ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M. E. MULTIMEDIA TECHNOLOGY

REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

To enable graduates to

I. Use their foundational expertise in multimedia technology to adapt to the rapid advances in the media-oriented fields.
II. Analyze and gather new information on modern tool usage, and investigate complex problems.
III. Apply their mathematical and analytical fundamentals with a research aptitude to solve real world technical problems.
IV. Function effectively and work collaboratively on multidisciplinary projects and exhibit high levels of professional and ethical values in organizations and society at large.
V. Pursue entrepreneurship showcasing their leadership and innovative technical skills.

2. PROGRAMME OUTCOMES

The graduates will be able to

1. Independently carry out research/investigation and development work to solve practical problems.
2. Write and present a substantial technical report/document.
3. Demonstrate a degree of mastery over Multimedia technology.
4. Use their foundational expertise in multimedia technology to adapt to the rapid advances in the media-oriented fields; analyze and gather new information on modern tool usage, and investigate complex problems.
5. Function effectively and work collaboratively on multidisciplinary projects and exhibit high levels of professional and ethical values in organizations and society at large.
6. Pursue entrepreneurship showcasing their leadership and innovative technical skills.

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M. E. MULTIMEDIA TECHNOLOGY
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABI
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4151	Applied Probability and Statistics for Computer Science Engineers	FC	3	1	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	CP4151	Advanced Data Structures and Algorithms	PCC	3	0	0	3	3
4.	MU4151	Advanced Graphics and Animation	PCC	3	0	2	5	4
5.	MU4152	Multimedia Communication Networks	PCC	3	0	0	3	3
6.	MU4153	Principles of Multimedia	PCC	3	0	0	3	3
7.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
8.	CP4161	Advanced Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
9.	MU4161	Multimedia Authoring Tools Laboratory	PCC	0	0	4	4	2
			TOTAL	**19**	**1**	**10**	**30**	**23**

*Audit course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MU4251	Digital Image Processing	PCC	3	0	0	3	3
2.	MU4252	Media Security	PCC	3	0	0	3	3
3.	MU4291	Mixed Reality	PCC	3	0	2	5	4
4.	MU4201	Multimedia Databases	PCC	3	0	0	3	3
5.		Professional Electives I	PEC	3	0	0	3	3
6.		Professional Electives II	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
8.	MU4211	Term Paper Writing and Seminar	EEC	0	0	2	2	1
9.	MU4212	Digital Image Processing Laboratory	PCC	0	0	2	2	1
			TOTAL	**20**	**0**	**6**	**26**	**21**

*Audit course is optional

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MU4301	Video and Audio Processing	PCC	3	0	0	3	3
2.		Professional Electives III	PEC	3	0	0	3	3
3.		Professional Electives IV	PEC	3	0	2	5	4
4.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
5.	MU4311	Project Work I	EEC	0	0	12	12	6
			TOTAL	**12**	**0**	**14**	**26**	**19**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	MU4411	Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTAL NO. OF CREDITS: 75

PROFESSIONAL ELECTIVES

SEMESTER II, ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MU4001	Sound Engineering	PEC	3	0	0	3	3
2.	MU4091	Multimedia Compression Techniques	PEC	3	0	0	3	3
3.	MU4002	3D Game Modeling and Rendering	PEC	3	0	0	3	3
4.	ML4151	Artificial Intelligence	PEC	3	0	0	3	3
5.	BD4251	Big Data Mining and Analytics	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MU4003	Multimedia Information Storage and Retrieval	PEC	3	0	0	3	3
2.	IF4092	Computer Vision	PEC	3	0	0	3	3
3.	IF4093	GPU computing	PEC	3	0	0	3	3
4.	IF4095	Social Network Analysis	PEC	3	0	0	3	3
5.	MP4251	Cloud Computing Technologies	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MU4004	Non Linear Editing	PEC	3	0	0	3	3
2.	MU4005	User Interface Design	PEC	3	0	0	3	3
3.	MU4006	Voice Technologies	PEC	3	0	0	3	3
4.	MP4092	Human Computer Interaction	PEC	3	0	0	3	3
5.	MU4007	Web design and Management	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MU4008	Video Processing and Analytics	PEC	3	0	2	5	4
2.	MU4009	Short film Development	PEC	3	0	2	5	4
3.	MX4291	Medical Image Processing	PEC	3	0	2	5	4
4.	CP4252	Machine Learning	PEC	3	0	2	5	4
5.	CP4291	Internet of Things	PEC	3	0	2	5	4
6.	BC4151	Biometric Systems	PEC	3	0	2	5	4
7.	IF4291	Full Stack Web Application Development	PEC	3	0	2	5	4
8.	IF4071	Deep Learning	PEC	3	0	2	5	4

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

FOUNDATION COURSES (FC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MA4151	Applied Promubability and Statistics for Computer Science Engineers	3	1	0	4	I

PROFESSIONAL CORE COURSES (PCC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	CP4151	Advanced Data Structures and Algorithms	3	0	0	3	I
2.	MU4151	Advanced Graphics and Animation	3	0	2	4	I
3.	MU4152	Multimedia Communication	3	0	0	3	I
4.	MU4153	Principles of Multimedia	3	0	0	3	I
5.	CP4161	Advanced Data Structures and Algorithms Laboratory	0	0	4	2	I
6.	MU4161	Multimedia Authoring Tools Laboratory	0	0	4	2	I
7.	MU4251	Digital Image Processing	3	0	0	3	I I
8.	MU4252	Media Security	3	0	0	3	I I
9.	MU4291	Mixed Reality	3	0	2	4	I I
10.	MU4201	Multimedia Databases	3	0	0	3	I I
11.	MU4212	Digital Image Processing Laboratory	0	0	2	1	I I
12.	MU4301	Video and Audio Processing	3	0	0	3	I I I

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	RM4151	Research Methodology and IPR	2	0	0	2	1

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MU4211	Term Paper Writing and seminar	0	0	2	1	II
2.	MU 4311	Project Work I	0	0	12	6	III
3.	MU 4411	Project Work II	0	0	24	12	IV

SUMMARY

Sl. No.	NAME OF THE PROGRAMME: M.E. MULTIMEDIA TECHNOLOGY						
	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1.	FC	04	00	00	00	04
2.	PCC	17	14	03	00	34
3.	PEC	00	06	07	00	13
4.	RMC	02	00	00	00	02
5.	OEC	00	00	03	00	03
6.	EEC	00	01	06	12	19
7.	Non Credit/Audit Course	✓	✓	00	00	
8.	**TOTAL CREDIT**	**23**	**21**	**19**	**12**	**75**

MA4151 **APPLIED PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE ENGINEERS** **L T P C 3 1 0 4**

COURSE OBJECTIVES:

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I LINEAR ALGEBRA 12

Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

UNIT II PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Bayes 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 III TWO DIMENSIONAL RANDOM VARIABLES 12

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

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

COURSE OUTCOMES:

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

- apply the concepts of Linear Algebra to solve practical problems.
- use the ideas of probability and random variables in solving engineering problems.
- be familiar with some of the commonly encountered two dimension random variables and be equipped for a possible extension to multivariate analysis.
- use statistical tests in testing hypothesis on data.
- develop critical thinking based on empirical evidence and the scientific approach to knowledge development.

REFERENCES:

1. Dallas E Johnson, “Applied multivariate methods for data Analysis”, Thomson and Duxbury press, Singapore, 1998.
2. Richard A. Johnson and Dean W. Wichern, “Applied multivariate statistical Analysis”, Pearson Education, Fifth Edition, 6th Edition, New Delhi, 2013.
3. Bronson, R.,”Matrix Operation” Schaum’s outline series, Tata McGraw Hill, New York, 2011.
4. Oliver C. Ibe, “Fundamentals of Applied probability and Random Processes”, Academic Press, Boston, 2014.
5. Johnson R. A. and Gupta C.B., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson India Education, Asia, 9th Edition, New Delhi, 2017.

RM4151 RESEARCH METHODOLOGY AND IPR L T P C
2 0 0 2

UNIT I RESEARCH DESIGN 6

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association.
Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS 6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.

3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

CP4151 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

COURSE 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 & COMPLEXITY ANALYSIS 9

Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms- Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms-Program performance measurement - Recurrences: The Substitution Method – The Recursion-Tree Method- Data structures and algorithms.

UNIT II HIERARCHICAL DATA STRUCTURES 9

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

UNIT III GRAPHS 9

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

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

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

UNIT V NP COMPLETE AND NP HARD 9

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

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell
5. Discuss about any NP completeness problem

COURSE OUTCOMES:

CO1: Design data structures and algorithms to solve computing problems.
CO2: Choose and implement efficient data structures and apply them to solve problems.
CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.
CO4: Design one's own algorithm for an unknown problem.
CO5: Apply suitable design strategy for problem solving.

