

## **PROGRAM EDUCATIONAL OBJECTIVES (PEO)**

Graduates of this M. E. Multimedia will be able to

- Apply the necessary mathematical tools and fundamental & advanced knowledge of multimedia related applications.
- Develop computer/software/network systems understanding the importance of social, business, technical, environmental, and human context in which the systems would work.
- Articulate fundamental concepts, design underpinnings of computer/software/network systems, and research findings to train professionals or to educate engineering students.
- To mould the students to be ethically committed towards teamwork for producing quality output with the aim of developing our nation.
- Contribute effectively as a team member/leader, using common tools and environment, in multimedia projects, research, or education
- To engage in sustained learning for the career opportunities in industries, research divisions, and academics so that they can adapt to ever-changing technological and societal requirements.
- Pursue life-long learning and research in selected fields of Multimedia with animation and contribute to the growth of those fields and society at large.
- To be competent in the Multimedia segments and to bring out novel ideas by exploring the multiple solutions for the given problem

## **PROGRAM OUTCOMES**

1. Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the conceptualization of engineering models.
2. Identify, formulate, research literature and solve complex engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
3. An ability to design a Multimedia system with components and processes to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Conduct investigations of complex problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. Create, select and apply appropriate techniques, resources, and modern engineering tools, including animation, web based techniques, prediction and modeling, to *complex* engineering activities, with an understanding of the limitations.
6. An ability to apply Multimedia Engineering principles, techniques and tools in web based multimedia development..
7. Apply a systematic, disciplined, quantifiable approach to the cost-effective development, operation and maintenance of software systems to the satisfaction of their beneficiaries.
8. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
9. Understand and commit to professional ethics and responsibilities and norms of engineering practice.
10. Understand the impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development.
11. An ability to identify, formulates, and solves engineering problems.
12. An understanding of real-time, safety-critical, embedded computer systems.

**AFFILIATED INSTITUTIONS**  
**ANNA UNIVERSITY, CHENNAI**  
**REGULATIONS - 2013**  
**M.E. MULTIMEDIA TECHNOLOGY**  
**I TO IV SEMESTERS CURRICULA AND SYLLABI (FULL TIME)**

**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MA7155	Applied Probability and Statistics	3	1	0	4
2.	CP7102	Advanced Data Structures and Algorithms	3	0	0	3
3.	CP7103	Multicore Architectures	3	0	0	3
4.	MU7101	Multimedia Coding Techniques	3	0	0	3
5.	MU7102	Multimedia Communication Networks	3	0	0	3
6.	MU7103	Cryptography and Multimedia Data Hiding	3	0	0	3
<b>PRACTICAL</b>						
7.	MU7111	Advanced Data Structures Laboratory	0	0	3	2
8.	MU7112	Multimedia Tools Laboratory	0	0	3	2
9.	MU7113	Mini Project	0	0	2	1
<b>TOTAL</b>			<b>18</b>	<b>1</b>	<b>8</b>	<b>24</b>

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MU7201	Graphics Design and Multimedia Presentation	3	0	0	3
2.	MU7202	Image Processing and Pattern Recognition	3	0	0	3
3.	IF7203	Data Warehousing and Data Mining	3	0	0	3
4.	MU7203	Multimedia Databases	3	0	0	3
5.		Elective I	3	0	0	3
6.		Elective II	3	0	0	3
<b>PRACTICAL</b>						
7.	MU7211	Graphics and Imaging Laboratory	0	0	3	2
8.	MU7212	Multimedia Database Laboratory	0	0	3	2
9.	MU7213	Technical Seminar	0	0	2	1
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>8</b>	<b>23</b>

### SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MU7301	3D Modelling and Rendering	3	0	0	3
2.		Elective III	3	0	0	3
3.		Elective IV	3	0	0	3
<b>PRACTICAL</b>						
4.	MU7311	Project Work (Phase I)	0	0	12	6
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

### SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>PRACTICAL</b>						
1.	MU7411	Project Work (Phase II)	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL NO OF CREDITS :74**

**LIST OF ELECTIVES  
ELECTIVE I**

<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	MU7001	Audio Video Broad Casting Systems	3	0	0	3
2.	MU7002	Web Programming Techniques	3	0	0	3
3.	MU7003	Creativity, Innovation and Product Development	3	0	0	3
4.	CP7018	Language Technologies	3	0	0	3
5.	MU7004	Service Oriented Architecture	3	0	0	3

**ELECTIVE II**

<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
6.	MU7005	Non Linear Editing	3	0	0	3
7.	NE7071	Web Design and Management	3	0	0	3
8.	MU7006	Visualization Techniques	3	0	0	3
9.	CP7008	Speech Processing and Synthesis	3	0	0	3
10.	IF7202	Cloud Computing	3	0	0	3

**ELECTIVE III**

<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
11.	MU7007	Virtual Reality	3	0	0	3
12.	NE7002	Mobile and Pervasive Computing	3	0	0	3
13.	MU7008	User Interface Design	3	0	0	3
14.	IF7102	Object Oriented Software Engineering	3	0	0	3
15.	MU7009	Intelligent Agent Systems	3	0	0	3

**ELECTIVE IV**

<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
16.	IF7301	Soft Computing	3	0	0	3
17.	IF7003	Video Analytics	3	0	0	3
18.	MU7010	Content Based Image Retrieval	3	0	0	3
19.	NE7012	Social Network Analysis	3	0	0	3
20.	MU7011	Video Compression	3	0	0	3

**OBJECTIVES:**

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

**UNIT I ONE DIMENSIONAL RANDOM VARIABLES 9+3**

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

**UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3**

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

**UNIT III ESTIMATION THEORY 9+3**

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

**UNIT IV TESTING OF HYPOTHESES 9+3**

Sampling distributions - Type I and Type II errors - Tests based on Normal, t, Chi-Square 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****OUTCOME:**

- The student will able to acquire the basic concepts of Probability and Statistical techniques for solving mathematical problems which will be useful in solving Engineering problems

**REFERENCES:**

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

**OBJECTIVES:**

- To understand the principles of iterative and recursive algorithms.
- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.
- To learn the principles of shared and concurrent objects.
- To learn concurrent data structures.

**UNIT I ITERATIVE AND RECURSIVE ALGORITHMS 9**

Iterative Algorithms: Measures of Progress and Loop Invariants-Paradigm Shift: Sequence of Actions versus Sequence of Assertions- Steps to Develop an Iterative Algorithm-Different Types of Iterative Algorithms--Typical Errors-Recursion-Forward versus Backward- Towers of Hanoi- Checklist for Recursive Algorithms-The Stack Frame-Proving Correctness with Strong Induction- Examples of Recursive Algorithms-Sorting and Selecting Algorithms-Operations on Integers-Ackermann's Function- Recursion on Trees-Tree Traversals- Examples- Generalizing the Problem - Heap Sort and Priority Queues-Representing Expressions.

**UNIT II OPTIMISATION ALGORITHMS 9**

Optimization Problems-Graph Search Algorithms-Generic Search-Breadth-First Search-Dijkstra's Shortest-Weighted-Path -Depth-First Search-Recursive Depth-First Search-Linear Ordering of a Partial Order- Network Flows and Linear Programming-Hill Climbing-Primal Dual Hill Climbing-Steepest Ascent Hill Climbing-Linear Programming-Recursive Backtracking-Developing Recursive Backtracking Algorithm- Pruning Branches-Satisfiability

**UNIT III DYNAMIC PROGRAMMING ALGORITHMS 9**

Developing a Dynamic Programming Algorithm-Subtle Points- Question for the Little Bird-Subinstances and Subsolutions-Set of Subinstances-Decreasing Time and Space-Number of Solutions-Code. Reductions and NP-Completeness-Satisfiability-Proving NP-Completeness- 3-Coloring- Bipartite Matching. Randomized Algorithms-Randomness to Hide Worst Cases-Optimization Problems with a Random Structure.

