ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
M.E. MULTIMEDIA TECHNOLOGY
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. To enable graduates to excel in multimedia technology and information technology profession by adapting to rapid advances in newer technologies.
2. To provide graduates a proper foundation in mathematical, scientific, multimedia and engineering fundamentals to solve real world problems.
3. To train graduates with good scientific, multimedia technologies and solve real time problems.

PROGRAM OUTCOMES (POs)
Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and\design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

1) To learn the basics of multimedia technologies and protocols.
2) To analyze, design and develop animation movies involving computer graphics and video analytics using advanced techniques and tools.
3) To apply media security in virtual reality video processing using IoT for multimedia applications.
4) To innovate ideas and smart solutions for game development,sound engineering and production of short films.

Provide mapping of 1) POs to PEOs and 2) PSOs to PEOs.
Use the following marking:

Contribution 1: Reasonable 2:Significant 3:Strong

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	2	3	2							
2	3				3		2			**1**
3			2	2		2		1	1	
4		3		2	2	2	2	3	2	

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	3	2	2	1	1	2	2	2
2	3	2	2	2	2	2	2	1	1	2	2	2
3	2	3	2	2	2	2	2	2	3	2	3	2
4	3	3	3	2	2	2	2	3	2	1	2	3

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

YEAR	SEMESTER	SUBJECTS	PROGRAMME OUTCOMES									
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
I YEAR	SEM I	Applied Probability and Statistics	3	1		1						
		Advanced Data Structures and Algorithms		2	2	2	3	2	1	1		
		Advanced Computer Architecture		1	3	1	2		1		1	**2**
		Operating System Internals	2		3		2	1	2			
		Advanced Software Engineering	1		2	1	2			2	2	2
		Advanced Databases	2	1	2		2	2	2			
		Data Structures Laboratory		2	3	1	2		1		1	2
		Databases Laboratory	3		3		2	1	2			
	SEM II	Multimedia Communication Networks	2	1	2		2	2	2	1		
		Advanced Computer Graphics and Animation	1	3	1	3	2		2		1	2
		Digital Image Processing and Pattern Recognition				1	2			3	2	2
		Video Analytics	2	1	2		2	2	2	1	1	1
		Professional Elective I										
		Multimedia Compression Techniques	2	1	2	2	3	2	2	1		2
		3D Game Modeling and Rendering	2	3	2	2		1		2		
		Web Design and Programming	2	2	3		2		1		1	1
		Cloud Computing Technologies	2	2	2	3	2		1	1		1
		Professional Elective II										
		Media Security		2	3	2		1	1	1		
		Biometrics		2	3	3	2	2	1	1	1	1
		Data Warehousing and Data Mining	1	2	3		2		2	2	1	1
		Multimedia Information Storage and Retrieval		2	3	3	2	1	2	1	2	1
		Computer Vision	1	2	3		2		2	2	1	1
		Term Paper Writing and Seminar	2	1	1						3	
		Multimedia Tools Laboratory		1	3	2	2		1		1	1

II YEAR	**SEM III**	Professional Elective III										
		Human Computer Interaction		1	2	2	3	1		1		2
		Medical Image Processing		2	3	2		1	1	1		
		GPU Architecture and Programming		2	3	3	2	2	1	1	1	1
		Sound Engineering	1	2	3		2		2	2	1	1
		Software Development for Short film Development		3	2		2	1			2	
		Professional Elective IV										
		Virtual Reality			3				2	1	1	1
		Digital Video Processing		2	2	3	2		1	1		
		Cryptography and Multimedia Data Hiding	2	2	2	1	1					1
		Multimedia Coding Techniques		1	3	1	2		1	1		
		Professional Elective V										
		Social Network Analysis	2	2	3				1	3	1	1
		Non Linear Editing	2	2	2	3	2		1	1		1
		User Interface Design	1	2	2		2		1		1	
		Internet of Things	3		3				2	1	1	1
		Project Work Phase I	2	2	2	3	2		1	1		1
	SEM IV	Project Work (Phase II)		2	3	3	2	1	2	1	2	1

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CURRICULA AND SYLLABI

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA5160	Applied Probability and Statistics	FC	4	4	0	0	4
2.	CP5151	Advanced Data Structures and Algorithms	PC	4	4	0	0	4
3.	CP5152	Advanced Computer Architecture	PC	3	3	0	0	3
4.	CP5153	Operating System Internals	PC	3	3	0	0	3
5.	CP5154	Advanced Software Engineering	PC	3	3	0	0	3
6.	IF5191	Advanced Databases	PC	3	3	0	0	3
PRACTICALS								
7.	CP5161	Data Structures Laboratory	PC	4	0	0	4	2
8.	IF5161	Databases Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**20**	**0**	**8**	**24**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MU5251	Multimedia Communication Networks	PC	3	3	0	0	3
2.	MU5201	Advanced Computer Graphics and Animation	PC	3	3	0	0	3
3.	MU5252	Digital Image Processing and Pattern Recognition	PC	3	3	0	0	3
4.	IF5092	Video Analytics	PC	3	3	0	0	3
5.		Professional Elective I	PE	3	3	0	0	3
6.		Professional Elective II	PE	3	3	0	0	3
PRACTICALS								
7.	CP5281	Term Paper Writing and Seminar	EEC	2	0	0	2	1
8.	MU5211	Multimedia Tools Laboratory	PC	4	0	0	4	2
			TOTAL	**24**	**18**	**0**	**6**	**21**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective III	PE	3	3	0	0	3
2.		Professional Elective IV	PE	3	3	0	0	3
3.		Professional Elective V	PE	3	3	0	0	3
PRACTICALS								
4.	MU5311	Project Work Phase I	EEC	12	0	0	12	6
			TOTAL	**21**	**9**	**0**	**12**	**15**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1.	MU5411	Project Work Phase II	EEC	24	0	0	24	12
			TOTAL	**24**	**0**	**0**	**24**	**12**