REFERENCES:

1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, "Data Structures and algorithms in C++", Cengage Learning, 4th Edition, 2013.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

MU4151 ADVANCED GRAPHICS AND ANIMATION L T P C
3 0 2 4

COURSE 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.
- To become proficient in graphics programming using OpenGL

UNIT I FUNDAMENTALS 9

Basics - Scope and Applications – Graphics Standards – Display Systems – Image Formation – Graphics Systems – 2D and 3D Coordinate Systems – Vectors – Matrices and Basic Vector/Matrix Operations – Line Drawing – Object Representation – Anti-Aliasing.

Suggested Activities:

1. Practical - Basic application to be implemented for vectors and matrices.
2. Practical - Apply various implementations of the graphics algorithms and analyze.
3. Practical - Execute some shader application and fix the warnings and errors

Suggested Evaluation Methods:

1. Quiz to check the understanding of the graphics concepts (like graphics hardware, displays and standards).
2. Assessing the understanding of various basic graphics algorithms through programming assessment by using vectors and matrices

UNIT II TRANSFORMATIONS 9

2D and 3D Geometric Transformations: Translation, Rotation, Scaling, Affine – Hierarchical Modelling & viewing – The Camera Transformation – Perspective – Orthographic and Stereographic Views.

Suggested Activities:

1. Flipped classroom on rasterization.
2. Practical - Execute any shader application and set viewports, windows, draw polylines and explore the keyboard and mouse interaction routines.
3. Familiarize with transformations and hierarchical in OpenGL using a matrix stack

Suggested Evaluation Methods:

1. Quizzes on rasterization schemes.
2. Assessing the understanding of the basic elements available in the OpenGL environment through the programming structs.
3. Demonstration on transformations hierarchies using matrix stack.

UNIT III FRACTALS 9

Fractals and Self Similarity – Peano Curves – Creating Image by Iterated Functions – Mandelbrot Sets – Julia Sets – Random Fractals – Intersecting Rays with Other Primitives – Reflections and Transparency – Boolean Operations on Objects and its Applications.

Suggested Activities:

1. Flipped classroom on various algorithms used to generate the fractals.
2. Practical - Generation of fractals using Python and Numpy
3. Practical - Run any shader application and set viewports, windows, fractal rendering and explore the keyboard and mouse interaction routines.

Suggested Evaluation Methods:

1. Quiz on Fractals.
2. Demonstration the generation of fractals using Python and Numpy.
3. Assessing the understanding of generation of fractals by changing the various parameters in the OpenGL environment through the programming structs.

UNIT IV ADVANCED GRAPHICS 9

Hidden Surface Removal– Parametric Curves and Surfaces– Global Illumination – Ray Casting – Monte Carlo Algorithm – Texture Synthesis – Bump Mapping – Environmental Mapping –Advanced Lighting and Shading – Shadows –Volumetric Rendering.

Suggested Activities:

1. Flipped classroom on Texture Synthesis and photo realistic rendering
2. Run the shader application and add the texture and shadow.
3. Analyze a few more shaders - Toon/Cell, Cook-Torrance, Oren-Nayar, Gradient.

Suggested Evaluation Methods:

1. Quiz on advanced graphics techniques (like texture synthesis and photo realistic rendering).
2. Demonstration of shader application exploring texture and shadow features.
3. Discussion on bi-directional reflectance distribution function after analyzing the various shader models.

UNIT V ANIMATION 9

Overview of Animation Techniques – Keyframing, Computer Animation – Motion Capture and Editing–Forward/Inverse Kinematics– 3D Computer Animation for Applications Such as Games and Virtual Environments – Character Animation Techniques Such as Synthesizing their Body Movements – Facial Expressions and Skin Movements – Behaviors in Crowded Scenes.

Suggested Activities:

1. Exploration of various animation techniques and tools (Self Study).
2. Carry out small projects like Design of small animation movies using any tools with good aesthetic sense.

Suggested Evaluation Methods

1. Discussion on various animation techniques and tools.
2. Projects may be evaluated based on the theme, design, creativity, tools and aesthetic sense.

PRACTICAL EXERCISES: 30 PERIODS

1. Introduction to Programming in OpenGL.
2. Write a program to draw the following points: (0.0,0.0), (20.0,0.0), (20.0,20.0), (0.0,20.0) and (10.0,25.0). For this purpose, use the GL_POINTS primitive.
3. Re-write the previous program in order to draw a house. The house consists of two figures: a square and a triangle. The first four points given above define the square, while the last three points define the triangle. For this purpose, use the GL_QUADS and GL_TRIANGLES primitives.
4. Write a program to color to primitives like cube, triangle and perform 2D rotation using OpenGL.
5. Modify the above program extending the 2D rotation to 3D with a simple 3D Orthographic Projection.
6. Write a program to roll a wheel on a horizontal line using OpenGL.
7. Draw the Koch snowflake (or some other variation of the Koch curve) using python.
8. Create a rotating cube with lighting using OpenGL.
9. Create a scene consisting of multiple spheres and cubes, apply a different texture to each object, and give a bumpy-looking appearance to each surface using normal mapping.
10. Create 10 seconds Walking animation with a rigged character using any animation tool.

TOTAL : 75 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Understand and apply 3d graphics algorithms related to transformations, illumination, texturing, etc. With the aid of software libraries.
2. Develop interactive applications using 3d graphics
3. Investigate and apply software libraries for 3d graphics and related software needs.
4. Understand the issues relevant to computer animation.
5. Describe and synthesize character animation techniques, including motion, changing their facial expressions and crowd behavior.

REFERENCES:

1. Donald D. Hearn, M. Pauline Baker, Warren Carithers, “Computer Graphics with OpenGL”, Fourth Edition, Prentice Hall, 2011.
2. JungHun Hyan, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 1st Edition, 2011.
3. Foley van Dam, Feiner Hughes, “Computer Graphics Principles and Practice”, Third Edition, Addison Wesley, 2014.
4. Alan Watt, Mark Watt, “Advanced Animation and Rendering Techniques: Theory and Practice”, Addison Wesley, 1992.
5. Rick Parent, “Computer Animation – Algorithms and Techniques”, Third Edition, Morgan Kaufman, 2012.
6. Edward Angel, Dave Shreiner, “Interactive Computer Graphics: A Top-Down Approach with OpenGL”, Sixth Edition, Addison Wesley, 2012.

MU4152 MULTIMEDIA COMMUNICATION NETWORKS L T P C

3 0 0 3

COURSE OBJECTIVES:

- To recapitulate the fundamentals of networking and understand the requirements for multimedia communication.
- To learn guaranteed service model.
- To learn communication protocols that is frequently used in IoT ecosystems.
- To explore the support provided for multimedia communication in 3G and 4G networks.
- To study about VoIP and real time multimedia network applications.

UNIT I INTRODUCTION 9

Switched Networks and Shared media Networks – Circuit Switching, Packet Switching and Virtual Circuits – Flow Control and Congestion Control – TCP/IP reference model – Network Externalities – Service Integration – Elastic and Inelastic Traffic – Playback Applications – Additional Requirements For Inelastic Traffic – Core Networks And Access/Edge Networks.

Suggested Activities:

- Flipped classroom on network externalities and Economies of scale.
- External learning – Inter-continental backbone network and Autonomous Systems model of the Internet.
- Assignments on computing the playout time of packets.

Suggested Evaluation Methods:

- Quiz and discussion on network externalities and economies of scale.
- Assignments on proprietary protocols used in IoT and M2M.
- Assignments on problems related to playout time of multimedia applications.

UNIT II GUARANTEED SERVICE MODEL 9

Best Effort Service Model and Its Limitations – Qos Metrics – Diffserv and Intserv Networks – Queuing Techniques – WFQ and Its Variants – RED – Qos Aware Routing – Call Admission Control – RSVP – Policing and Traffic Shaping Algorithms – Multicast Routing – IGMP, Protocol Independent Multicast – PIM SM and PIM DM Variants.

Suggested Activities:

- Flipped classroom on IntServ and DiffServ networks.
- External learning – Exploring the ways of using DSCP in IP header.
- Assignments on finish time problems related to WFQ and its variants.

Suggested Evaluation Methods:

- Quiz and discussion on IntServ and DiffServ networks.
- Assignments on configuring a router in such a way that DSCP fielder is exploited to provide QoS.
- Assignments on problems related to the virtual finish and actual finish of packets in WFQ and its variants.