**UNIT IV SHARED OBJECTS AND CONCURRENT OBJECTS 9**

Shared Objects and Synchronization -Properties of Mutual Exclusion-The Moral-The Producer-Consumer Problem -The Readers-Writers Problem-Realities of Parallelization-Parallel Programming- Principles- Mutual Exclusion-Time- Critical Sections--Thread Solutions-The Filter Lock-Fairness-Lamport's Bakery Algorithm-Bounded Timestamps-Lower Bounds on the Number of Locations-Concurrent Objects- Concurrency and Correctness-Sequential Objects-Quiescent Consistency- Sequential Consistency-Linearizability- Formal Definitions- Progress Conditions- The Java Memory Model

**UNIT V CONCURRENT DATA STRUCTURES 9**

Practice-Linked Lists-The Role of Locking-List-Based Sets-Concurrent Reasoning- Coarse-Grained Synchronization-Fine-Grained Synchronization-Optimistic Synchronization- Lazy Synchronization-Non-Blocking Synchronization-Concurrent Queues and the ABA Problem-Queues-A Bounded Partial Queue-An Unbounded Total Queue-An Unbounded Lock-Free Queue-Memory Reclamation and the ABA Problem- Dual Data Structures- Concurrent Stacks and Elimination- An Unbounded Lock-Free Stack- Elimination-The Elimination Backoff Stack

**TOTAL: 45PERIODS**

**OUTCOMES:**

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

1. Implement and apply concurrent linked lists, stacks, and queues
2. Implement advanced concurrent structures
3. Design and implement concurrent algorithms.
4. Design and implement algorithms using different techniques

**REFERENCES:**

1. Jeff Edmonds, "How to Think about Algorithms", Cambridge University Press, 2008.
2. M. Herlihy and N. Shavit, "The Art of Multiprocessor Programming", Morgan Kaufmann, 2008.
3. Steven S. Skiena, "The Algorithm Design Manual", Springer, 2008.
4. Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.
5. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", McGrawHill, 2008.
6. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2006.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.
8. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, 1995.
9. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley, 1975.
10. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson, 2006.

**CP7103****MULTICORE ARCHITECTURES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multicore architectures
- To expose the students to warehouse-scale and embedded architectures

**UNIT I      FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS      9**

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Case Studies of Multicore Architectures.

**UNIT II      DLP IN VECTOR, SIMD AND GPU ARCHITECTURES      9**

Vector Architecture - SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units - Detecting and Enhancing Loop Level Parallelism - Case Studies.

**UNIT III      TLP AND MULTIPROCESSORS      9**

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

**UNIT IV      RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES      9**

Programming Models and Workloads for Warehouse-Scale Computers – Architectures for Warehouse-Scale Computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

**UNIT V ARCHITECTURES FOR EMBEDDED SYSTEMS 9**  
 Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Identify the limitations of ILP and the need for multicore architectures
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism
- Critically analyze the different types of inter connection networks
- Discuss the architecture of GPUs, warehouse-scale computers and embedded processors

**REFERENCES:**

1. John L. Hennessey and David A. Patterson, “ Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5<sup>th</sup>. edition, 2012.
2. Kai Hwang, “Advanced Computer Architecture”, Tata McGraw-Hill Education, 2003
3. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, PHI, 2011.
4. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture : A Hardware/ Software Approach” , Morgan Kaufmann / Elsevier, 1997.

**MU7101 MULTIMEDIA CODING TECHNIQUES L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- Understand the importance of multimedia in today’s online and offline information sources and repositories.
- Understand how Text, Audio, Image and Video information can be represented digitally in a computer, so that it can be processed, transmitted and stored efficiently.
- Understand the possibility and limitations of multimedia data compression.
- Understand the basic audio coding techniques including predictive coding and more advanced techniques based around LPC and sub-band coding.
- Understand bi-level Image lossless coding techniques and how these can be extended to code grayscale images, and colour images.
- Understand GIF and JPEG lossless coding techniques.
- Understand lossy Image, video Coding techniques

**UNIT I INTRODUCTION 9**  
 Multimedia Representation - Text, Audio, Image and Video Representation - Input and Output Transducers -Human Vision and Audio Systems and their Limitations - Sampling, Quantization, Coding, Companding.

**UNIT II BASIC CODING TECHNIQUES 9**  
 Introduction to Data Compression - Information Theory -Statistical Coding - Dictionary Based Coding – Audio Coding.

**UNIT III LOSSLESS IMAGE CODING 9**  
 Bi-Level -Reflected Gray Codes - Predictive Coding –GIF-Lossless JPEG

**UNIT IV LOSSY IMAGE CODING 9**  
 Distortion Measures -Transform Coding -JPEG -Wavelet Coding -Sub-band Coding - JPEG2000 - Progressive Image Coding.



**UNIT V VIDEO CODING (LOSSY)****9**

Video Coding Concepts - The Hybrid DPCM/DCT algorithm-Motion Compensated Prediction-Motion Estimation-Standards: H.261, MPEG-1,2,4,7.

**TOTAL : 45 PERIODS****REFERENCES:**

1. Ze-Nian Li & Mark Drew, "Fundamentals of Multimedia", Prentice Hall, 2004.
2. Yun Q. Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering: Fundamentals, Algorithms, and Standards", CRC Press, Second edition, 2008
3. B.Prabhakaran, "Multimedia Database Management Systems", Springer International Edition, 2007.
4. Tay Vaughan, "Multimedia: Making it Work", McGraw Hill Publication, Eighth Edition, 2010.
5. Charles Marsh, David W.Guth, B.PShort, "Strategic Writing: Multimedia writing for Public Relations, Advertising and More", Pearson education, Second Edition, 2008.

**MU7102****MULTIMEDIA COMMUNICATION NETWORKS****L T P C  
3 0 0 3****OBJECTIVES:**

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

**UNIT I MULTIMEDIA COMMUNICATION MODELS****9**

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

**UNIT II GUARANTEED SERVICE MODEL****9**

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

**UNIT III MULTIMEDIA TRANSPORT****9**

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

**UNIT IV MULTIMEDIA OVER WIRELESS NETWORKS****9**

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

**UNIT V MULTIMEDIA NETWORK SECURITY AND APPLICATIONS****9**

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

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

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

- deploy the right multimedia communication models
- apply QoS to multimedia network applications with efficient routing techniques
- solve the security threats in the multimedia networks
- develop the real-time multimedia network applications

## REFERENCES:

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

**MU7103**

**CRYPTOGRAPHY AND MULTIMEDIA DATA HIDING**

**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.
- To bring the knowledge about the data hiding for image and video with countermeasures for attacks.

### **UNIT I CLASSICAL TECHNIQUES AND ENCRYPTION STANDARDS 9**

Classical Cryptography-The Shift Cipher, The Substitution Cipher, The Affine Cipher, Cryptanalysis-Cryptanalysis of the Affine Cipher, Cryptanalysis of the Substitution Cipher, Cryptanalysis of the Vigenere Cipher, Shannon's Theory- Block Cipher and the Advanced Encryption Standard-Substitution –Permutation Networks, Linear Cryptanalysis, Differential Cryptanalysis, The Data Encryption Standard- The Advanced Encryption Standard.

### **UNIT II AUTHENTICATION 9**

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

### **UNIT III MULTIMEDIA DATA HIDING INTRODUCTION 9**

Overview of Multimedia Data Hiding – Data hiding framework-Key elements -Basic embedding mechanisms-Techniques for Embedding multiple bits-Quantitative model for Uneven embedding Capacity-Constant embedding Rate (CER)-Variable embedding Rate(VER).

### **UNIT IV DATA HIDING FOR IMAGE AND VIDEO 9**

Data Hiding in Binary Image: Proposed Scheme – Applications-Robustness and Security considerations-Multilevel embedding- Multilevel image data hiding: Spectrum Partition-System Design-Refined Human visual model- Multilevel video data hiding: Embedding Domain-System Design.