TOTAL NO. OF CREDITS:72

FOUNDATION COURSES (FC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA5160	Applied Probability and Statistics	FC	4	4	0	0	4

PROFESSIONAL CORE (PC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CP5151	Advanced Data Structures and Algorithms	PC	4	4	0	0	4
2.	CP5152	Advanced Computer Architecture	PC	3	3	0	0	3
3.	CP5153	Operating System Internals	PC	3	3	0	0	3
4.	CP5154	Advanced Software Engineering	PC	3	3	0	0	3
5.	IF5191	Advanced Databases	PC	3	3	0	0	3
6.	CP5161	Data Structures Laboratory	PC	4	0	0	4	2
7.	IF5161	Databases Laboratory	PC	4	0	0	4	2
8.	MU5251	Multimedia Communication Networks	PC	3	3	0	0	3
9.	MU5201	Advanced Computer Graphics and Animation	PC	3	3	0	0	3
10	MU5252	Digital Image Processing and Pattern Recognition	PC	3	3	0	0	3
11	IF5092	Video Analytics	PC	3	3	0	0	3
12	MU5211	Multimedia Tools Laboratory	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)*

SEMESTER II
ELECTIVE I

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MU5091	Multimedia Compression Techniques	PE	3	3	0	0	3
2.	MU5001	3D Game Modeling and Rendering	PE	3	3	0	0	3
3.	MU5002	Web Design and Programming	PE	3	3	0	0	3
4.	CP5092	Cloud Computing Technologies	PE	3	3	0	0	3

SEMESTER II
ELECTIVE II

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MU5003	Media Security	PE	3	3	0	0	3
2.	MU5004	Biometrics	PE	3	3	0	0	3
3.	MU5071	Data Warehousing and Data Mining	PE	3	3	0	0	3
4.	MU5005	Multimedia Information Storage and Retrieval	PE	3	3	0	0	3
5.	CP5095	Computer Vision	PE	3	3	0	0	3

SEMESTER III
ELECTIVE III

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MP5091	Human Computer Interaction	PE	3	3	0	0	3
2.	MU5006	Medical Image Processing	PE	3	3	0	0	3
3.	IF5071	GPU Architecture and Programming	PE	3	3	0	0	3
4.	MU5007	Sound Engineering	PE	3	3	0	0	3
5.	MU5008	Software Development for Short film Development	PE	3	3	0	0	3

SEMESTER III
ELECTIVE IV

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MU5009	Virtual Reality	PE	3	3	0	0	3
2.	MU5010	Digital Video Processing	PE	3	3	0	0	3
3.	MU5011	Cryptography and Multimedia Data Hiding	PE	3	3	0	0	3
4.	MU5012	Multimedia Coding Techniques	PE	3	3	0	0	3

SEMESTER III
ELECTIVE V

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CP5074	Social Network Analysis	PE	3	3	0	0	3
2.	MU5013	Non Linear Editing	PE	3	3	0	0	3
3.	MU5014	User Interface Design	PE	3	3	0	0	3
4.	CP5292	Internet of Things	PE	3	3	0	0	3

***Professional Electives are grouped according to elective number as was done previously.**

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CP5281	Term Paper and Seminar	EEC	2	0	0	2	1
2.	CP5311	Project Work Phase – I	EEC	12	0	0	12	6
3.	CP5411	Project Work Phase – II	EEC	24	0	0	24	12

MA5160 APPLIED PROBABILITY AND STATISTICS L T P C
4 0 0 4

OBJECTIVES:

This course is designed to provide the solid foundation on topics in applied probability and various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling. It is framed to address the issues and the principles of estimation theory, testing of hypothesis and multivariate analysis.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT III ESTIMATION THEORY 12

Unbiased estimators – Method of moments – Maximum likelihood estimation - Curve fitting by principle of least squares – Regression lines.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and Type II errors – Small and large samples – 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 12

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: 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following topics:

- Basic probability axioms and rules and the moments of discrete and continuous random variables.
- Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

REFERENCES :

1. Devore, J. L., “Probability and Statistics for Engineering and the Sciences”, 8th Edition, Cengage Learning, 2014.
2. Dallas E. Johnson, “Applied Multivariate Methods for Data Analysis”, Thomson and Duxbury press, 1998.
3. Gupta S.C. and Kapoor V.K.,” Fundamentals of Mathematical Statistics”, Sultan and Sons, New Delhi, 2001.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund’s Probability and Statistics for Engineers ", Pearson Education, Asia, 8th Edition, 2015.
5. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, 5th Edition, Pearson Education, Asia, 2002.

CP5151 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C

4 0 0 4

OBJECTIVES:

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

UNIT I ROLE OF ALGORITHMS IN COMPUTING 12

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

UNIT II HIERARCHICAL DATA STRUCTURES 12

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III GRAPHS 12

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra’s Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm;

UNIT IV ALGORITHM DESIGN TECHNIQUES 12

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

UNIT V NP COMPLETE AND NP HARD 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

REFERENCES:

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

CP5152	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To learn the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP 9

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP - Multithreading

UNIT II MEMORY HIERARCHY DESIGN 9

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III MULTIPROCESSOR ISSUES 9

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

UNIT IV MULTICORE ARCHITECTURES 9

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers- Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer.