UNIT III MULTIMEDIA TRANSPORT 9

End To End Solutions – Laissez Faire Approach – Multimedia over TCP – Significance of UDP – Multimedia Streaming – Audio and Video Streaming – Accessing Audio And Video from a Web Server And Media Server – Removing Jitter at the Receiver – Recovering from Packet Loss – Forward Error Correction and Interleaving – Interactive And Non-Interactive Multimedia – Transcoding – RTSP – RTP/RTCP.

Suggested Activities:

- External learning – Exploring various media players available and the ways to customize them.
- Exploring the ways to configure RTP.
- Flipped classroom on RTP and RTCP.

Suggested Evaluation Methods:

- Assignments on media players available and configuring them.
- Configuring RTP and RTSP.
- Quiz and discussion on RTP and RTCP.

UNIT IV MULTIMEDIA OVER WIRELESS NETWORKS 9

Architecture of IP Multimedia Subsystem in 3G Networks – Application, Control and Data Planes in IMS Networks – Session Control, AAA, Real Time Data Transfer and Policy Control Protocols of IMS Networks – Relay Node and Multiple Radio Access Technologies in LTE – Voice Over IP Basics – IMS Volte Architecture – IP Multimedia Service Identity Module, Private Identity, Public Identity (ISIM, IMPI And IMPU) – SIP User Agent (SIP UAC And SIP UAE) – Real Time Polling Service and Extended Real Time Polling Service in IEEE 802.16/Wimax Networks.

Suggested Activities:

- Flipped classroom on IMSVoLTE architecture.
- External learning – Multimedia support in 5G networks.
- Analyzing the protocols of IP media subsystem.

Suggested Evaluation Methods:

- Quiz and discussion on IMSVoLTE architecture.
- Assignments on multimedia support in 5G networks.
- Assignments on analyzing the headers of IP multimedia subsystem.

UNIT V MULTIMEDIA NETWORKED APPLICATIONS 9

H.322 Standard – Protocol Stack And Call Setup – Session Initiation Protocol – Components, Messages And Operation – Supporting Protocols For SIP – Media Gateway Access Protocol, Resource Reservation Protocol, Session Description Protocol – Case Study – Video Conferencing – Military Surveillance – Interactive TV – Video On Demand – Smart Phone.

Suggested Activities:

- Flipped classroom on SCIBus and S.100.
- External learning – Multimedia access networks and edge networks.
- Exploring the ways to configure SIP.

Suggested Evaluation Methods:

- Quiz and discussion on SCIBus and S.100.
- Assignments on multimedia access networks and edge networks.
- Configuring SIP using suitable commands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications at the network level with efficient scheduling and routing techniques.
3. Apply QoS to multimedia network applications at the end system level with efficient scheduling and routing techniques.
4. Understand IP multimedia subsystem and IP initiatives in cellular networks to support multimedia traffic.
5. Design and implement VoIP based solutions for multimedia transport.
6. Develop the real-time multimedia network applications.

REFERENCES:

1. Mario Marques da Silva, “Multimedia Communications and Networking”, CRC Press, 2012
2. K. R. Rao, Zoron S. Bojkovic, Bojan M. Bakmaz, “Wireless Multimedia Communication Systems: Design, Analysis and Implementation”, CRC Press, 2017
3. Jim Kurose, Keith Ross, “Computer Networking: A Top Down Approach”, Pearson Education, 2017
4. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, “Introduction to Multimedia Communications Applications, Middleware, Networking”, John Wiley and Sons, 2009

MU4153 **PRINCIPLES OF MULTIMEDIA** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To get familiarity with gamut of multimedia and its significance
- To acquire knowledge in multimedia components.
- To acquire knowledge about multimedia tools and authoring.
- To acquire knowledge in the development of multimedia applications.
- To explore the latest trends and technologies in multimedia

UNIT I INTRODUCTION **9**

Introduction to Multimedia – Characteristics of Multimedia Presentation – Multimedia Components – Promotion of Multimedia Based Components – Digital Representation – Media and Data Streams – Multimedia Architecture – Multimedia Documents, Multimedia Tasks and Concerns, Production, sharing and distribution, Hypermedia, WWW and Internet, Authoring, Multimedia over wireless and mobile networks.

Suggested Activities:

1. Flipped classroom on media Components.
2. External learning – Interactive presentation.

Suggested Evaluation Methods:

1. Tutorial – Handling media components
2. Quizzes on different types of data presentation.

UNIT II ELEMENTS OF MULTIMEDIA **9**

Text-Types, Font, Unicode Standard, File Formats, Graphics and Image data representations – data types, file formats, color models; video – color models in video, analog video, digital video, file formats, video display interfaces, 3D video and TV: Audio – Digitization, SNR, SQNR, quantization, audio quality, file formats, MIDI; Animation- Key Frames and Tweening, other Techniques, 2D and 3D Animation.

Suggested Activities:

1. Flipped classroom on different file formats of various media elements.
2. External learning – Adobe after effects, Adobe Media Encoder, Adobe Audition.

Suggested Evaluation Methods:

1. Demonstration on after effects animations.
2. Quizzes on file formats and color models.

UNIT III MULTIMEDIA TOOLS **9**

Authoring Tools – Features and Types – Card and Page Based Tools – Icon and Object Based Tools – Time Based Tools – Cross Platform Authoring Tools – Editing Tools – Painting and Drawing Tools – 3D Modeling and Animation Tools – Image Editing Tools – Sound Editing Tools – Digital Movie Tools.

Suggested Activities:

1. Flipped classroom on multimedia tools.
2. External learning – Comparison of various authoring tools.

Suggested Evaluation Methods:

1. Tutorial – Audio editing tool.
2. Quizzes on animation tools.

UNIT IV MULTIMEDIA SYSTEMS 9

Compression Types and Techniques: CODEC, Text Compression: GIF Coding Standards, JPEG standard – JPEG 2000, basic audio compression – ADPCM, MPEG Psychoacoustics, basic Video compression techniques – MPEG, H.26X – Multimedia Database System – User Interfaces – OS Multimedia Support – Hardware Support – Real Time Protocols – Play Back Architectures – Synchronization – Document Architecture – Hypermedia Concepts: Hypermedia Design – Digital Copyrights, Content analysis.

Suggested Activities:

1. Flipped classroom on concepts of multimedia hardware architectures.
2. External learning – Digital repositories and hypermedia design.

Suggested Evaluation Methods:

1. Quizzes on multimedia hardware and compression techniques.
2. Tutorial – Hypermedia design.

UNIT V MULTIMEDIA APPLICATIONS FOR THE WEB AND MOBILE PLATFORMS 9

ADDIE Model – Conceptualization – Content Collection – Storyboard–Script Authoring Metaphors – Testing – Report Writing – Documentation. Multimedia for the web and mobile platforms. Virtual Reality, Internet multimedia content distribution, Multimedia Information sharing – social media sharing, cloud computing for multimedia services, interactive cloud gaming. Multimedia information retrieval.

Suggested Activities:

1. External learning – Game consoles.
2. External learning – VRML scripting languages.

Suggested Evaluation Methods:

1. Demonstration of simple interactive games.
2. Tutorial – Simple VRML program.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

1. Handle the multimedia elements effectively.
2. Articulate the concepts and techniques used in multimedia applications.
3. Develop effective strategies to deliver Quality of Experience in multimedia applications.
4. Design and implement algorithms and techniques applied to multimedia objects.
5. Design and develop multimedia applications following software engineering models.

REFERENCES:

1. Li, Ze-Nian, Drew, Mark, Liu, Jiangchuan, “Fundamentals of Multimedia”, Springer, Third Edition, 2021.
2. Prabhat K.Andleigh, Kiran Thakrar, “MULTIMEDIA SYSTEMS DESIGN”, Pearson Education, 2015.
3. Gerald Friedland, Ramesh Jain, “Multimedia Computing”, Cambridge University Press, 2018. (digital book)

4. Ranjan Parekh, “Principles of Multimedia”, Second Edition, McGraw-Hill Education, 2017

CP4161 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY **L T P C 0 0 4 2**

COURSE 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
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:

1: Implementation of recursive function for tree traversal and Fibonacci
2: Implementation of iteration function for tree traversal and Fibonacci
3: Implementation of Merge Sort and Quick Sort
4: Implementation of a Binary Search Tree
5: Red-Black Tree Implementation
6: Heap Implementation
7: Fibonacci Heap Implementation
8: Graph Traversals
9: Spanning Tree Implementation
10: Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)
11: Implementation of Matrix Chain Multiplication
12: Activity Selection and Huffman Coding Implementation

HARDWARE/SOFTWARE REQUIREMENTS

1: 64-bit Open source Linux or its derivative
2: Open Source C++ Programming tool like G++/GCC

COURSE OUTCOMES:

CO1: Design and implement basic and advanced data structures extensively
CO2: Design algorithms using graph structures
CO3: Design and develop efficient algorithms with minimum complexity using design techniques
CO4: Develop programs using various algorithms.
CO5: Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

TOTAL :60 PERIODS

REFERENCES:

1. Lipschutz Seymour, “Data Structures Schaum's Outlines Series”, Tata McGraw Hill, 3rd Edition, 2014.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. http://www.coursera.org/specializations/data-structures-algorithms

4. http://www.tutorialspoint.com/data_structures_algorithms
5. http://www.geeksforgeeks.org/data-structures/

MU4161 MULTIMEDIA AUTHORING TOOLS LABORATORY L T P C
0 0 4 2

COURSE 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

COURSE 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

MU4251 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study fundamental concepts of digital image processing.
- To understand and learn image processing operations and restoration.
- To use the concepts of Feature Extraction
- To study the concepts of Image Compression.
- To expose students to current trends in the field of image segmentation.