### **UNIT V AUTHENTICATION AND ATTACKS WITH COUNTERMEASURES 9**

Data Hiding for Image Authentication- Data Hiding for Video Communication-Attacks on known Data Hiding Algorithms-Countermeasures against Geometric attacks- Attacks on unknown Data Hiding Algorithms.

**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 may have idea about the data hiding for image and video with supporting algorithms.
- Students may be now aware of developing data hiding algorithms for the specialized applications.

**REFERENCES:**

1. Douglas R. Stinson ,“Cryptography Theory and Practice ”, Third Edition, Chapman & Hall/CRC, 2006
2. Kaufman, R. Perlman, and M. Speciner, Network Security: Private Communication in a Public World, 2<sup>nd</sup> ed., Prentice Hall, ISBN 0-13-0460192.
3. Min Wu, Bede Liu, “Multimedia Data Hiding”, Springer-Verlag NewYork Inc., 2002.
4. I. Cox, M. Miller, J. Bloom: Digital Watermarking, Morgan Kaufman Publishers, 2001.
5. L.C. Washington, W. Trappe: Introduction to Cryptography with Coding Theory, Prentice Hall, 2001.
6. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001.
7. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.
8. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007.

**MU7111****ADVANCED DATA STRUCTURES LABORATORY****L T P C  
0 0 3 2****OBJECTIVES:**

- To learn to implement iterative and recursive algorithms.
- To learn to design and implement algorithms using hill climbing and dynamic programming techniques.
- To learn to implement shared and concurrent objects.
- To learn to implement concurrent data structures.

**LAB EXERCISES:**

Each student has to work individually on assigned lab exercises. Lab sessions could be scheduled as one contiguous four-hour session per week or two two-hour sessions per week. There will be about 15 exercises in a semester. It is recommended that all implementations are carried out in Java. If C or C++ has to be used, then the threads library will be required for concurrency. Exercises should be designed to cover the following topics:

- Implementation of graph search algorithms.
- Implementation and application of network flow and linear programming problems.
- Implementation of algorithms using the hill climbing and dynamic programming design techniques.
- Implementation of recursive backtracking algorithms.
- Implementation of randomized algorithms.
- Implementation of various locking and synchronization mechanisms for concurrent linked lists, concurrent queues, and concurrent stacks.
- Developing applications involving concurrency.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Design and apply iterative and recursive algorithms.
2. Design and implement algorithms using the hill climbing and dynamic programming and recursive backtracking techniques.
3. Design and implement optimisation algorithms for specific applications.
4. Design and implement randomized algorithms.
5. Design appropriate shared objects and concurrent objects for applications.
6. Implement and apply concurrent linked lists, stacks, and queues.

**REFERENCES:**

1. Jeff Edmonds, "How to Think about Algorithms", Cambridge University Press, 2008.
2. M. Herlihy and N. Shavit, "The Art of Multiprocessor Programming", Morgan Kaufmann, 2008.
3. Steven S. Skiena, "The Algorithm Design Manual", Springer, 2008.
4. Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.
5. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", McGrawHill, 2008.
6. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2006.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.
8. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, 1995.
9. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley, 1975.
10. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson, 2006.

**MU7112****MULTIMEDIA TOOLS LABORATORY****L T P C  
0 0 3 2****OBJECTIVES:**

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

The following experiments should be practiced

1. Audi and video editing
2. Image editing
3. 2D and 3D animation

(Tools such as HTML/Frontpage/Dreamweaver, Multimedia application enabling software, System software support for multimedia, Performance measurement tools for multimedia, Multimedia authoring tools, Web tools and applications). The case studies are:

- Video on-demand
- Interactive TV
- Home shopping
- Remote home care
- Electronic album
- Personalized electronic journals

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

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

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

**MU7113**

**MINI PROJECT**

**L T P C**  
**0 0 2 1**

The Mini project on multimedia network application software development

- Must use multimedia coding techniques.
- Must provide security
- Must prepare a Document in the form of report

**TOTAL :30 PERIODS**

**MU7201**

**GRAPHICS DESIGN AND MULTIMEDIA PRESENTATION**

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

**OBJECTIVES:**

- To develop skills in 2D and 3D Graphics concepts and Multimedia presentation with their applications.
- To learn and implement 2D and 3D Transformation drawing lines, circle, curve etc.,
- To learn about various color models with their features.
- To study about concepts of Multimedia and its applications.

**UNIT I INTRODUCTION**

**6**

I/O devices – I/O primitives –Attributes of output primitives– DDA – Bresenham technique – Circle drawing algorithms – Interactive input methods.

**UNIT II 2D GRAPHICS**

**9**

2D Transformations – Window View port mapping – Clipping algorithms – polygons – Splines – Bezier curves – Basics.

**UNIT III 3D GRAPHICS**

**12**

3D concepts – Representations – 3D transformation - Projections – Hidden surface removal – Visualization and rendering – Color models – Textures.

**UNIT IV OVERVIEW OF MULTIMEDIA**

**9**

Introduction to Multimedia - Multimedia Hardware & Software – Components of multimedia – Multimedia Authoring and tools – Multimedia Project development.

**UNIT V MULTIMEDIA SYSTEMS AND APPLICATIONS**

**9**

Multimedia Communication Systems – Database Systems – Synchronization issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive Video – Media on Demand.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Implement Transformations in 2Dimensional and 3Dimensional.
- Develop algorithms for drawing Line, polygon clipping, projection etc.,
- Apply and explore new techniques in the areas of Multimedia applications.
- Critically analyze different approaches to implement mini projects related with Multimedia applications.
- Explore the possibility of applying Multimedia concepts in various domains

**REFERENCES:**

1. Donald Hearn, M. Pauline Baker, "Computer Graphics – C Version", second edition, Pearson Education, 2006.
2. Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications & Applications" Pearson Education, 2004.
3. Tay Vaughan, "Multimedia Making It Work", McGraw Hill, 7 th edition, 2006.
4. J. D. Foley, A. VanDam, S. K. Feiner, J. F. Hughes, "Computer Graphics Principles and Practice", Addison and Wesley Publications, 2002.
5. Ze-Nian Li, Mark S. Drew, "Fundamentals Of Multimedia ", PHI, 2004.

**MU7202****IMAGE PROCESSING AND PATTERN RECOGNITION****L T P C****3 0 0 3****OBJECTIVES:**

To introduce the student to various Image processing and Pattern recognition techniques.

- To study the Image fundamentals.
- To study the mathematical morphology necessary for Image processing and Image segmentation.
- To study the Image Representation and description and feature extraction.
- To study the principles of Pattern Recognition.
- To know the various applications of Image processing.

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

Elements of an Image Processing System- Mathematical Preliminaries-Image Enhancement- Grayscale Transformation- Piecewise Linear Transformation-Bit Plane Slicing- Histogram Equalization--Histogram Specification- Enhancement by Arithmetic Operations- Smoothing Filter- Sharpening Filter- Image Blur Types and Quality Measures.

**UNIT II MATHEMATICAL MORPHOLOGY and IMAGE SEGMENTATION****9**

Binary Morphology-Opening and Closing- Hit-or-Miss Transform- Grayscale Morphology- Basic morphological Algorithms- Morphological Filters-Thresholding-Object (Component) Labeling- Locating Object Contours by the Snake Model- Edge Operators-Edge Linking by Adaptive Mathematical morphology- Automatic Seeded Region Growing- A Top-Down Region Dividing Approach.

**UNIT III IMAGE REPRESENTATION AND DESCRIPTION AND FEATURE EXTRACTION.****9**

Run-Length Coding- Binary Tree and Quadtree- Contour Representation-Skeletonization by Thinning- Medial Axis Transformation-Object Representation and Tolerance- Fourier Descriptor and Moment Invariants-Shape Number and Hierarchical Features-Corner Detection- Hough Transform-Principal Component Analysis-Linear Discriminate Analysis- Feature Reduction in Input and Feature Spaces.