UNIT V VECTOR, SIMD AND GPU ARCHITECTURES 9

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

TOTAL :45 PERIODS

OUTCOMES:

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

- Identify the limitations of ILP.
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism.
- Discuss the various techniques used for optimising the cache performance
- Design hierarchal memory system
- Point out how data level parallelism is exploited in architectures

REFERENCES:

1. Darryl Gove, “Multicore Application Programming: For Windows, Linux, and Oracle Solaris”, Pearson, 2011.
2. David B. Kirk, Wen-mei W. Hwu, “Programming Massively Parallel Processors”, Morgan Kauffman, 2010.
3. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/software approach” , Morgan Kaufmann /Elsevier Publishers, 1999.
4. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
5. Kai Hwang and Zhi.Wei Xu, “Scalable Parallel Computing”, Tata McGraw Hill, New Delhi, 2003.

CP5153 OPERATING SYSTEM INTERNALS L T P C

3 0 0 3

OBJECTIVES:

- To be able to read and understand sample open source programs and header files.
- To learn how the processes are implemented in linux.
- To understand the implementation of the Linux file system.
- To study Linux memory management data structures and algorithms.
- To acquire the knowledge in the implementation of interprocess communication.
- To understand how program execution happens in Linux.

UNIT I INTRODUCTION 9

Basic Operating System Concepts - Overview of Unix File System - Files - Links - Types - Inodes - Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization - Interprocess Communication - Process Management - Memory Management - Device Drivers.

UNIT II PROCESSES 9

Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - - System Calls - Kernel Threads - Destroying Processes -Termination - Removal.

UNIT III FILE SYSTEM 9

The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Filesystems - Filesytem Type Registration - Filesytem Handling - Namespaces - Mounting - Unmounting - Implementation of VFS System Calls.

UNIT IV MEMORY MANAGEMENT 9

Page frame management -page descriptors - non-uniform memory access - memory zones - reserved page frames - zoned page frame allocator - kernel mappings - buddy system algorithm - page frame cache - zone allocator.

UNIT V PROCESS COMMUNICATION AND PROGRAM EXECUTION 9

Process Communication - Pipes -Usage - Data Structures - Creating and Destroying a Pipe - Reading From and Writing into a Pipe. Program Execution - Executable Files - Process Credentials - Command-Line Arguments and Shell Environment - Libraries - Program Segments and Process Memory Regions - Execution tracing - Executable Formats - Execution Domains - The exec Functions

TOTAL: 45 PERIODS

OUTCOMES:

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

- To explain the functionality of a large software system by reading its source.
- To revise any algorithm present in a system.
- To design a new algorithm to replace an existing one.
- To appropriately modify and use the data structures of the linux kernel for a different software system.

REFERENCES:

1. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005.
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, “Structure and Interpretation of Computer Programs”, Second Edition, Universities Press, 2013.
3. Maurice J. Bach, “The Design of the Unix Operating System” 1st Edition Pearson Education, 2003.
4. Michael Beck, Harald Bohme, Mirko Dziadzka, Ulrich Kunitz, Robert Magnus, Dirk Verworner, **“**Linux Kernel Internals”, 2nd Edition, Addison-Wesley, 1998.
5. Robert Love, “Linux Kernel Development”, 3rd Edition, Addison-Wesley, 2010.

CP5154	ADVANCED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Software Engineering Lifecycle Models
- To do project management and cost estimation
- To gain knowledge of the System Analysis and Design concepts.
- To understand software testing approaches
- To be familiar with DevOps practices

UNIT I INTRODUCTION 9

Software engineering concepts – Development activities – Software lifecycle models - Classical waterfall - Iterative waterfall – Prototyping – Evolutionary - Spiral – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management.

UNIT II SOFTWARE REQUIREMENT SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram.

UNIT III ARCHITECTURE AND DESIGN 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client-server - Tiered - Pipe and filter.- User interface design

UNIT IV TESTING 9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking

UNIT V DEVOPS 9

DevOps:Motivation-Cloud as a platform-Operations- Deployment Pipeline:Overall Architecture-Building and Testing-Deployment- Case study: Migrating to Microservices.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the advantages of various Software Development Lifecycle Models
- Gain knowledge on project management approaches as well as cost and schedule estimation strategies
- Perform formal analysis on specifications
- Use UML diagrams for analysis and design
- Architect and design using architectural styles and design patterns
- Understand software testing approaches
- Understand the advantages of DevOps practices

REFERENCES:

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd edition, Pearson Education, 2004.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
4. Len Bass, Ingo Weber and Liming Zhu, “DevOps: A Software Architect’s Perspective”, Pearson Education, 2016
5. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
6. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

IF5191	ADVANCED DATABASES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the emerging databases like Mobile, XML, Cloud and Big Data

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

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

UNIT II INTELLIGENT DATABASES 9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases TSQL2- Deductive Databases-Recursive Queries in SQL- Spatial Databases- Spatial Data Types - Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

UNIT III XML DATABASES 9

XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity.

UNIT IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols.

UNIT V MULTIMEDIA DATABASES 9

Multidimensional Data Structures – Image Databases – Text / Document Databases – Video Databases – Audio Databases – Multimedia Database Design.