UNIT I INTRODUCTION 9

Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation

model, image sampling and quantization, basic relationships between pixels. Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing, and sharpening spatial filters, combining the spatial enhancement methods.

Suggested Activities:

- Discussion of Mathematical Transforms.
- Numerical problem solving using Fourier Transform.
- Numerical problem solving in Image Enhancement.
- External learning – Image Noise and its types.

Suggested Evaluation Methods:

- Tutorial – Image transforms.
- Assignments on histogram specification, histogram equalization and spatial filters.
- Quizzes on noise modeling.

UNIT II IMAGE RESTORATION 9

A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function. Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation

Suggested Activities:

- Discussion on Image Artifacts and Blur.
- Discussion of Role of Wavelet Transforms in Filter and Analysis.
- Numerical problem solving in Wavelet Transforms.
- External learning – Image restoration algorithms.

Suggested Evaluation Methods:

- Tutorial – Wavelet transforms.
- Assignment problems on order statistics and multi-resolution expansions.
- Quizzes on wavelet transforms.

UNIT III FEATURE EXTRACTION 9

Detection of discontinuities – Edge linking and Boundary detection- Thresholding- -Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors**.**

Suggested Activities:

- External learning – Feature selection and reduction.
- External learning – Image salient features.
- Assignment on numerical problems in texture computation.

Suggested Evaluation Methods:

- Assignment problems on feature extraction and reduction.
- Quizzes on feature selection and extraction.

UNIT IV IMAGE COMPRESSION 9

Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphological algorithms

Suggested Activities:

- Flipped classroom on different image coding techniques.
- Practical – Demonstration of EXIF format for given camera.
- Practical – Implementing effects quantization, color change.
- Case study of Google's WebP image format.

Suggested Evaluation Methods:

- Evaluation of the practical implementations.
- Assignment on image file formats

UNIT V IMAGE SEGMENTATION 9

Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation. Object Recognition: Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching.

Suggested Activities:

- Flipped classroom on importance of segmentation.

Suggested Evaluation Methods:

- Tutorial – Image segmentation and edge detection.

COURSE OUTCOMES:

CO1: Apply knowledge of Mathematics for image processing operations
CO2: Apply techniques for image restoration.
CO3: Identify and extract salient features of images.
CO4: Apply the appropriate tools (Contemporary) for image compression and analysis.
CO5: Apply segmentation techniques and do object recognition.

TOTAL: 45 PERIODS

REFERENCES

1. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI., 2002
2. Digital Image Processing, Sridhar S, Second Edition, Oxford University Press, 2016
3. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology, .Brooks/Cole 2004
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thompson Learning, 2007.
5. Digital Image Processing using Matlab, Rafeal C.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education. Second Edition, 2017

MU4252 MEDIA SECURITY L T P C 3 0 0 3

COURSE OBJECTIVES:

- To understand the cryptanalysis on standard algorithms meant for confidentiality, integrity and authenticity.
- To know about Digital rights management.
- To know about the concepts of Digital Watermarking techniques.
- To understand the concept of Steganography
- To learn the privacy preserving techniques on Multimedia data.

UNIT I CRYPTANALYSIS AND DIGITAL RIGHTS MANAGEMENT 9

Cryptanalysis Techniques – Encryption Evaluation metrics – Histogram Deviation - Introduction to DRM – DRM Products –DRM Laws

Suggested Activities:

1. External learning - cryptanalysis for algorithms such as AES, RSA.
2. Analysis for DRM products.

Suggested Evaluation Methods:

1. Group discussion on linear and differential cryptanalysis of cryptographic algorithms.
2. Tutorial on DRM products.

UNIT II DIGITAL WATERMARKING BASICS 9

Introduction – Basics Models of Watermarking – Basic Message Coding – Error Correction coding – Mutual Information and Channel Capacity – Designing a Good Digital Watermark – Information Theoretical Analysis of Digital Watermarking.

Suggested Activities:

1. Problems on Error Correction Coding.
2. Designing a good watermark.

Suggested Evaluation Methods:

1. Assignment on ECC.
2. Tutorial on DRM products.

UNIT III DIGITAL WATERMARKING SCHEMES AND PROTOCOLS 9

Spread Spectrum Watermarking – Block DCT-domain Watermarking – Watermarking with Side Information – Dirty-paper Coding – Quantization Watermarking – buyer Seller Watermarking Protocol – Media Specific Digital Watermarking: Image WM, Video WM , Audio WM– Watermarking for CG-Models: Watermarking for Binary Images and 3D Contents – Data Hiding Through Watermarking Techniques.

Suggested Activities:

1. Implementation of buyer seller watermarking protocol.
2. Analyzing the performance of different media specific WM and WM for CG models.

Suggested Evaluation Methods:

1. Tutorial - Media specific watermarking techniques.
2. Group discussion on the performance evaluation of watermarking techniques.

UNIT IV STEGANOGRAPHY AND STEGANALYSIS 9

Stenographic Communication – Notation and Terminology – Information –Theoretic Foundations of Steganography – Cachin's Definition of Steganographic Security – Statistics Preserving Steganography – Model-Based Steganography – Masking Embedding as Natural Processing – Minimizing the Embedding Impact – Matrix Embedding –Nonshared Selection Rule – Steganalysis Algorithms: LSB Embedding and the Histogram Attack – Sample Pairs Analysis.

Suggested Activities:

1. An application to be developed using Steganography.

Suggested Evaluation Methods:

- Can be done by hiding capacity,Distortion measure and Security

- Project.

UNIT V MULTIMEDIA ENCRYPTION 9

Multimedia Processing in the Encryption Domain – Information Processing – Data Sanitization – Finger Printing – Digital Forensics: Intrusive and Non- Intrusive –Forgeries Detection– Privacy Preserving – Surveillance.

Suggested Activities:

1. Case study on forensic data.
2. Case study on forgery detection.

Suggested Evaluation Methods:

1. Group discussion on case studies.

COURSE OUTCOMES:

CO1:Identify the security challenges and issues that may arise in any system.
CO2:Implement the concepts of steganography, digital watermarking techniques.
CO3:Design secure applications using steganography and watermarking schemes
CO4:Apply concepts on digital rights management while developing secure systems
CO5:Design a secure multimedia system using encryption and privacy preservation techniques.

TOTAL: 45 PERIODS

REFERENCES

1. Frank Shih, “Digital Watermarking and Steganography: Fundamentals and Techniques”, CRC Press,Second Edition 2017.
2. 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 , “Image Encryption: A Communication Perspective”, CRC Press, First Edition 2013.
3. Douglas R. Stinson, “Cryptography Theory and Practice”, Fourth Edition, Chapman & Hall/CRC,2006
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, 2006.
5. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and TonKalker, “Digital Watermarking and Steganography”, Second Edition, Elsevier, 2007.

MU4291 MIXED REALITY L T P C 3 0 2 4

COURSE OBJECTIVES:

- To study about Fundamental Concept and Components of Virtual Reality
- To study about Interactive Techniques in Virtual Reality
- To study about Visual Computation in Virtual Reality
- To study about Augmented and Mixed Reality and Its Applications
- To know about I/O Interfaces and its functions.

UNIT I INTRODUCTION TO VIRTUAL REALITY 9

Introduction, Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading

algorithms, Radiosity, Hidden Surface Removal, Realism Stereographic image.

Suggested Activities:

- Flipped classroom on uses of MR applications.
- Videos – Experience the virtual reality effect.
- Assignment on comparison of VR with traditional multimedia applications.