**UNIT IV PATTERN RECOGNITION****9**

The Unsupervised Clustering Algorithm - Bayes Classifier- Support Vector Machine- Neural Networks-The Adaptive Resonance Theory Network-Fuzzy Sets in Image Analysis-Document image processing and classification-Block Segmentation and Classification- Rule-Based Character Recognition system- Logo Identification-Fuzzy Typographical Analysis for Character Pre classification-Fuzzy Model for Character Classification.

**UNIT V APPLICATIONS:****9**

Face and Facial Feature Extraction-Extraction of Head and Face Boundaries and Facial Features-Recognizing Facial Action Units-Facial Expression Recognition in JAFFE Database-Image Steganography- Types of Steganography- Applications of Steganography- Embedding Security and Imperceptibility- Examples of Steganography Software-Genetic Algorithm Based Steganography.

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

Upon Completion of the course, the students will be able

- To know the basic concepts in Image Processing.
- To segment the various types of Images.
- To represent the images in different forms
- To develop algorithms for Pattern Recognition
- To implement the features of Image processing in applications

**REFERENCES:**

1. Frank Y Shih, Image Processing and Pattern Recognition: Fundamentals and Techniques-, Willey IEEE Press, April 2010.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", Pearson Education, Inc., 2004.
3. D.E. Dudgeon and R.M. Mersereau, "Multidimensional Digital Signal Processing", Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, "Digital Image Processing", John Wiley, New York, 2002.
5. Milan Sonka et al, "Image Processing, Analysis and Machine Vision", Brookes/Cole, Vikas Publishing House, 2nd edition, 1999;
6. Sid Ahmed, M.A., "Image Processing Theory, Algorithms and Architectures", McGrawHill, 1995

**IF7203****DATA WAREHOUSING AND DATA MINING****L T P C  
3 0 0 3****OBJECTIVES:**

- To expose the students to the concepts of Data warehousing Architecture and Implementation
- To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- To learn to use association rule mining for handling large data
- To understand the concept of classification for the retrieval purposes
- To know the clustering techniques in details for better organization and retrieval of data
- To identify Business applications and Trends of Data mining

**UNIT I DATA WAREHOUSE****8**

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

**UNIT II DATA MINING & DATA PREPROCESSING****9**

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

**UNIT III ASSOCIATION RULE MINING****8**

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

**UNIT IV CLASSIFICATION & PREDICTION****10**

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

**UNIT V CLUSTERING****10**

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

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

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

- Store voluminous data for online processing
- Preprocess the data for mining applications
- Apply the association rules for mining the data
- Design and deploy appropriate classification techniques
- Cluster the high dimensional data for better organization of the data
- Discover the knowledge imbibed in the high dimensional system
- Evolve Multidimensional Intelligent model from typical system
- Evaluate various mining techniques on complex data objects

**REFERENCES:**

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008.
2. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. BERSON, ALEX & SMITH, STEPHEN J, Data Warehousing, Data Mining, and OLAP, TMH Pub. Co. Ltd, New Delhi, 2012
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007
6. PRABHU Data Warehousing, PHI Learning Private Limited, New Delhi, 2012, ,
7. PONNIAH, PAULRAJ, Data Warehousing Fundamentals, John Wiley & Sons, New Delhi, 2011
8. MARAKAS, GEORGE M, Modern Data Warehousing, Mining, and Visualization, Pearson Education, 2011

**MU7203****MULTIMEDIA DATABASES****L T P C****3 0 0 3****OBJECTIVES:**

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



<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
An introduction to Object-oriented Databases; Multidimensional Data Structures k-d Trees, Point Quadtrees, The MX-Quadtree, R-Trees, comparison of Different Data Structures		
<b>UNIT II</b>	<b>IMAGE DATABASES AND TEXT/DOCUMENT DATABASES</b>	<b>9</b>
Raw Images, Compressed Image Representations, Image Processing Segmentation, Similarity-Based Retrieval, Alternative Image DB Paradigms, Representing Image DBs with Relations, Representing Image DBs with R-Trees, Retrieving Images By Spatial Layout, Implementations Text/Document Databases Precision and Recall, Stop Lists, Word Stems, and Frequency Tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques		
<b>UNIT III</b>	<b>VIDEO DATABASES &amp; AUDIO DATABASES</b>	<b>9</b>
Video Databases Organizing Content of a Single Video, Querying Content of Video Libraries, Video Segmentation, video Standards Audio Databases A General Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data		
<b>UNIT IV</b>	<b>MULTIMEDIA DATABASES</b>	<b>9</b>
Design and Architecture of a Multimedia Database, Organizing Multimedia Data Based on The Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/Expansion, Web-based multimedia applications.		
<b>UNIT V</b>	<b>OBJECT MODEL &amp; SPATIAL DATABASES</b>	<b>9</b>
Creating Distributed Multimedia Presentations Objects in Multimedia Presentations, Specifying Multimedia Documents with Temporal Constraints, Efficient Solution of Temporal Presentation Constraints, Spatial Constraints. Introduction to Spatial Databases-Spatial Concepts and Data Models - Spatial Query Language - Spatial Storage and Indexing.		

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

**REFERENCES:**

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

**OBJECTIVES:**

- To understand the basics of different 2D and 3D transformations
  - To get an understanding of animation and authoring tools
  - To understand the concepts of 2D and 3D viewing and clipping
  - To gain the knowledge of interactive multimedia applications.
1. Line drawing algorithm, Circle drawing algorithms, Ellipse drawing algorithm
  2. 2D transformations
  3. Clipping algorithms
  4. 3D Graphics using OpenGL, 3D viewing, 3D transformations
  5. Developing interactive multimedia applications:

The case studies are

- Authoring a 2D presentation: (storyboard, design layout, collect the content, Presentation)
- Mini project using any of the popular authoring tools (say, flash, director, dreamweaver)
- Creating simple 3D animations and visualizations
- Multimedia encyclopaedia
- Multimedia security systems
- Multimedia mail and documents
- Visual Information Systems.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Implement various transformations on 2D and 3D
- Develop algorithms for viewing, clipping
- Build multimedia interactive applications.

**OBJECTIVES:**

- To study the design of databases for applications.
  - To practice DBMS query language SQL and embedded programming.
1. Database Querying – Nested queries, Sub queries and Joins
  2. Triggers & Transaction Control
  3. Embedded SQL & Database Connectivity with Front End Tools
  4. PL/SQL - Procedures and Functions
  5. Developing Multimedia Database Applications like **case studies** such as:
    - Interactive image and Video retrieval system
    - Executive information systems
    - Remote consulting systems
    - Video conferencing
    - Image and Video Indexing
    - Searching Image Documents

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- To design databases for various applications such as Image and Video Retrieval, Indexing.

Presentation of seminar on any one topic of the following areas from Journals like ACM/Elsevier/IETE/IEEE Transactions.

- Multimedia compression
- Multimedia Data structures and Indexing
- Image segmentation techniques
- Feature Extraction and Classification
- Protocols for routing techniques for multimedia data.
- Techniques for Multimedia security.
- Multimedia Databases – Queries and Transactions.