TOTAL :45PERIODS

OUTCOMES:

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

- To develop skills on databases to optimize their performance in practice.
- To analyze each type of databases and its necessity.
- To design faster algorithms in solving practical database problem.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers,2006.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
4. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education/Addison Wesley, 2010.
5. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.

CP5161 **DATA STRUCTURES LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.

LIST OF EXPERIMENTS

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:

EXPERIMENTS:

1. Implementation of Merge Sort and Quick Sort-Analysis
2. Implementation of a Binary Search Tree
3. Red-Black Tree Implementation
4. Heap Implementation
5. Fibonacci Heap Implementation
6. Graph Traversals
7. Spanning Tree Implementation
8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
9. Implementation of Matrix Chain Multiplication
10. Activity Selection and Huffman Coding Implementation.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Design and implement basic and advanced data structures extensively.
- Design algorithms using graph structures
- Design and develop efficient algorithms with minimum complexity using design techniques.

IF5161 **DATABASES LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

The student should be able:

- To understand the concepts of DBMS.
- To familiarize with SQL queries.
- To write stored procedures in DBMS.
- To learn front end tools to integrate with databases.

EXPERIMENTS IN THE FOLLOWING TOPICS:

1. Data Definition, Manipulation of Tables and Views, Database Querying – Simple queries, Nested queries, Sub queries and Joins.
2. Triggers, Transaction Control.

3. Embedded SQL, Database Connectivity with Front End Tools High level language extensions - PL/SQL Basics, Procedures and Functions.
4. Active Databases, Deductive Databases.
5. Distributed and Parallel Transactions and Query Processing .
6. Mobile Database Query Processing.
7. Object Oriented Database Design.
8. Multimedia Database for Image and Video Processing.
9. Spatial and Temporal Databases.
10. XML Databases and No SQL Database Storage and Retrieval.

TOTAL : 60 PERIODS

OUTCOMES :

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

- Design and Implement databases.
- Formulate complex queries using SQL.
- Design and Implement applications that have GUI and access databases for backend connectivity

MU5251	MULTIMEDIA COMMUNICATION NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the multimedia communication models
- To analyze the guaranteed service model
- To study the multimedia transport in wireless networks
- To explore real-time multimedia network applications

UNIT I MULTIMEDIA COMMUNICATION MODELS 9

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

UNIT II BEST EFFORT AND GUARANTEED SERVICE MODEL 9

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

UNIT III MULTIMEDIA ON IP NETWORKS 9

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

UNIT IV TRANSPORT LAYER SUPPORT FOR MULTIMEDIA 9

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

UNIT V MULTIMEDIA QOS ON WIRELESS NETWORKS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- Deploy the right Multimedia Communication models
- Apply QoS to multimedia network applications with efficient routing techniques
- Develop the real-time multimedia network applications

REFERENCES:

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

MU5201 ADVANCE COMPUTER GRAPHICS AND ANIMATION L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION 9

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

UNIT II TRANSFORMATIONS 9

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

UNIT III FRACTALS 9

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

UNIT IV ADVANCED RENDERING TECHNIQUE 9

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

UNIT V ANIMATION 9

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

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of this course, the student will:

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

REFERENCES:

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

MU5252	DIGITAL IMAGE PROCESSING AND PATTERN RE COGNITION	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

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

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9

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

UNIT III IMAGE SEGMENTATION AND MORPHOLOGY 9

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

UNIT IV INTRODUCTION TO PATTERN RECOGNITION 9

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

UNIT V IMAGE PATTERN RECOGNITION CASE STUDIES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course

- The students should be able to implement basic image processing algorithms using MATLAB tools
- Design an application that incorporates different concepts of Image processing
- Apply and explore new techniques in the areas of image enhancement, restoration, segmentation, compression, wavelet processing and image morphology
- Critically analyze different approaches to implements mini projects
- Explore the possibility of Appling image processing concepts in various domains

REFERENCES:

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

IF5092 **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:

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

REFERENCES:

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

CP5281 **TERM PAPER WRITING AND SEMINAR** **L T P C**
0 0 2 1

In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation

Please keep a file where the work carried out by you is maintained.
Activities to be carried Out

Activity	Instructions	Submission week	Evaluation
Selection of area of interest and Topic Stating an Objective	You are requested to select an area of interest, topic and state an objective	2nd week	**3 %** Based on clarity of thought, current relevance and clarity in writing
Collecting Information about your area & topic	1. List 1 Special Interest Groups or professional society 2. List 2 journals 3. List 2 conferences, symposia or workshops 4. List 1 thesis title 5. List 3 web presences (mailing lists, forums, news sites) 6. List 3 authors who publish regularly in your area 7. Attach a call for papers (CFP) from your area.	3rd week	**3%** (the selected information must be area specific and of international and national standard)

Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter	• You have to provide a complete list of references you will be using- Based on your objective -Search various digital libraries and Google Scholar
	• When picking papers to read - try to:
	  • Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them,
	  • Favour papers from well-known journals and conferences,
		4th week	**6%**
			(the list of standard papers and reason for selection)