Suggested Evaluation Methods:

- Tutorial – Applications of MR.
- Quizzes on the displayed video and the special effects

UNIT II INTERACTIVE TECHNIQUES IN VIRTUAL REALITY 9

Introduction, from 2D to 3D, 3D spaces curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Suggested Activities:

- Flipped classroom on modeling three dimensional objects.
- External learning – Collision detection algorithms.
- Practical – Creating three dimensional models.

Suggested Evaluation Methods:

- Tutorial – Three dimensional modeling techniques.
- Brainstorming session on collision detection algorithms.
- Demonstration of three dimensional scene creation.

UNIT III VISUAL COMPUTATION IN VIRTUAL REALITY 9

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

Suggested Activities:

- External learning – Different types of programming toolkits and Learn different types of available VR applications.
- Practical – Create VR scenes using any toolkit and develop applications.

Suggested Evaluation Methods:

- Tutorial – VR tool comparison.
- Brainstorming session on tools and technologies used in VR.
- Demonstration of the created VR applications.

UNIT IV AUGMENTED AND MIXED REALITY 9

Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems

Suggested Activities:

- External learning - AR Systems

Suggested Evaluation Methods:

- Brainstorming session different AR systems and environments.

UNIT V I/O INTERFACE IN VR & APPLICATION OF VR 9

Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML, Input -- Tracker, Sensor, Digitalglobe, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices. VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

Suggested Activities:

- External learning – Different types of sensing and tracking devices for creating mixed reality environments.
- Practical – Create MR scenes using any toolkit and develop applications.

Suggested Evaluation Methods:

- Tutorial – Mobile Interface Design.
- Brainstorming session on wearable computing devices and games design.
- Demonstration and evaluation of the developed MR application.

TOTAL: 45 PERIODS

PRACTICALS:

1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection methods by handling the camera.
3. Download objects from asset stores and apply various lighting and shading effects.
4. Model three dimensional objects using various modeling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
9. Develop MR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications.

COURSE OUTCOMES:

CO1: Understand the Fundamental Concept and Components of Virtual Reality
CO2: Able to know the Interactive Techniques in Virtual Reality
CO3: Can know about Visual Computation in Virtual Reality
CO4: Able to know the concepts of Augmented and Mixed Reality and Its Applications
CO5: Know about I/O Interfaces and its functions.

TOTAL:45+30=75 PERIODS

REFERENCES

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann,First Edition 2013.
3. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
4. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
5. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
6. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.
7. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008

MU4201 MULTIMEDIA DATABASES

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand about the database storage, retrieval of multimedia elements.
- To familiarize about the database indexing methods and different multidimensional data structures.
- To learn about text database and image database storage and retrieval.
- To understand design and architecture of a Multimedia Database.
- To understand about Audio and Video Storage.

UNIT I DATABASE INDEXING METHODS 9

Hashing – B-trees – Secondary Key Access Methods – Inverted Files – Point Access Methods (PAMs) –Spatial Access Methods (SAMs) – Space Filling Curves – Transformation to Higher–D Points – Multidimensional Data Structures – K-D Trees – Point Quadtrees– The MX–Quadtree– R-Trees.

Suggested Activities

1. Flipped classroom on traditional databases.
2. External learning - Comparison of different data structures and its usage.
3. Practical - Application development using multi-dimensional data structures.

Suggested Evaluation Methods

1. Assignments on hashing mechanisms
2. Tutorials - Indexing and access methods.
3. Demonstration of the application development.

UNIT II TEXT DATABASES 9

Precision and Recall – Stop Lists – Word Stems and Frequency Tables – Latent Semantic Indexing – TV-Trees – Indexing Text and DNA Strings – Access Methods for Text – Full Text Scanning – Inversion – Signature Files – Vector Space Model and Clustering.

Suggested Activities

1. Flipped classroom on text databases.

2. External learning - Comparison of other retrieval techniques for text databases and its usage.
3. Practical - Application development in text databases.

Suggested Evaluation Methods

1. Assignments on information retrieval techniques.
2. Tutorials - Access methods for text databases.
3. Demonstration of the practical implementation.

UNIT III IMAGE RETRIEVAL MECHANISMS 9

Image Databases – Raw Images – Compressed Image Representations – Similarity Based Retrieval – Alternative Image DB Paradigms – Representing Image DBs with Relations – Representing Image DBs with R-Trees – Retrieving Images by Spatial Layout – Implementations.

Suggested Activities

1. Flipped classroom on image databases.
2. External learning – Retrieving Images.
3. Practical - Application development in image databases.

Suggested Evaluation Methods

1. Assignments on image retrieval mechanisms.
2. Tutorials - R-trees.
3. Demonstration of the practical implementation

UNIT IV AUDIO/VIDEO DATABASES 9

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

Suggested Activities

1. Flipped classroom on audio/video databases.
2. External learning - Capturing and querying audio and video content.
3. Practical - Application development in video databases.

Suggested Evaluation Methods

1. Assignments on capturing audio/ video content.
2. Tutorials - Indexing audio/video databases.
3. Demonstration of the practical implementation

UNIT V MULTIMEDIA DATABASE DESIGN 9

Design and Architecture of a Multimedia Database – Organizing Multimedia Data based on the Principle of Uniformity – Media Abstractions – Query Languages for Retrieving Multimedia Data.

Suggested Activities

1. Flipped classroom on text databases.
2. External learning - Query languages for retrieving multimedia data.
3. Practical – Application development.

Suggested Evaluation Methods

1. Assignments on organizing multimedia data.
2. Tutorials - Query languages for retrieving multimedia data.
3. Demonstration of the practical implementation

COURSE OUTCOMES:

CO1:Demonstrate the multidimensional data structures for multimedia applications
CO2:Apply database indexing methods for efficient storage and retrieval of multimedia content.
CO3:Work with Text databases, its storage and retrieval.
CO4:Formulate and generalize the use of audio and video databases for real time multimedia applications.
CO5:Demonstrate about the Image database, its storage and retrieval.Apply multimedia database design for multimedia architecture.

TOTAL: 45 PERIODS

REFERENCES

1. V. S. Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt Ltd., 2001.
2. Christos Faloutsos, “Searching Multimedia databases by Content”, Kluwer Academic Publishers,2011.
3. S. Khoshafian, A. B. Baker, “Multimedia and Imaging Databases”, Elsevier, 1996.
4. C. Kingsley Nwosu, “Multimedia Database Systems: Design and Implementation Strategies”, Kluwer Academic Publishers,1996.
5. Lynne Dunckley, “Multimedia Databases: An Object Relational Approach”, Pearson Education, 2003.
6. R. Elmasri, S. B. Navathe, “Fundamentals of Database Systems”, Seventh edition, Pearson Education,2017.

MU4211 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, • 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	4th week	**6%** (the list of standard papers and reason for selection)
Reading and notes for first 5 papers	Reading Paper Process • For each paper form a Table answering the following questions:	5th week	**8%** (the table given should indicate your

	• 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)		understanding of the paper and the evaluation is based on your conclusions about each paper)
Reading and notes for next 5 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

MU 4212 DIGITAL IMAGE PROCESSING LABORATORY L T P C
0 0 2 1

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

1. Simulation and Display of an Image,
    a) Binary & Gray Scale
    b) Analysis of spitaI implementation of Relationships between Pixels
2. Transformations of an Image
3. Contrast stretching of a

. low contrast image,
    1. Histogram processing and Histogram Equalization
4. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
5. Implementation of image sharpening filters and Edge Detection using Gradient Filters
6. Image Compression by DCT,DPCM, HUFFMAN coding
7. Implementation of Image Enhancement

. Spatial filtering

a. Filtering in frequency domain

8. Implementation of Image Segmentation

. Edge,line, Point

9. Segmentation

. Region based segmentation

a. Segmentation using Watershed transformation

10. Analysis of different colour images
11. Image Compression and restoration techniques
12. Mini project on coloured images using maximum image processing techniques which support any format of pattern recognition .

TOTAL:30 PERIODS

COURSE OUTCOME :

CO1: Understand the Fundamentals of Image Processing Systems.
CO2: Perform enhancing operations on the image using spatial filters and frequency domain filters
CO3: Use transforms and analyze the characteristics of the image.
CO4: Perform segmentation operations in the images
CO5: Apply image processing techniques to solve real life problems and for further study in the field.

REFERENCES :

1. Rafael C.Gonzalez, Richard E.Woods.Steven Eddins, Digital Image Processing using MATLAB, Pearson Education. Inc., Second Edition 2004.
2. Sridhar S, Digital Image Processing, Oxford University Press,Second Edition 2015
3. R. Gonzalez and R. Woods, “Digital Image Processing, third edition”, Prentice Hall, 2008.