**TOTAL :30 PERIODS**

**OBJECTIVES:**

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

**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 MODELING SHAPES 9**

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

**UNIT III SHADING & ILLUMINATION MODELS 9**

Shading models – Flat shading – smooth shading – Reflections – Diffuse and specular reflection - Adding color - Antialiasing techniques – Dithering techniques - creating more shades and color – Opengl – specular highlights – spotlight – blending – reflections – applying colors- real world lights

**UNIT IV TEXTURE AND RENDERING 9**

Procedural and bitmaps textures - texture mapping or image – bump mapping – Environmental mapping – Magnification and minification, Minmapped textures – Ray tracing techniques - adding textures on to curved surfaces – tiling – fractals – Opengl – texture mapping

**UNIT V COMPUTER ANIMATION 9**

Raster methods – Design of animation sequences – animation techniques – Key-frame systems – motion specification – direct, kinematics, dynamics – rigid body animation – radiosity – collision detection – Graphics file format – Opengl animation procedures

**TOTAL: 45 PERIODS**

## OUTCOMES:

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

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

## 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.

**MU7001**

## **AUDIO VIDEO BROAD CASTING SYSTEMS**

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

## OBJECTIVES:

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

### **UNIT I INTRODUCTION TO BROADCASTING 9**

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

### **UNIT II DATA BROADCASTING 9**

Introduction to data Broadcasting- Data Broadcasting system overview and Architecture- Mpeg 2 Transport Basics- Data Categorization- Service Description Frame work – Synchronized Streaming Encapsulation – Data Piping Protocol.

### **UNIT III DESIGN AND INSTALLATION OF VIDEO AND AUDIO SYSTEMS 9**

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

### **UNIT IV AUDIO VIDEO STREAMING 9**

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

### **UNIT V ALGORITHMS AND INTERFACES 9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES:**

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

**REFERENCES:**

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

**MU7002****WEB PROGRAMMING TECHNIQUES****L T P C  
3 0 0 3****OBJECTIVES:**

- To understand the issues in the design of web application development
- To learn the concepts of client side and server side technologies
- To understand and learn the importance of java based security solutions
- To learn the concept of other framework

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

Internet Principles – Basic Web Concepts – Client/Server model – Retrieving data from Internet – Scripting Languages – Perl Programming – Next Generation Internet – Protocols and applications.

**UNIT II COMMON GATEWAY INTERFACE PROGRAMMING****9**

HTML forms – CGI Concepts – HTML tags Emulation – Server–Browser communication – E–mail generation – CGI Client side Applets – CGI Server Side Applets – Authorization and Security – CGI programs using Perl.

**UNIT III XML****9**

Creating Markup with XML – Document Type Definition – Schemas – Document Object Model – Simple API for XML – Extensible Stylesheet languages – Formatting Objects –Xpath – XLink and XPointer – Introduction to SOAP – Case Studies – Custom markup languages.

**UNIT IV SERVER SIDE PROGRAMMING****9**

Dynamic Web Content – Server Side – Communication – Active and Java Server Pages – Firewalls – Proxy Servers – Web Service Implementation.

**UNIT V ONLINE APPLICATIONS****9**

Simple applications – On–line Databases – Monitoring User Events – Plug–ins – Database connectivity – Internet Information Systems – EDI application in business –Internet commerce – Customization of Internet commerce.

**TOTAL: 45 PERIODS**

**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
- Design and development of applications using other frameworks

**REFERENCES:**

1. Deitel and Deitel, Nieto, Sadhu, "XML How to Program", Pearson Education publishers, 2001.
2. Eric Ladd, Jim O' Donnel, " Using HTML 4, XML and Java", Prentice Hall of India – QUE, 1999.
3. Jeffy Dwight, Michael Erwin and Robert Niles, "Using CGI", prentice Hall of India – QUE, 1999
4. Scot Johnson, Keith Ballinger, Davis Chapman, "Using Active Server Pages", Prentice Hall of India, 1999.
5. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina, "Web Engineering Modelling and Implementing web Applications", Springer, 2008.

**MU7003                      CREATIVITY, INNOVATION AND PRODUCT DEVELOPMENT                      L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the issues in the need of creativity and innovation.
- To learn the concepts of project selection and its purpose.
- To understand and learn the importance of new product development.
- To learn and design of creative application in different domain.

**UNIT I                      INTRODUCTION                      8**

The process of technological innovation – factors contributing to successful technological innovation – the need for creativity and innovation – creativity and problem solving – brain storming different techniques.

**UNIT II                      PROJECT SELECTION AND EVALUATION                      8**

Collection of ideas and purpose of project – Selection criteria – screening ideas for new products (evaluation techniques).

**UNIT III                      NEW PRODUCT DEVELOPMENT                      7**

Research and new product development – Patents – patent search – Patent laws – International code for patents – Intellectual property rights (IPR).

**UNIT IV                      NEW PRODUCT PLANNING                      7**

Design of proto type – testing – quality standards – marketing research – introducing new products.

**UNIT V                      LABORATORY                      15**

Creative design – Model Preparation – Testing – cost evaluation – Patent application

**TOTAL :45 PERIODS**

**OUTCOMES:**

**Students should be able to work with**

- Comparison of different technological innovation
- Analysis and design of Project selection and evaluation.
- Implementation of new product development.
- Design and implementation of creative applications in different domain areas.

**REFERENCES:**

1. Harry Nystrom, "Creativity and Innovation", John Wiley & Sons, 1979.
2. Brain Twiss, "Managing Technological Innovation", Pitman Publishing Ltd., 1992.
3. Harry B. Watton, "New Product Planning", Prentice-Hall Inc., 1992.
4. P.N. Khandwalla, "Fourth Eye (Excellence through Creativity)", Wheeler Publishing, Allahabad, 1992.
5. I.P.R. Bulletins, TIFAC, New Delhi, 1997.

**CP7018****LANGUAGE TECHNOLOGIES****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- To understand the mathematical foundations needed for language processing
- To understand the representation and processing of Morphology and Part-of Speech Taggers
- To understand different aspects of natural language syntax and the various methods used for processing syntax
- To understand different methods of disambiguating word senses
- To know about various applications of natural language processing
- To learn the indexing and searching processes of a typical information retrieval system and to study NLP based retrieval systems
- To gain knowledge about typical text categorization and clustering techniques

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

Natural Language Processing – Mathematical Foundations – Elementary Probability Theory – Essential information Theory - Linguistics Essentials - Parts of Speech and Morphology – Phrase Structure – Semantics – Corpus Based Work.

**UNIT II WORDS****9**

Collocations – Statistical Inference – n-gram Models – Word Sense Disambiguation – Lexical Acquisition.

**UNIT III GRAMMAR****9**

Markov Models – Part-of-Speech Tagging – Probabilistic Context Free Grammars – Parsing.

**UNIT IV INFORMATION RETRIEVAL****9**

Information Retrieval Architecture – Indexing - Storage – Compression Techniques – Retrieval Approaches – Evaluation - Search Engines - Commercial Search Engine Features – Comparison - Performance Measures – Document Processing - NLP based Information Retrieval – Information Extraction.

**UNIT V TEXT MINING****9**

Categorization – Extraction Based Categorization – Clustering - Hierarchical Clustering - Document Classification and Routing - Finding and Organizing Answers from Text Search – Text Categorization and Efficient Summarization using Lexical Chains – Machine Translation - Transfer Metaphor - Interlingual and Statistical Approaches.

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

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

- Identify the different linguistic components of given sentences
- Design a morphological analyser for a language of your choice using finite state automata concepts

- Implement a parser by providing suitable grammar and words
- Discuss algorithms for word sense disambiguation
- Build a tagger to semantically tag words using WordNet
- Design an application that uses different aspects of language processing.

#### REFERENCES:

1. Christopher D. Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
2. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson, 2008.
3. Ron Cole, J. Mariani, et al., "Survey of the State of the Art in Human Language Technology", Cambridge University Press, 1997.
4. Michael W. Berry, "Survey of Text Mining: Clustering, Classification and Retrieval", Springer Verlag, 2003.