	• Favour “first” or “foundational” papers in the field (as indicated in other people’s survey paper), • Favour more recent papers, • Pick a recent survey of the field so you can quickly gain an overview, • Find relationships with respect to each other and to your topic area (classification scheme/categorization) • Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered		
Reading and notes for first 5 papers	Reading Paper Process • For each paper form a Table answering the following questions: • What is the main topic of the article? • What was/were the main issue(s) the author said they want to discuss? • Why did the author claim it was important? • How does the work build on other’s work, in the author’s opinion? • What simplifying assumptions does the author claim to be making? • What did the author do? • How did the author claim they were going to evaluate their work and compare it to others? • What did the author say were the limitations of their research? • What did the author say were the important directions for future research? Conclude with limitations/issues not addressed by the paper (from the perspective of your survey)	5th week	**8%** (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Reading and notes for next5 papers	Repeat Reading Paper Process	6th week	**8%** (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Reading and notes for final 5 papers	Repeat Reading Paper Process	7th week	**8%** (the table given should indicate your understanding of the paper and the evaluation is based on

			your conclusions about each paper)
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, along with a classification / categorization diagram	8th week	**8%** (this component will be evaluated based on the linking and classification among the papers)
Abstract	Prepare a draft abstract and give a presentation	9th week	**6%** (Clarity, purpose and conclusion) **6%** Presentation & Viva Voce
Introduction Background	Write an introduction and background sections	10th week	**5%** (clarity)
Sections of the paper	Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey	11thweek	**10%** (this component will be evaluated based on the linking and classification among the papers)
Your conclusions	Write your conclusions and future work	12th week	**5%** (conclusions – clarity and your ideas)
Final Draft	Complete the final draft of your paper	13th week	**10%** (formatting, English, Clarity and linking) **4%** Plagiarism Check Report
Seminar	A brief 15 slides on your paper	14th & 15th week	**10%** (based on presentation and Viva-voce)

TOTAL : 30 PERIODS

MU5211 **MULTIMEDIA TOOLS LABORATORY** **L T P C**
0 0 4 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: 60 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

MU5091 **MULTIMEDIA COMPRESSION TECHNIQUES** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF COMPRESSION **9**

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

UNIT II TEXT COMPRESSION 9

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

UNIT III IMAGE COMPRESSION 9

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

UNIT IV AUDIO COMPRESSION 9

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

UNIT V VIDEO COMPRESSION 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

1. Darrel Hankerson, Greg A Harris, Peter D Johnson, ‘Introduction to Information Theory and Data Compression’ Second Edition, Chapman and Hall ,CRC press, 2003
2. David Solomon, “Data Compression – The Complete Reference”, Fourth Edition, Springer Verlog, New York, 2006.
3. Khalid Sayood: Introduction to Data Compression”, Morgan Kauffman Harcourt India, Third Edition, 2010.
4. Mark S. Drew, Ze-Nian Li, “Fundamentals of Multimedia”, PHI, 2009.
5. Peter Symes : Digital Video Compression, McGraw Hill Pub., 2004.
6. Yun Q.Shi, Huifang Sun, “Image and Video Compression for Multimedia Engineering,Algorithms and Fundamentals”, CRC Press, 2003.

MU5001 **3D GAME MODELING AND RENDERING** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I MATHEMATICS FOR MODELING **9**

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

UNIT II CHARACTER MODELING AND SHADING **9**

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

UNIT III GAME DESIGN PRINCIPLES **9**

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

UNIT IV GAMING PLATFORMS AND FRAMEWORKS **9**

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

UNIT V GAME DEVELOPMENT **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the student will:

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

REFERENCES:

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

MU5002 WEB DESIGN AND PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I WEB DESIGN BASICS 9

Web Engineering and application development – Introduction – challenges and role of web engineering – Web design methods – Design issues – OOWS model_driven approach – OOHDM – UML based web Engineering – Designing Multichannel Web Application – Designing web application with web ML and Web Ratio – semantic web Information System - Quality evaluation and experimental web Engineering – Measuring and evaluating web application – need for empirical Web engineering.

UNIT II CLIENT AND SERVER SIDE SCRIPTING 9

Web technology basics – HTML5 – Cascading Style Sheet – clinet side scripting – java script – java script objects – XML basics – DOM – SAX – XSL – AJAX – RSS – database connectivity – server side scripting – servlet – servlet life cycle – servlet based web application – JSP / PHP / ASP.NET – case study.

UNIT III WEB APPLICATION DEVELOPMENT 9

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

UNIT IV COMPONENT BASED DEVELOPMENT 9

Service Tier and Data tier – EJB architecture – session beans – entity beans – message driven beans – J2EE connector architecture - Web Services – J2EE Web Services – patterns – presentation, service tier and Data tier patterns – J2ME – J2ME application development

UNIT V ADVANCED FRAMEWORKS 9

Understanding Struts – MVC framework – Struts control flow – building mode, view and controller component - Hibernate – Architecture – understanding O/R mapping – Query language - Spring framework – architecture -case studies – current trends

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
- Developing web services using J2EE and related technologies
- Design and development of applications using other frameworks

REFERENCES:

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

CP5092	CLOUD COMPUTING TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of virtualization and virtual machines
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions
- To gain knowledge on the concept of virtualization that is fundamental to cloud computing
- To understand the various issues in cloud computing
- To be able to set up a private cloud
- To understand the security issues in the grid and the cloud environment

UNIT I VIRTUALIZATION 9

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization –– Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization

UNIT II VIRTUALIZATION INFRASTRUCTURE 9

Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization – Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization -

Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT III CLOUD PLATFORM ARCHITECTURE 9

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms : GAE,AWS – Inter-cloud Resource Management

UNIT IV PROGRAMMING MODEL 9

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus

UNIT V CLOUD SECURITY 9

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

TOTAL : 45 PERIODS

OUTCOMES:

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

- Employ the concepts of storage virtualization, network virtualization and its management
- Apply the concept of virtualization in the cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Develop services using Cloud computing
- Apply the security models in the cloud environment