MU4301	VIDEO AND AUDIO PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

After the completion of the course students will be able to:

- Understand the basic of sound fundamental process.
- Design and construct the audio-amplifier with various controls
- Understand about comprehensive of television systems.
- Understand the analysis and synthesis of TV pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes and the principles of Monochrome Television Transmitter and Receiver systems
- Understand advanced topics in Television systems and Video Engineering
- Evaluate and solve fault of different section in television receiver

UNIT I ELEMENTS, PRINCIPLES AND THEORIES OF DESIGN 9

The Physics of Sound - Sound and the Ear - The Cochlea - Mental Processes – Level and

Loudness – Pitch - Frequency Response and Linearity - Audio Level Metering –The Decibel
in Acoustics - Acoustic Intensity Level - Acoustic Power Level -Acoustic Pressure Level, Inverse Square Law, The VU and the Volume Indicator Instrument - The Phon, Velocity of Sound - Reflection and Refraction – Absorption -Root Mean Square Measurements – selection of sound absorbing materials -Architectural Acoustics.

UNIT II DIGITAL AUDIO 9

Digital Audio Fundamentals, Audio Compression, Disk-Based Recording, Rotary Head Digital Recorders, The basics of Magnetic Recording, Mixers, PA Systems & Installations, Digital Consoles, Digital Audio Broadcasting, Stereophony and Multichannel Sound.

UNIT III AUDIO PROCESSING AND CODING 9

Digitization of Audio: PCM, ADPCM – Waveform Audio File Format – Synthetic Sounds – Musical Instrument Digital Interface – Vocoders – MPEG Audio – MP3 – Advance Audio Coding – High-Efficiency Advanced Audio Coding – MPEG4 – Home Theatre Systems.

UNIT IV VIDEO FUNDAMENTALS 9

Basic Concepts and Terminology – Analog Video Standards – Digital Video Basics – Analog-to Digital Conversion – Color Representation and Chroma Sub Sampling – Video Sampling Rate and Standards Conversion – Digital Video Formats –Video Features – Colour, Shape and Textural Features

UNIT V MOTION ESTIMATION AND VIDEO SEGMENTATION 9

Fundamentals of Motion Estimation – Optical Flow – 2D and 3D Motion Estimation – Block Based Point Correspondences – Gradient Based Intensity Matching – Feature Matching – Frequency Domain Motion Estimation – Video Segmentation.

COURSE OUTCOMES:

CO1 Explain the fundamental principles of audio elements
CO2 Apply different kind of digital audio techniques
CO3 Choose and analyze suitable audio coding for a given media application.
CO4 Explain the principles of Video elements
CO5 Apply the functions of motion estimation and video segmentation in media application

TOTAL:45 PERIODS

REFERENCES

1. Ranjan Parekh, “Principles of Multimedia”, McGraw-Hill, Second Edition,2017.
2. Audio and Video Systems(Second Edition) - R.G.Gupta, McGraw Hill Education Limited
3. Fundamentals of Image, Audio, and Video Processing Using MATLAB, Taylor and Francis, CRC Press, 2021
4. Essential Guide to Digital Video - John Watkinson, Snell & Wilcox Inc. Publication.
5. John W. Woods, Multidimensional Signal, Image, And Video Processing And Coding”, Academic Press, 2006

MU4001 **SOUND ENGINEERING** **L T P C**
3 0 0 3

COURSE 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.
- To know the model, a framework for Human Activity Recognition.
- To showcase design optimization algorithms for better analysis and recognition of objects in a scene

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

COURSE OUTCOMES:

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

CO1:Work with big data platforms and its analysis techniques.
CO2:Design efficient algorithms for mining the data from large volumes.
CO3: Work with surveillance videos for analytics.
CO4: Design optimization algorithms for better analysis and recognition of objects in a scene.
CO5: Model a framework for Human Activity Recognition.

REFERENCES:

1. Charles Poynton, "Digital Video And HDTV Algorithm and Interfaces", Morgan Kaufman Publishers 2012.

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.

MU4091 MULTIMEDIA COMPRESSION TECHNIQUES L T P C
3 0 0 3

COURSE OBJECTIVES:

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

UNIT I FUNDAMENTALS OF COMPRESSION 9

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

UNIT II TEXT COMPRESSION 9

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

UNIT III IMAGE COMPRESSION 9

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

UNIT IV AUDIO COMPRESSION 9

Audio compression Techniques – μ law, A-Law 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

COURSE OUTCOMES:

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

CO1: Implement basic compression algorithms familiar with the use of MATLAB and its equivalent open source environments

CO2: Design and implement some basic compression standards

CO3: Critically analyze different approaches of compression algorithms in multimedia related mini projects.

CO4 : Understand the various audio,speech compression techniques

CO5 :Understand and implement MPEG video coding techniques.

REFERENCES

1. Khalid Sayood: Introduction to Data Compression", Morgan Kauffman Harcourt India, Third Edition, 2010.
2. David Solomon, "Data Compression – The Complete Reference", Fourth Edition, Springer Verlog, New York, 2006.
3. Yun Q.Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering, Algorithms and Fundamentals", CRC Press, 2003.
4. Mark S. Drew, Ze-Nian Li, "Fundamentals of Multimedia", PHI, 2009.

MU4002 3D GAME MODELING AND RENDERING L T P C

3 0 0 3

COURSE OBJECTIVES:

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

UNIT I MATHEMATICS FOR MODELING 9

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

UNIT II CHARACTER MODELING AND SHADING 9

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

UNIT III GAME DESIGN PRINCIPLES 9

Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Renderers, Software Rendering,

Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9

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

UNIT V GAME DEVELOPMENT 9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student will:

CO1: Analyze the fundamentals of 2D and 3D animation
CO2: Model a character with suitable actions.
CO3: Analyze the game design principle.
CO4: Explore different gaming platforms
CO5: Design an 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.

ML4151 ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand basic problem solving strategies.
- To outline game theory based search and constraint satisfaction
- To study knowledge representation techniques
- To explore reasoning and planning associated with AI.
- To study the techniques of knowledge representation.

- To understand probabilistic and other types of reasoning
- To discuss ethical and safety issues associated with AI

UNIT I INTRODUCTION AND PROBLEM SOLVING 9

Artificial Intelligence -Introduction - Problem-solving -Solving Problems by Searching – Uninformed Search Strategies -Informed (Heuristic) Search Strategies - Local Search - Search in Partially Observable Environments

UNIT II ADVERSARIAL SEARCH AND CONSTRAINT SATISFACTION PROBLEMS 9

Game Theory- Optimal Decisions in Games - Heuristic Alpha--Beta Tree Search- Monte Carlo Tree Search - Stochastic Games - Partially Observable Games - Limitations of Game Search Algorithms Constraint Satisfaction Problems (CSP)– Examples - Constraint Propagation-Backtracking Search for CSPs - Local Search for CSPs

UNIT III KNOWLEDGE, REASONING AND PLANNING 9

First Order Logic – Inference in First Order Logic -Using Predicate Logic - Knowledge Representation - Issues -Ontological Engineering - Categories and Objects – Reasoning Systems for Categories - Planning -Definition -Algorithms -Heuristics for Planning -Hierarchical Planning

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING 9

Quantifying Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning over Time Probabilistic Programming -Making Simple Decisions - Making Complex Decisions - Case Based Reasoning –Explanation-Based Learning – Evolutionary Computation

UNIT V PHILOSOPHY, ETHICS AND SAFETY OF AI 9

The Limits of AI – Knowledge in Learning –Statistical Learning Methods – Reinforcement Learning - Introduction to Machine Learning and Deep Learning -Can Machines Really Think? - Distributed AI Artificial Life-The Ethics of AI - Interpretable AI- Future of AI - AI Components -AI Architectures

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Solve puzzles with uninformed and informed searches.
2: Reasoning methods through puzzles and real life scenarios
3: Ontology creation using Protégé
4: Give example scenarios where probabilistic reasoning and case based reasoning can be applied
5: Discuss some case studies and their ethical issues

COURSE OUTCOMES:

CO1: Implement any three problem solving methods for a puzzle of your choice
CO2: Understand Game playing and implement a two player game using AI techniques
CO3: Design and Implement an example using predicate Logic
CO4: Implement a case based reasoning system
CO5:Discuss some methodologies to design ethical and explainable AI systems

REFERENCES:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Pearson, 4th

Edition, 2020.
2. Zhongzhi Shi “Advanced Artificial Intelligence”, World Scientific; 2019.
3. Kevin Knight, Elaine Rich, Shivashankar B. Nair, “Artificial Intelligence”, McGraw Hill Education; 3rd edition, 2017
4. Richard E. Neapolitan, Xia Jiang, “Artificial Intelligence with an Introduction to Machine Learning”, Chapman and Hall/CRC; 2nd edition, 2018
5. Dheepak Khemani, “A first course in Artificial Intelligence”, McGraw Hill Education Pvt Ltd., NewDelhi, 2013.
6. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmann Publishers Inc; Second Edition, 2003.