**MU7004**

**SERVICE ORIENTED ARCHITECTURE**

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

#### COURSE OBJECTIVES:

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

#### UNIT I SOA BASICS

**9**

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

#### UNIT II SOA ANALYSIS AND DESIGN

**9**

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

#### UNIT III SOA GOVERNANCE

**9**

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

#### UNIT IV SOA IMPLEMENTATION

**9**

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

#### UNIT V APPLICATION INTEGRATION

**9**

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

**TOTAL: 45 PERIODS**



**OUTCOMES:****Students should be able to work with**

- Comparison of different IT architecture
- Analysis and design of SOA based applications
- Implementation of web service and realization of SOA
- Implementation of RESTful services
- Design and implementation of SOA based Application Integration using BPEL

**REFERENCES:**

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

**MU7005****NON LINEAR EDITING****L T P C  
3 0 0 3****OBJECTIVES:**

- To introduce the broad perceptiveness of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with the audio and video recording.
- To apply different media tools.
- To learn and understand the concepts of AVID XPRESS DV 4.

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

Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.

**UNIT II STORYTELLING****9**

Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management.

**UNIT III USING AUDIO AND VIDEO****9**

Capturing digital and analog video – importing audio – putting video on – exporting digital video to tape – recording to CDs and VCDs.

**UNIT IV WORKING WITH FINAL CUT PRO****9**

Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

**UNIT V WORKING WITH AVID XPRESS DV 4****9**

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

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

- Compare the strengths and limitations of Nonlinear editing.
- Identify the infrastructure and significance of storytelling.
- Apply suitable methods for recording to CDs and VCDs.
- Address the core issues of advanced editing and training techniques.
- Design and develop projects using AVID XPRESS DV 4

**REFERENCES:**

1. Robert M. Goodman and Partick McGarth, "Editing Digital Video: The Complete Creative and Technical Guide", Digital Video and Audio, McGraw-Hill 2003.
2. Keith Underdahl, "Digital Video for Dummies", Third Edition, Dummy Series, 2001.
3. Final Cut Pro 6 User Manual, 2004.
4. Avid Xpress DV 4 User Guide, 2007.

**NE7071****WEB DESIGN AND MANAGEMENT****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- To understand the issues and process of Web design.
- To learn the concepts of Web design patterns and page design.
- To understand and learn the scripting languages with design of web applications.
- To learn the maintenance and evaluation of web design management.

**UNIT I SITE ORGANIZATION AND NAVIGATION****9**

User centered design – Web medium – Web design process – Evaluating process – Site types and architectures – Navigation theory – Basic navigation practices – Search – Site maps.

**UNIT II ELEMENTS OF PAGE DESIGN****9**

Browser compatible design issues - Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia - GUI Widgets and Forms – Web Design patterns

**UNIT III SCRIPTING LANGUAGES****10**

Client side scripting: XHTML – DHTML– JavaScript– XML Server side scripting: Perl – PHP – ASP/JSP Designing a Simple web application

**UNIT IV PRE-PRODUCTION MANAGEMENT****8**

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing content.

**UNIT V PRODUCTION, MAINTENANCE AND EVALUATION****9**

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study.

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

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

- Identify the various issues of web design process and evaluation.
- Determine templates for web pages and layout.
- Develop simple web applications using scripting languages.
- Determine the various issues of web project development.
- Address the core issues of web page maintenance and evaluation.

## REFERENCES:

1. Thomas A. Powell, "The Complete Reference – Web Design", Tata McGraw Hill, Third Edition, 2003.
2. Ashley Friedlein, "Web Project Management", Morgan Kaufmann Publishers, 2001.
3. H. M. Deitel, P. J. Deitel, A. B. Goldberg, "Internet and World Wide Web – How to Program", Third Edition, Pearson Education 2004.
4. Joel Sklar, "Principles of Web Design", Thomson Learning, 2001.
5. Van Duyne, Landay, and Hong "The Design of Sites: Patterns for creating winning web sites", 2<sup>nd</sup> Edition, Prentice Hall, 2006.
6. Lynch, Horton and Rosenfeld, "Web Style Guide: Basic Design Principles for Creating Web Sites", 2<sup>nd</sup> Edition, Yale University Press, 2002.

**MU7006**

**VISUALIZATION TECHNIQUES**

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

## OBJECTIVES:

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

### **UNIT I INTRODUCTION**

**9**

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

### **UNIT II FOUNDATIONS FOR DATA VISUALIZATION**

**9**

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

### **UNIT III COMPUTER VISUALIZATION**

**9**

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

### **UNIT IV MULTIDIMENSIONAL VISUALIZATION**

**9**

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

### **UNIT V CASE STUDIES**

**9**

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

**TOTAL: 45 PERIODS**

## OUTCOMES:

The student will be able

- To compare various visualization techniques.
- To design creative visualizations.
- To apply visualization over different types of data.

## REFERENCES:

1. Colin Ware, "Information Visualization Perception for Design" Morgan Kaufmann Publishers, 2nd edition, 2004.
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, 1st Edition, 2006
4. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers.

**OBJECTIVES**

- To understand the mathematical foundations needed for speech processing
- To understand the basic concepts and algorithms of speech processing and synthesis
- To familiarize the students with the various speech signal representation, coding and recognition techniques
- To appreciate the use of speech processing in current technologies and to expose the students to real– world applications of speech processing

**UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9**

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

**UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9**

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral Processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

**UNIT III SPEECH RECOGNITION 9**

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques.

**UNIT IV TEXT ANALYSIS 9**

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation schematic – Speaking Style – Symbolic Prosody – Duration Assignment – Pitch Generation

**UNIT V SPEECH SYNTHESIS 9**

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems.

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

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

- Identify the various temporal, spectral and cepstral features required for identifying speech units – phoneme, syllable and word
- Determine and apply Mel-frequency cepstral coefficients for processing all types of signals
- Justify the use of formant and concatenative approaches to speech synthesis
- Identify the apt approach of speech synthesis depending on the language to be processed
- Determine the various encoding techniques for representing speech.

**REFERENCES:**

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, “Spoken Language Processing – A guide to Theory, Algorithm and System Development”, Prentice Hall PTR, 2001.
2. Thomas F.Quatieri, “Discrete-Time Speech Signal Processing”, Pearson Education, 2002.
3. Lawrence Rabiner and Bing-Hwang Juang, “Fundamentals of Speech Recognition”, Prentice Hall Signal Processing Series, 1993.
4. Sadaoki Furui, “Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications)”, Marcel Dekker, 2000.
5. Joseph Mariani, “Language and Speech Processing”, Wiley, 2009.

**COURSE OBJECTIVES:**

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system

**UNIT I CLOUD ARCHITECTURE AND MODEL 9**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture.

Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

**UNIT II VIRTUALIZATION 9**

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

**UNIT III CLOUD INFRASTRUCTURE 9**

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

**UNIT IV PROGRAMMING MODEL 9**

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

**UNIT V SECURITY IN THE CLOUD 9**

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

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

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player
- Choose the appropriate Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services
- Set a private cloud

## REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer.
8. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
9. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, 'Mastering Cloud Computing', TMGH,2013.
10. Gautam Shroff,Enterprise Cloud Computing,Cambridge University Press,2011
11. Michael Miller, Cloud Computing,Que Publishing,2008
12. Nick Antonopoulos, Cloud computing,Springer Publications,2010

**MU7007**

**VIRTUAL REALITY**

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

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

**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.

**NE7002 MOBILE AND PERVASIVE COMPUTING L T P C  
3 0 0 3**

**COURSE OBJECTIVES :**

- To understand the basics of Mobile Computing and Personal Computing
- To learn the role of cellular networks in Mobile and Pervasive Computing
- To expose to the concept of sensor and mesh networks
- To expose to the context aware and wearable computing
- To learn to develop applications in mobile and pervasive computing environment

**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 Databases – 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 & WEARABLE 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  
Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications

**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:**

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

- Design a basic architecture for a pervasive computing environment
- Design and allocate the resources on the 3G-4G wireless networks
- Analyze the role of sensors in Wireless networks
- Work out the routing in mesh network
- Deploy the location and context information for application development
- Develop mobile computing applications based on the paradigm of context aware computing and wearable 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, ‘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. Mohammad s. Obaidat et al, “Pervasive Computing and Networking”, John wiley
10. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions”, Wiley, 2009.
11. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwiebert “Fundamentals of Mobile and Pervasive Computing, “, McGraw-Hill, 2005

<b>MU7008</b>	<b>USER INTERFACE DESIGN</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**OBJECTIVES:**

- To understand the basics of User Interface Design.
- To design the user interface, design, menu creation and windows creation
- To understand the concept of menus, windows, interfaces, business functions, various problems in windows design with colour, text, Non-anthropomorphic Design.
- To study the design process and evaluations.