REFERENCES:

1. Danielle Ruest, Nelson Ruest, “Virtualization: A Beginner‟s Guide”, McGraw-Hill Osborne Media, 2009.
2. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
5. Tim Mather, Subra Kumaraswamy, and Shahed Latif ,"Cloud Security and Privacy", O’Reilly Media, Inc.,2009.
6. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
7. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

MU5003	MEDIA SECURITY	L T P C
		3 0 0 3

OBJECTIVES:

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

UNIT I BASICS OF CRYPTOGRAPHY 8

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

UNIT II DIGITAL WATERMARKING 12

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

UNIT III DIGITAL WATERMARKING TECHNIQUES 8

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

UNIT IV INTRODUCTION TO DIGITAL STEGANOGRAPHY 7

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

UNIT V STEGANALYSIS 10

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

TOTAL : 45 PERIODS

OUTCOMES:

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

REFERENCES:

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

MU5004 **BIOMETRICS** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I BIOMETRICS FUNDAMENTALS 9

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

UNIT II FINGER AND FACIAL SCAN 9

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

UNIT III IRIS AND VOICE 9

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

UNIT IV PHYSIOLOGICAL BIOMETRICS 9

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

UNIT V BIOMETRICS APPLICATION DEVELOPMENT 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

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

MU5071	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understanding data warehousing and OLAP Concepts
- Understanding of the value of data mining in solving real-world problems.
- Understanding of foundational concepts underlying data mining.
- Understanding of algorithms commonly used in data mining tools

UNIT I DATA WAREHOUSING 9

Introduction – Basic Concepts, Data Warehouse Modeling: Data Cube an OLAP, Data Warehouse Design and Usage, Implementation, Data Generalization, Data Cube Technology, Concepts, Computation methods, query Processing, Multidimensional Data Analysis.

UNIT II INTRODUCTION TO DATA MINING 9

Need for Data Mining, Kinds of Data, Kinds of patterns, Kinds of Applications, Issues, Data Objects and Attribute types, Statistical Descriptions of Data, Data Visualization, Measuring data similarity and dissimilarity, Data Preprocessing

UNIT III ASSOCIATION MINING 9

Concepts, Frequent Item set Mining Methods, Pattern Evaluation Methods, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Mining High-Dimensional Data, Mining Compressed Patterns, Pattern Exploration and Application

UNIT IV CLASSIFICATION 9

Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Bagging and Boosting, Random Forests, Bayesian Belief Networks, Backpropagation, SVM, Associative Classification, Lazy learners, Genetic algorithms, Rough Set Approach, Fuzzy Set Approaches, Multi class classification, Semi-supervised classification, Active Learning, Transfer Learning

UNIT V CLUSTERING 9

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation, Advanced Cluster Analysis, Outlier Detection, Applications and Trends in Data Mining

TOTAL :45 PERIODS

OUTCOMES:

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

- Demonstrate multidimensional modelling of data in a data warehouse
- Display a comprehensive understanding of different data mining tasks and the algorithms most appropriate for addressing them.
- Evaluate models/algorithms with respect to their accuracy.
- Demonstrate capacity to perform a self-directed piece of practical work that requires the application of data mining techniques.
- Conceptualise a data mining solution to a practical problem.

REFERENCES:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. David J. Hand, Heikki Mannila and Padhraic Smyth "Principles of Data Mining" (Adaptive Computation and Machine Learning), 2005
3. Ian H.Witten, Eibe Frank and Mark A. Hall,"Data Mining, Practical Machine Learning Tools and Techniques", Third Edition, The Morgan Kaufmann Series in Data Management Systems, 2011,Elsevier Publications
4. Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining: Concepts and Techniques", Third Edition (The Morgan Kaufmann Series in Data Management Systems), 2012.
5. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", 2003
6. Soman, K. P., Diwakar Shyam and Ajay V. "Insight Into Data Mining: Theory And Practice", PHI, 2009.

MU5005	MULTIMEDIA INFORMATION STORAGE AND RETRIEVAL	L T P C 3 0 0 3

OBJECTIVES:

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

UNIT I FUNDAMENTAL MEDIA UNDERSTANDING 9

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

UNIT II TEXT RETRIEVAL AND MUSIC 9

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

UNIT III IMAGE RETRIEVAL 9

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

UNIT IV VIDEO RETRIEVAL 9

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

UNIT V RETRIEVAL METRICS AND MODERN IR 9

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student can able to

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

REFERENCES:

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

CP5095 COMPUTER VISION L T P C

3 0 0 3

OBJECTIVES:

- To review image processing techniques for computer vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional image analysis techniques
- To understand motion analysis
- To study some applications of computer vision algorithms

UNIT I IMAGE PROCESSING FOUNDATIONS 9

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II SHAPES AND REGIONS 9

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT III HOUGH TRANSFORM 9

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT IV 3D VISION AND MOTION 9

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

UNIT V APPLICATIONS 9

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

TOTAL : 45 PERIODS

OUTCOMES:

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

- Implement fundamental image processing techniques required for computer vision
- Perform shape analysis
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections
- Apply 3D vision techniques
- Implement motion related techniques
- Develop applications using computer vision techniques

REFERENCES:

1. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.
2. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.
4. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
5. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.
6. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.

MP5091 HUMAN COMPUTER INTERACTION L T P C
3 0 0 3

OBJECTIVES:

- To know how to analyze and consider user's need in the interaction system.
- To understand various interaction design techniques and models.
- To understand the theory and framework of HCI.
- Understand and analyze the cognitive aspects of human – machine interaction.