BD4251 BIG DATA MINING AND ANALYTICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the computational approaches to Modeling, Feature Extraction
- To understand the need and application of Map Reduce
- To understand the various search algorithms applicable to Big Data
- To analyse and interpret streaming data
- To learn how to handle large data sets in main memory and learn the various cluster techniques applicable to Big Data

UNIT I DATA MINING AND LARGE SCALE FILES 9

Introduction to Statistical modeling – Machine Learning – Computational approaches to modelin Summarization – Feature Extraction – Statistical Limits on Data Mining - Distributed File System Map-reduce – Algorithms using Map Reduce – Efficiency of Cluster Computing Techniques.

UNIT II SIMILAR ITEMS 9

Nearest Neighbor Search – Shingling of Documents – Similarity preserving summaries – Loca sensitive hashing for documents – Distance Measures – Theory of Locality Sensitive Function LSH Families – Methods for High Degree of Similarities.

UNIT III MINING DATA STREAMS 9

Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distar Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows.

UNIT IV LINK ANALYSIS AND FREQUENT ITEMSETS 9

Page Rank –Efficient Computation - Topic Sensitive Page Rank – Link Spam – Market Basket M – A-priori algorithm – Handling Larger Datasets in Main Memory – Limited Pass Algorithm – Cou Frequent Item sets.

UNIT V CLUSTERING 9

Introduction to Clustering Techniques – Hierarchical Clustering –Algorithms – K-Means – CURI Clustering in Non -– Euclidean Spaces – Streams and Parallelism – Case Study: Advertising on Web – Recommendation Systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Design algorithms by employing Map Reduce technique for solving Big Data problems.
CO2: Design algorithms for Big Data by deciding on the apt Features set .
CO3: Design algorithms for handling petabytes of datasets
CO4: Design algorithms and propose solutions for Big Data by optimizing main memory consumpt
CO5: Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

REFERENCES:

1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 3rd Edition, 2020.
2. Jiawei Han, MichelineKamber, Jian Pei, “Data Mining Concepts and Techniques”, Morgan Kaufman Publications, Third Edition, 2012.
3. Ian H.Witten, Eibe Frank “Data Mining – Practical Machine Learning Tools and Techniques Morgan Kaufman Publications, Third Edition, 2011.
4. David Hand, HeikkiMannila and Padhraic Smyth, “Principles of Data Mining”, MIT PRESS, 2001

WEB REFERENCES:

1. *https://swayam.gov.in/nd2_arp19_ap60/preview*
2. *https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/106104189/lec1.pdf*

ONLINE RESOURCES:

1. *https://examupdates.in/big-data-analytics/*
2. *https://www.tutorialspoint.com/big_data_analytics/index.htm*
3. *https://www.tutorialspoint.com/data_mining/index.htm*

MU4003 MULTIMEDIA INFORMATION STORAGE AND RETRIEVAL L T P C
3 0 0 3

COURSE 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 use of machine learning methods on multimedia collections.
- To critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

UNIT I STORAGE AND PRESENTATION OF MULTIMEDIA 9

Introduction – Media Types – Media Understanding – Description of Audio, Visual Spectral and Video – Storage Networks, Storage Medium – Multidimensional Data Structures: K-D Trees –

Point Quadtrees – The MX-Quadtree – Rtrees – Comparison of Different Data Structures.

Suggested Activities:

- Install openCV and learn the functions which are used for Image retrieval.

Suggested Evaluation Methods:

- Quiz on applications of data structure

UNIT II TEXT AND MUSIC RETRIEVAL 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.

Suggested Activities:

- Compute the tf-idf weights for the terms car, auto, insurance, best for each document, using the idf values from Figure.

	Doc1	Doc2	Doc3
Car	27	4	24
Auto	3	33	0
Insurance	0	33	29
Best	14	0	17

- Consider the query best car insurance on a fictitious collection with N=1,000,000 documents where the document frequencies of auto, best, car and insurance are respectively 5000, 50000, 10000 and 1000. Compute the cosine similarities between the query vector and each document vector in the collection.

Suggested Evaluation Methods:

- Discussion on applying various tf-idf variant and similarity measurements and comparing the results.

UNIT III IMAGE RETRIEVAL 9

Content-Based Image Retrieval – Techniques – Feature Extraction – Integration – Similarity – Feature in Indexing – Interactive Retrieval – MPEG-7 Standard.

Suggested Activities:

- Assignment on numerical problems on feature extraction techniques.

Suggested Evaluation Methods:

- Tutorial – MPEG-7 standards.
- Tutorial on the problem of choosing the features to be extracted for a large image collection.

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.

Suggested Activities:

- External learning – Survey on colour-based tracking and optical flow.
- Practical – Learn any open source database software for database operations.

Suggested Evaluation Methods:

- Demonstration and quiz on the practical exercise and the EL component.

UNIT V RETRIEVAL METRICS AND TRENDS 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 To Parallel IR – Distributed IR – Trends and Research Issue.

Suggested Activities:

- External learning – Survey on image and video retrieval processing in a search engine such as Google, Yahoo and Bing.

Suggested Evaluation Methods:

- Group discussion and quiz on EL component.
- Assignment on various metric calculations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

CO1:Learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval.

CO2: Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.

CO3: Implement the process by exploring the open source tool for Image retrieval and video retrieval.

CO4: Recognize the feasibility of applying machine learning for a particular problem.

CO5: Critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, “Introduction to Information Retrieval” , Cambridge University Press, 2008.
2. Philip K. C. Tse, “Multimedia Information Storage and Retrieval: Techniques and Technologies”, IGI Publishing, 2002.
3. Oge Marques, Borko Furht, “Content-Based Image And Video Retrieval”, Springer, 2002.
4. V.S. Subrahmanian, “Principles of Multimedia Database Systems”, Morgan Kaufmann, 1998.
5. Stefan Rüger, “Multimedia Information Retrieval”, Morgan and Claypool Publishers, 2009.

IF4092 **COMPUTER VISION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Articulate & apply standard computer vision concepts
- Implement standard image processing tasks
- Applying Clustering concept for Image Classification
- Identify practical constraints in computer vision application
- Architecture of an existing computer vision pipeline based on deep learning models

UNIT I COMPUTER VISION 8

About Computer Vision. Components of an Image Processing System. Image Resolution. Image Formats. Colour Spaces. Fundamental of Image Processing. Visual Inspection System. Biomedical Imaging Methods. Image Thresholding. Based Image Retrieval. Human Visual Inception. Image Formation. Geometric Properties. 3D Imaging. Stereo Images.

UNIT II PIXEL-BASED MANIPULATIONS & TRANSFORMATION 8

Visual properties. Pixel colour manipulation. Colour Change with Pixel Position. Colour Change with Pixel Distance. Colour Change with Trigonometric Functions. Randomness. Drawing with existing images. Blending multiple images. Image transformation. Image orientation. Image resizing. Affine transform. Known Affine Transformations. Unknown Affine Transformations. Perspective transform. Linear vs. polar coordinates. Three-dimensional space. General pixel mapping.

UNIT III STRUCTURE IDENTIFICATION 11

Image preparation. Conversion to grayscale. Conversion to a black-and-white image. Morphological operations (erode, dilate). Blur operations (smoothing)Edge detection. First Derivative Edge Detectors. Second Derivative Edge Detectors. Multispectral Edge Detection. Line detection. Circle detection. Contours processing. Finding the contours. Bounding box. Minimum area rectangle. Convex hull. Polygon approximation. Testing a point in contour. Checking intersection. Shape detection. Moravec Corner Detection. Harris Corner Detection. FAST Corner Detection. SIFT.

UNIT IV CLUSTERING IMAGES & IMAGE RETRIEVAL 9

About Transfer Learning. Extract features. SciPy Clustering Package. K-Means Clustering. Clustering Images. Principal Components. Clustering Pixels. Hierarchical Clustering. Spectral Clustering. Fast Fourier Transforms. -Based Image Retrieval. Indexing Images. Searching the Database for Images. Querying with an Image. Benchmarking and Plotting the Results. Ranking Results Using Geometry.

UNIT V IMAGE CLASSIFICATION USING DEEP LEARNING 9

Working with Image Datasets. k-NN: A Simple Classifier. k-NN Hyperparameters. Gradient Descent. Loss Functions. Stochastic Gradient Descent (SGD). Regularisation. The Perceptron Algorithm. Backpropagation and Multi-layer Networks. Weight Initialization. Constant Initialization. Uniform and Normal Distributions. CNN Building Blocks. Image Classification.

