Video processing.

- To provide an overview of video enhancement and restoration algorithms
- To provide details about video Tracking
- To review latest trends and future technologies in video computing.

### 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 - – Digital Video – Notation – ITU– R.BT.601 Digital Video Format and Other Digital Video Formats and Applications

### UNIT II DIGITAL VIDEO ENHANCEMENT AND SEGMENTATION 9

Video Sampling – Basics of the Lattice Theory – Sampling of Video Signals over Lattices –Filtering Operations in Cameras and Display Devices – Video Segmentation Algorithms – Median Cut, Graph Cut and EM Algorithms – Active Contour models.

### UNIT III VIDEO ANALYSIS AND TRACKING 9

Typical Tracker – Localization – Optical Flow - Object Tracking and analysis – Kalman Filtering – Video Tracking – Bayesian Approach – Particle Filter – Trackers – Evaluation – Video Inpainting – restoration –Video Mining – Video Search Engines and retrieval – Visual Event Detection – Video Surveillance and Security.

### UNIT IV MOTION ESTIMATION 9

Two-Dimensional Motion Estimation - Optical Flow. General Methodologies - Motion Representation, Motion Estimation Criteria, Optimization Methods. Pixel-Based Motion Estimation - Block-Matching Algorithm - Exhaustive Block-Matching Algorithm - Phase Correlation Method and Multiresolution Motion Estimation.

### UNIT V VIDEO CLASSIFICATION AND RECOGNITION 9

Video Classification – Classification and Clustering models – Video Annotation – Video Summarization – Action Recognition - Visual Event Detection.

**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. Maggio E., Cavallaro A., Video Tracking, Wiley , 2011.
3. Alan Bovik C "The Essential Guide to Video Processing", Academic Press Inc, 2009.
4. Oge Marques 'Practical Image and Video processing using Matlab", IEEE Press, 2011.
5. Niels NielsHaering, Niels Da Vitoria Lobo, Visual Event Detection, The International Series in Video Computing, Springer US, 2001.
6. Michael A. Smith, Takeo Kanade, Multimodal Video Characterization and Summarization, The Kluwer International Series in Video Computing, 2005.