<b>UNIT I</b>	<b>INTERACTIVE SOFTWARE AND INTERACTION DEVICE</b>	<b>9</b>
Human-Computer Interface – Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic & Principles.		
<b>UNIT II</b>	<b>HUMAN COMPUTER INTERACTION</b>	<b>9</b>
User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed –Business Functions –Requirement Analysis – Direct – Indirect Methods – Basic Business Functions – Design Standards – General Design Principles – Conceptual Model Design – Conceptual Model Mock-Ups		
<b>UNIT III</b>	<b>WINDOWS</b>	<b>9</b>
Characteristics– Components– Presentation Styles– Types– Managements– Organizations– Operations– Web Systems– System Timings - Device– Based Controls Characteristics– Screen – Based Controls — Human Consideration In Screen Design – Structures Of Menus – Functions Of Menus– Contents Of Menu– Formatting – Phrasing The Menu – Selecting Menu Choice– Navigating Menus– Graphical Menus. Operate Control – Text Boxes– Selection Control– Combination Control– Custom Control– Presentation Control.		
<b>UNIT IV</b>	<b>MULTIMEDIA</b>	<b>9</b>
Text For Web Pages – Effective Feedback– Guidance & Assistance– Internationalization– Accessibility– Icons– Image– Multimedia – Coloring- Case Study: Addressing usability in E-Commerce sites		
<b>UNIT V</b>	<b>DESIGN PROCESS AND EVALUATION</b>	<b>9</b>
User Interface Design Process - Usability Testing - Usability Requirements and Specification procedures and techniques- User Interface Design Evaluation		

**TOTAL:45 PERIODS**

**OUTCOMES:**

- Knowledge on development methodologies, evaluation techniques and user interface building tools
- Explore a representative range of design guidelines
- Gain experience in applying design guidelines to user interface design tasks.
- Ability to design their own Human Computer

**REFERENCES:**

1. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, John Wiley& Sons, 2001.
2. Deborah Mayhew, The Usability Engineering Lifecycle, Morgan Kaufmann, 1999Ben Shneiderman, “Design The User Interface”, Pearson Education, 1998.
3. Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd., 2002. Sharp, Rogers, Preece, ‘Interaction Design’, Wiley India Edition, 2007
4. Alan Dix et al, " Human - Computer Interaction ", Prentice Hall, 1993.
5. Ben Schneiderman, " Designing the User Interface ", Addison Wesley, 2000.

**COURSE OBJECTIVES:**

- To provide information about wider engineering issues that form the background to develop complex, evolving (software-intensive) systems
- To gain basic knowledge about object-oriented analysis and to familiarize UML concepts
- To study the requirements of various domain applications
- To design, implement and test the software in object oriented approach
- To discuss the issues in managing the software projects
- To explore the standards related to life cycle process

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

System Concepts – Software Engineering Concepts – Development Activities – Managing Software Development –Modelling with UML – Project Organization and Communication – Case Study

**UNIT II REQUIREMENT ELICITATION AND ANALYSIS****9**

Requirements Elicitation Concepts – Requirements Elicitation Activities – Managing Requirements Elicitation– Analysis Concepts – Analysis Activities – Managing Analysis - Case Study

**UNIT III SYSTEM DESIGN****9**

Decomposing the system – Overview of System Design – System Design Concepts – System Design Activities: Objects to Subsystems – System Design Activities: Addressing Design Goals – Managing System Design - Case Study

**UNIT IV OBJECT DESIGN, IMPLEMENTATION AND TESTING****9**

Object Design Overview – Reuse Concepts – Design Patterns – Reuse Activities – Managing Reuse – Interfaces Specification Concepts – Interfaces Specification Activities – Managing Object Design – Mapping Models to Code Overview – Mapping Concepts – Mapping Activities – Managing Implementation – Testing – Case Study

**UNIT V MANAGING CHANGE****9**

Rationale Management Overview – Rationale Concepts – Rationale Activities: From Issues to Decisions – Managing Rationale – Configuration Management Overview – Configuration Management Concepts – Configuration Management Activities – Managing Configuration Management – Project Management Overview – Project Management Activities – Standard for Developing Life Cycle Process (IEEE 1074) – Overview of Capability Maturity Model (CMM) – Life Cycle Models

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

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

- Apply Object Oriented Software Engineering approach in every aspect of software project
- Analyse the requirements from various domains
- Evaluate the relationships between Software Design and Software Engineering
- Adapt appropriate object oriented design aspects in the development process
- Implement and test the software project using object oriented approach
- Manage the issues regarding the decision making and changes in the different stage of software development
- Implement mini projects incorporating the principles of object oriented software engineering

**REFERENCES:**

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd ed, PearsonEducation, 2004.
2. Ivar Jacobson, "Object Oriented Software Engineering", Pearson Education, 1992
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
4. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

**MU7009****INTELLIGENT AGENT SYSTEMS****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

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

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

Agents and Multi Agent Systems- Intelligent Agent- Concepts of Building Agent – Situated Agents – Proactive and Reactive agents- Challenging Agent Environment- Social Agents- Agent Execution Cycle- Prometheus Methodology- Guidelines for using Prometheus- Agent Oriented Methodologies- System Specification – Goal Specification – Functionalities – Scenario Development – Interface Description – Checking for Completeness and Consistency.

**UNIT II ARCHITECTURAL DESIGN****9**

Agent Types - Grouping Functionalities - Agent Coupling - Develop Agent Descriptors - Interactions - Interaction Diagram from Scenarios- Interaction Protocol from Interaction Diagram- Develop Protocol and Message Descriptors –Architectural Design - Identifying the Boundaries of Agent System – Percepts and Action - Shared Data Objects – System Overview – Checking for Completeness and Consistency.

**UNIT III MODEL DESIGN CONCEPTS****9**

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

**UNIT IV PATTERN ORIENTED MODELING****9**

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

**UNIT V AGENTS FOR INTELLIGENT ASSISTANCE****9**

Computer Characters- Software Agents for Cooperative Learning – Integrated Agents- Agent Oriented Programming- KQML as an Agent Communication Language- Agent Based Framework for Interoperability - Agents for Information Gathering - KAoS- Communicative Actions for Artificial Agents – Mobile Agents.

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

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

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

## REFERENCES:

1. Lin Padgham and Michael Winikoff "Developing Intelligent Agent System " John Wiley,2004.
2. Steven F. RailsBack and Volker Grimm "Agent-Based and Individual Based modeling",s,Princeton university press, 2012
3. Lin Padgham and Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", John Wiley & sons Publication, 2004.
4. Jeffrey M. Bradshaw, "Software Agents", MIT Press , 1997.
5. Steven F. RailsBack and Volker Grimm, "Agent-Based and Individual Based modeling: A Practical Introduction", Princeton University Press, 2012.

IF7301

SOFT COMPUTING

L T P C  
3 0 0 3

## OBJECTIVES:

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

### UNIT I INTRODUCTION TO SOFT COMPUTING 9

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

### UNIT II GENETIC ALGORITHMS 9

Introduction, Building block hypothesis, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem),Differences & similarities between GA & other traditional methods, Applications of GA.