UNIT I INTRODUCTION 9

Foundation – Human – Computer – Interaction – Paradigms – What is HCI – Components – Cognitive Framework – Perception and Representation – Attention and Memory Constraint – Knowledge and Mental Model – Interface Metaphors – Input – Output.

UNIT II DESIGN PROCESS 9

Interaction Styles – Interaction Design Basics – HCI in the Software Process – Design Rules - Designing Windowing Systems - User Support and On-Line Information - Designing For Collaborative Work and Virtual Environments - Principles and User-Centred Design - Methods for User-Centred Design.

UNIT III IMPLEMENTATION AND EVALUATION PROCESS 9

Implementation issues – Implementation Support - Evaluation techniques – Universal Design – User Support.

UNIT IV MODELS 9

Cognitive models – Communication and collaboration models: Models of the system – Models of the System – Modeling Rich Interaction.

UNIT V APPLICATIONS 9

Socio – organization issues and stakeholder requirements - Ubiquitous Computing - Context – aware User Interfaces - Hypertext, multimedia and the World Wide Web.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Develop good design for human machine interaction system
- Analyze the user's need in interaction system
- Design new interaction model to satisfy all types of customers
- Evaluate the usability and effectiveness of various products
- Know how to apply interaction techniques for systems

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory D.Abowd, Russell Beale, "Human Computer Interaction", Third Edition, Pearson Education, 2004
2. Dix, Finlay, Abowd and Beale. "Human – Computer Interaction", Second edition, Prentice Hall,1998.
3. J. Preece, Y. Rogers, H. Sharp, D. Benyon, S. Holland and T. Carey. "Human – Computer Interaction", Addison Wesley, 1994.
4. John M.Carrol, "Human Computer Interaction in the New Millenium", Pearson Education, 2002

MU5006 **MEDICAL IMAGE PROCESSING** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

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

UNIT II BIO-MEDICAL IMAGE PREPROCESSING 9

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

UNIT III MEDICAL IMAGE RECONSTRUCTION 9

Mathematical preliminaries and basic reconstruction methods, Image reconstruction in CT scanners, MRI, fMRI, Ultra sound imaging., 3D Ultra sound imaging Nuclear, Medical Imaging modalities – SPECT,PET, Molecular Imaging.

UNIT IV IMAGE ANALYSIS AND CLASSIFICATION 9

Image segmentation- pixel based, edge based, region based segmentation. Active contour models and Level sets for medical image segmentation, Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and statistical image classification.

UNIT V IMAGE REGISTRATIONS AND VISUALIZATION 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

REFERENCES:
1. Alasdair Mc Andrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning 2011, India.
2. Alfred Horowitz, ‘MRI Physics for Radiologists – A Visual Approach’, Second edition Springer Verlag Network, 1991.
3. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
4. Atam P.Dhawan, “Medical Image Analysis’, Wiley Interscience Publication, NJ S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011, New Delhi.
5. Geoff Dougherty, “Digital Image Processing for Medical Applications”, Cambridge University Press, 2010.
6. John L.Semmlow, ”Biosignal and Biomedical Image Processing Matlab Based applications” Marcel Dekker Inc., New York,2004
7. Kavyan Najarian and Robert Splerstor,” Biomedical signals and Image processing”,CRC – Taylor and Francis, New York, 2006
8. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008, New Delhi

IF5071 GPU ARCHITECTURE AND PROGRAMMING L T P C
3 0 0 3

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

UNIT I GPU ARCHITECTURES 9
Parallel Processors – Classification – Performance – Multimedia SIMD Architectures. GPU – NVIDIA Case Study – GPU Computational Structures – ISA – Memory Structures.

UNIT II GPU COMPUTING AND CUDA 9
Introduction – Parallel Programming Languages and models – Evolution of Graphic pipelines – GPGPUs - CUDA Program Structure – Device memories – Data Transfer – Kernel Functions

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

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

MU5007	SOUND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I INTRODUCTION TO BROADCASTING 9

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

UNIT II DATA BROADCASTING 9

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

UNIT III DESIGN AND INSTALLATION OF VIDEO AND AUDIO SYSTEMS 9

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

UNIT IV AUDIO VIDEO STREAMING 9

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

UNIT V ALGORITHMS AND INTERFACES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

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

MU5008 SOFTWARE DEVELOPMENT FOR SHORT FILM DEVELOPMENT L T P C

3 0 0 3

OBJECTIVES:

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

UNIT I GRAMMAR OF DOCUMENTARIES 9

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

UNIT II DEVELOPING THE STORY – PREPRODUCTION 9

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

UNIT III SHOOTING THE STORY – PRODUCTION 9

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

UNIT IV BUILDING THE STORY – POST PRODUCTION 9

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

UNIT V PROJECT – PRACTICE & SCREENING 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

REFERENCES:

1. Alan Rosenthal. Writing, Directing, and Producing Documentary Film, SIU Press, 2007.
2. Andy Glynne. Documentaries and How to Make Them, Kamera Books, Harpenden, Herts, 2012.
3. Barry Hampe. Making Documentary Films and Videos: A Practical Guide to Planning, Filming, and Editing Documentaries, Henry Holt and Company, 2007.
4. Clifford Thurlow. Making Short Films: The Complete Guide from Script to Screen (2nd Edition), Oxford International Publishers, 2008.
5. Genevieve Jolliffe and Andrew Zinnes. The Documentary Film Makers Handbook: A Guerilla Guide, Continuum International Publishing Group, New York, 2006.
6. James R. Martin. Create Documentary Films, Videos, and Multimedia: A Comprehensive Guide to Using Documentary Storytelling Techniques for Film, Video, the Internet and Digital Media Nonfiction Projects (Films Cinema), Real Deal Press, 2010.
7. Louise Spence and Vinicius Navarro. Crafting Truth: Documentary Form and Meaning, Rutgers University Press, New Brunswick, N.J., 2011.
8. Michael Rabiger. Directing the Documentary, Focal Press, 2004.

MU5009 VIRTUAL REALITY L T P C

3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION 9

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

UNIT II VR ARCHITECTURE 9

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

UNIT III VR MODELING 9

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

UNIT IV VR PROGRAMMING 9

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

UNIT V VR APPLICATIONS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

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

MU5010 DIGITAL VIDEO PROCESSING L T P C

3 0 0 3

OBJECTIVES:

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

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

UNIT I FUNDAMENTALS OF VIDEO PROCESSING 9

Video Formation, Perception and Representation - Video Capture and Display – Principles of Color Video - Video Cameras – Video Display and Composite versus Component Models and Gamma Correction – Analog Video Raster – Progressive vs Interlaced scans - – Digital Video – Notation – ITU– R.BT.601Digital Video Format and Other Digital Video Formats and Applications

UNIT II DIGITAL VIDEO ENHANCEMENT AND SEGMENTATION 9

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

UNIT III VIDEO ANALYSIS AND TRACKING 9

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

UNIT IV MOTION ESTIMATION 9

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

UNIT V VIDEO CLASSIFICATION AND RECOGITION 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

1. A. Murat Tekalp ,"Digital Video Processing", Pearson, 2010.
2. Alan Bovik C “The Essential Guide to Video Processing”, Academic Press Inc, 2009.
3. Maggio E., Cavallaro A., Video Tracking, Wiley , 2011.
4. Michael A. Smith, Takeo Kanade, Multimodal Video Characterization and Summarization, The Kluwer International Series in Video Computing, 2005.
5. Niels NielsHaering, Niels Da Vitoria Lobo, Visual Event Detection, The International Series in Video Computing, Springer US, 2001.
6. Oge Marques ‘Practical Image and Video processing using Matlab”, IEEE Press, 2011.

MU5011 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. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001.
2. Douglas R. Stinson ,“Cryptography Theory and Practice ”, Third Edition, Chapman & Hall/CRC, 2006
3. I. Cox, M. Miller, J. Bloom: Digital Watermarking, Morgan Kaufman Publishers, 2001.
4. Kaufman, R. Perlman, and M. Speciner, Network Security: Private Communication in a Public World, 2nd ed., Prentice Hall, ISBN 0-13-0460192.
5. L.C. Washington, W. Trappe: Introduction to Cryptography with Coding Theory, Prentice Hall, 2001.
6. Min Wu, Bede Liu, “Multimedia Data Hiding”, Springer-Verlag New York Inc., 2002.
7. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007.
8. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.

MU5012 MULTIMEDIA CODING TECHNIQUES L T P C
3 0 0 3

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

OUTCOMES:

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

- Articulate the fundamental properties of media elements
- Analyze the various coding techniques and theory behind.
- Verify the contrast between Lossless and lossy image coding techniques
- Familiarize with Video Coding techniques and standards

REFERENCES:

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

CP5074	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the components of the social network
- To model and visualize the social network
- To mine the users in the social network
- To understand the evolution of the social network
- To know the applications in real time systems

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 **–** Random Walks and their Applications –Use of Hadoop and Map Reduce - 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 APPLICATIONS **9**

A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection

TOTAL : 45 PERIODS

OUTCOMES:

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

- Work on the internals components of the social network
- Model and visualize the social network
- Mine the behaviour of the users in the social network
- Predict the possible next outcome of the social network
- Apply social network in real time applications

REFERENCES:

1. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2012.
2. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 1st edition, 2011
3. Charu C. Aggarwal, “Social Network Data Analytics”, Springer; 2014
4. Giles, Mark Smith, John Yen, “Advances in Social Network Mining and Analysis”, Springer, 2010.
5. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer, 1st edition, 2012
6. Peter Mika, “Social Networks and the Semantic Web”, Springer, 1st edition, 2007.
7. Przemyslaw Kazienko, Nitesh Chawla,”Applications of Social Media and Social Network Analysis”, Springer,2015

MU5013 NON LINEAR EDITING **L T P C**

3 0 0 3

OBJECTIVES:

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

MU5014 USER INTERFACE DESIGN L T P C

3 0 0 3

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.

UNIT I INTERACTIVE SOFTWARE AND INTERACTION DEVICE 9

Human–Computer Interface – Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic & Principles.

UNIT II HUMAN COMPUTER INTERACTION 9

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

UNIT III WINDOWS 9

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.

UNIT IV MULTIMEDIA 9

Text For Web Pages – Effective Feedback– Guidance & Assistance– Internationalization– Accessibility– Icons– Image– Multimedia – Coloring- Case Study: Addressing usability in E-Commerce sites

UNIT V DESIGN PROCESS AND EVALUATION 9

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

CP5292	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I INTRODUCTION TO IoT 9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT II IoT ARCHITECTURE 9

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

UNIT III IoT PROTOCOLS 9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security.

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO 9

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS 9

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

TOTAL :45 PERIODS

OUTCOMES:

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

- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Rasperry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
3. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012