### UNIT III NEURAL NETWORKS 9

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

### UNIT IV FUZZY LOGIC 9

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

### UNIT V NEURO-FUZZY MODELING 9

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

**TOTAL: 45 PERIODS**

## OUTCOMES:

- Implement machine learning through Neural networks.
- Develop a Fuzzy expert system.
- Model Neuro Fuzzy system for clustering and classification.
- Write Genetic Algorithm to solve the optimization problem

## REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer-Verlag Berlin Heidelberg, 2005.
3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
5. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2007.
6. Mitsuo Gen and Runwei Cheng,"Genetic Algorithms and Engineering Optimization", Wiley Publishers 2000.
7. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
8. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.
9. Eiben and Smith "Introduction to Evolutionary Computing" Springer
10. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7, River Edge, World Scientific, 1997.

IF7003

VIDEO ANALYTICS

L T P C  
3 0 0 3

## OBJECTIVES:

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

### UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS

9

Introduction to Big Data Platform – Challenges of Conventional systems – Web data- Evolution of Analytic scalability- analytic processes and tools- Analysis Vs Reporting- Modern data analytic tools- Data Analysis: Regression Modeling- Bayesian Modeling- Rule induction.

### UNIT II MINING DATA STREAMS

9

Introduction to Stream concepts- Stream data model and architecture – Stream Computing- Sampling data in a Stream- Filtering Streams- Counting distinct elements in a Stream- Estimating moments- Counting oneness in a window- Decaying window- Real time Analytics platform(RTAP) applications- case studies.

### UNIT III VIDEO ANALYTICS

9

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

### UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION

9

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

**UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS 9**

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

**TOTAL:45 PERIODS**

**OUTCOMES:**

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

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

**REFERENCES:**

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

**MU7010 CONTENT BASED IMAGE RETRIEVAL L T P C  
3 0 0 3**

**OBJECTIVES**

- To learn about Content-Based Image Retrieval with user needs
- To gain knowledge about content-based image and video retrieval system.
- To have knowledge about the survey of Content-Based Image Retrieval

**UNIT I INTRODUCTION 9**

Fundamentals – Definition of CBIR - A typical CBIVR system architecture-User’s perspective-Image use in the community- Users needs for image data.

**UNIT II DESIGN OF CONTENT-BASED IMAGE RETRIEVAL SYSTEM 9**

Feature extraction and representation- Similarity measurements-Dimension Reduction and High dimensional Indexing- Clustering-The Semantic Gap-Learning-Relevance Feedback(RF)- Benchmarking CBIVR solutions.

**UNIT III DESIGN OF CONTENT-BASED VIDEO RETRIEVAL SYSTEM 9**

The problem – Video Parsing-Video Abstraction and Summarization-Video content representation, Indexing and Retrieval-Video browsing schemes-Examples of Video Retrieval systems.

**UNIT-IV SURVEY OF CONTENT-BASED IMAGE RETRIEVAL SYSTEM 9**

Criteria – Systems: ADL – AMORE-ASSERT-BDLP-CANDID-CBIRD-CVBQ-CHROMA-Quicklook2-VisualSEEK-WISE.

**UNIT V CASE STUDY: MUSE****9**

Overview of the System-User's Perspective-The RF mode-RFC mode-Experiments and Results

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

- To apply knowledge of content-based image retrieval system
- To model and design of Retrieval system.
- To develop Content-Based Image Retrieval system with simple case studies.

**REFERENCES:**

1. Oge Marques, Borgo Furht, "Content Based Image and Video Retrieval", Kluwer Academic Publishers, 2002.
2. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008
3. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008, New Delhi.

**NE7012****SOCIAL NETWORK ANALYSIS****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- To understand the concepts of Social networks and Web Social Networks
- To appreciate the modeling and visualizing techniques associated with Social Networks
- To understand the different techniques used to mine communities from Web Social Networks
- To appreciate concepts of evolution and prediction in Social Networks
- To understand the application of text mining techniques for Content and Opinion mining

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

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

**UNIT II MODELING AND VISUALIZATION****9**

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data - RandomWalks and their Applications –Use of Hadoop and MapReduce - Ontological representation of social individuals and relationships.

**UNIT III MINING COMMUNITIES****9**

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

**UNIT IV EVOLUTION****9**

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models

**UNIT V TEXT AND OPINION MINING****9**

Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

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

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

- Build a social network data set from existing social networking sites
- Identify the different components of a web social network that can be used for analyzing and mining
- Identify the different data structures and graph algorithms that can be used for web social network mining
- Implement a community detection algorithm
- Process Social Network data using MapReduce paradigm
- Design an application that uses various aspects of Social Network Mining to improve its functionality and to harvest information available on the web to build recommender systems
- Analyze social media data using appropriate data/web mining techniques

**REFERENCES:**

1. Charu C. Aggarwal, “Social Network Data Analytics”, Springer; 2011
2. Peter Mika, “Social Networks and the Semantic Web”, Springer, 1<sup>st</sup> edition 2007.
3. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 1<sup>st</sup> edition, 2010.
4. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer, 1<sup>st</sup> edition, 2011.
5. Giles, Mark Smith, John Yen, “Advances in Social Network Mining and Analysis”, Springer, 2010.
6. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2009.
7. Toby Segaran, “Programming Collective Intelligence”, O’Reilly, 2012

**MU7011****VIDEO COMPRESSION****L T P C  
3 0 0 3****OBJECTIVES :**

- To introduce principles and current technologies of multimedia systems.
- To study the issues in effectively representing, processing and transmitting multimedia data including text, graphics, sound and music, image and video.
- To study the Image, video and audio standards such as JPEG, MPEG, H.26x, Dolby Digital and AAC will be reviewed.
- To study the applications such as video conferencing, multimedia data indexing and retrieval will also be introduced.



<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Overview of image compression - important information theory concepts - entropy definition and interpretation - Shannon-Fanon coding - Huffman coding - Adaptive Huffman coding - Lempel-Ziv codec- QM codec, context-based QM coder - examples of lossless compression		
<b>UNIT II</b>	<b>QUANTIZATION</b>	<b>9</b>
Scalar quantization, optimal scalar quantizer, commander- Vector quantization- Audio and speech compression- JPEG & JPEG-2000 still image compression- Video coding standards (A) MPEG-1, MPEG-2		
<b>UNIT III</b>	<b>VIDEO PROCESSING</b>	<b>9</b>
Video coding standards H.264/AVC and HEVC- Video coding techniques - motion estimation, rate control algorithms, pre & post processing- Video delivery/streaming over wired and wireless networks		
<b>UNIT IV</b>	<b>ADVANCED VIDEO CODING TECHNIQUES</b>	<b>9</b>
Mobile multimedia computing- Multimedia content management and protection- Future directions – Multi-view video coding, depth coding and others		
<b>UNIT V</b>	<b>CONTENT MANAGEMENT</b>	<b>9</b>
Video Compression-Motion Compensation, H.261 standard – FMM-14 Multimedia Applications Content-based retrieval in digital libraries – FMM		

**TOTAL:45 PERIODS**

**OUTCOMES:**

Upon Completion of the course, the students will be able

- To know principles and current technologies of multimedia systems
- To know issues in effectively representing, processing, and retrieving multimedia data
- To know the areas by implementing some components of a multimedia streaming system
- To know the latest web technologies and some advanced topics in current multimedia research

**REFERENCES:**

1. Handbook of Image and Video processing - Al Bovik (Alan C Bovik), Academic Press, Second Edition, 2005.
2. Digital Image Sequence Processing, Compression, and Analysis - Todd R. Reed, CRC Press, 2004.
3. H.264 and MPEG-4 Video Compression: Video Coding for Next Generation Multimedia - Iain E.G. Richardson, Wiley, 2003
4. Digital Video Processing - A. Murat Tekalp, Prentice Hall, 1995
5. Andy Beach, "Real World Video Compression" Pearson Education, 2010.
6. Peter D. Symes , " Video Compression Demystified" McGraw-Hill, 2001.
7. Yun Q. Shi, Huifang Sun," Image and Video Compression for Multimedia Engineering Fundamentals, Algorithms, and Standards" 2<sup>nd</sup> Edition 2008.