SUGGESTED ACTIVITIES:

1: Identify and List various noises in the Image.

2: Identify Image Manipulation
3: Add colour descriptors and improve the search results.
4: Hierarchical k-means is a clustering method that applies k-means recursively to the clusters to create a tree of incrementally refined clusters
5: Image Classification using CNN

COURSE OUTCOMES:

CO1: Understand the basic knowledge, theories and methods of computer vision.
CO2: to understand the essentials of image processing concepts through mathematical interpretation.
CO3: Demonstrate a knowledge of a broad range of fundamental image processing and image analysis techniques
CO4: Apply Clustering algorithms for clustering.
CO5: Analyse cognitive tasks including image classification, recognition and detection through deep learning.

TOTAL :45 PERIODS

REFERENCES

1. Pro Processing for Images and Computer Vision with OpenCV, Bryan WC Chung, Apress, 2017
2. Programming Computer Vision with Python, Jan Erik Solem, O'Reilly Media, 2012
3. A PRACTICAL INTRODUCTION TO COMPUTER VISION WITH OPENCV, Kenneth Dawson-Howe, Wiley, 2014
4. Practical Computer Vision Applications Using Deep Learning with CNNs: With Detailed Examples in Python Using TensorFlow and Kivy, Ahmed Fawzy Gad, Apress. 2018
5. Computer Vision Principles, Algorithms, Applications, Learning E.R. Davies, Academic Press, 5th edition, 2017

IF4093 **GPU COMPUTING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of GPU architectures
- To understand CPU GPU Program Partitioning
- To write programs for massively parallel processors
- To understand the issues in mapping algorithms for GPUs
- To introduce different GPU programming models

UNIT I GPU ARCHITECTURE **9**

Evolution of GPU architectures - Understanding Parallelism with GPU –Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT II CUDA PROGRAMMING **9**

Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT III PROGRAMMING ISSUES 9

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

UNIT IV OPENCL BASICS 9

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

UNIT V ALGORITHMS ON GPU 9

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster.

SUGGESTED ACTIVITIES:

1. Debugging Lab
2. Performance Lab
3. Launching Nsight
4. Running Performance Analysis
5. Understanding Metrics
6. NVIDIA Visual Profiler
7. Matrix Transpose Optimization
8. Reduction Optimization

COURSE OUTCOMES:

CO1: Describe GPU Architecture
CO2: Write programs using CUDA, identify issues and debug them
CO3: Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
CO4: Write simple programs using OpenCL
CO5: Identify efficient parallel programming patterns to solve problems

TOTAL: 45 PERIODS

REFERENCES

1. Shane Cook, CUDA Programming: “A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.
2. David R. Kaeli, Perhaad Mistry, Dana Schaa, Dong Ping Zhang, “Heterogeneous computing with OpenCL, 3rd Edition, Morgan Kauffman, 2015.
3. Nicholas Wilt, “CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison - Wesley, 2013.
4. Jason Sanders, Edward Kandrot, “CUDA by Example: An Introduction to General Purpose GPU Programming, Addison - Wesley, 2010.
5. David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors - A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.
6. http://www.nvidia.com/object/cuda_home_new.html
7. http://www.openCL.org

IF4095 **SOCIAL NETWORK ANALYSIS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Formalise different types of entities and relationships as nodes and edges and represent this information as relational data.
- Understand the fundamental concepts in analyzing the large-scale data that are derived from social networks
- Understand the basic concepts and principles of different theoretical models of social networks analysis.
- Transform data for analysis using graph-based and statistics-based social network measures
- Choose among social network designs based on research goals

UNIT I GRAPH THEORY AND STRUCTURE 10

Breadth First Search (BFS) Algorithm. Strongly Connected Components (SCC) Algorithm. Weakly Connected Components (WCC) Algorithm. First Set of Experiments—Degree Distributions. Second Set of Experiments—Connected Components. Third Set of Experiments—Number of Breadth First Searches. Rank Exponent R. Out-Degree Exponent O. Hop Plot Exponent H. Eigen Exponent E. Permutation Model. Random Graphs with Prescribed Degree Sequences. Switching Algorithms. Matching Algorithm. “Go with the Winners” Algorithm. HyperANF Algorithm. Iterative Fringe Upper Bound (iFUB) Algorithm. Spid. Degree Distribution. Path Length. Component Size. Clustering Coefficient and Degeneracy. Friends-of-Friends. Degree Assortativity. Login Correlation.

UNIT II SOCIAL NETWORK GRAPH ANALYSIS 9

Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs. Pregel paradigm and Apache Giraph graph processing system.

UNIT III INFORMATION DIFFUSION IN SOCIAL NETWORKS 9

Strategic network formation: game theoretic models for network creation/ user behavior in social networks. Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection. Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation.

UNIT IV CASCADING IN SOCIAL NETWORKS 8

Cascading in Social Networks. Decision Based Models of Cascade. Collective Action. Cascade Capacity. Co-existence of Behaviours. Cascade Capacity with Bilinguality. Probabilistic Models of Cascade. Branching Process. Basic Reproductive Number. SIR Epidemic Model. SIS Epidemic Model. SIRS Epidemic Model. Transient Contact Network. Cascading in Twitter.

UNIT V LINK ANALYSIS & COMMUNITY DETECTION 9

Search Engine. Crawling. Storage. Indexing. Ranking. Google. Data Structures. Crawling. Searching. Web Spam Pages Strength of Weak Ties. Triadic Closure. Detecting Communities in a Network. Girvan-Newman Algorithm. Modularity. Minimum Cut Trees. Tie Strengths in Mobile Communication Network. Exact Betweenness Centrality. Approximate Betweenness Centrality.

SUGGESTED ACTIVITIES:

1: Twitter Intelligence project performs tracking and analysis of the Twitter
2: Large-Scale Network Embedding as Sparse Matrix Factorization
3: Implement how Information Propagation on Twitter
4: Social Network Analysis and Visualization software application.
5: Implement the Structure of Links in Networks

COURSE OUTCOMES:

CO1: Plan and execute network analytical computations.
CO2: Implement mining algorithms for social networks
CO3: Analyze and evaluate social communities.
CO4: Use social network analysis in behavior analytics
CO5: Perform mining on large social networks and illustrate the results.

TOTAL: 45 PERIODS

REFERENCES

1. Practical Social Network Analysis with Python, Krishna Raj P. M. Ankith Mohan and K. G. Srinivasa. Springer, 2018
2. SOCIAL NETWORK ANALYSIS: METHODS AND APPLICATIONS, STANLEY WASSERMAN, and KATHERINE F' AUST. CAMBRIDGE UNIVERSITY PRESS, 2012
3. Social Network Analysis: History, Theory and Methodology by Christina Prell, SAGE Publications, 1st edition, 2011
4. Sentiment Analysis in Social Networks, Federico Alberto Pozzi, Elisabetta Fersini, Enza Messina, and Bing. LiuElsevier Inc, 1st edition, 2016
5. Social Network Analysis, John Scott. SAGE Publications, 2012

MP4251 **CLOUD COMPUTING TECHNOLOGIES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing.
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To gain knowledge in the working of Windows Azure and Storage services offered by Windows Azure
- To develop the cloud application using various programming model of Hadoop and Aneka

UNIT I VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE 6

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- 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 II CLOUD PLATFORM ARCHITECTURE 12

Cloud Computing: Definition, Characteristics - 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 – Architectural Design Challenges

UNIT III AWS CLOUD PLATFORM - IAAS 9

Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools: Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager

UNIT IV PAAS CLOUD PLATFORM 9

Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services- REST API- Blops

UNIT V 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- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka

COURSE OUTCOMES:

CO1: Employ the concepts of virtualization in the cloud computing
CO2: Identify the architecture, infrastructure and delivery models of cloud computing
CO3: Develop the Cloud Application in AWS platform
CO4: Apply the concepts of Windows Azure to design Cloud Application
CO5: Develop services using various Cloud computing programming models.

TOTAL: 45 PERIODS

REFERENCES

1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019.
3. Sriram Krishnan, Programming: Windows Azure, O'Reilly,2010.
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.
5. Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner"s Guidell, McGraw-Hill Osborne Media, 2009.
6. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
8. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
9. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

MU4004 **NON LINEAR EDITING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To introduce the broad perspective of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with 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

COURSE OUTCOMES:

CO1: Compare the strengths and limitations of Nonlinear editing.
CO2: Identify the infrastructure and significance of storytelling.
CO3:Apply suitable methods for recording to CDs and VCDs.
CO4: Address the core issues of advanced editing and training techniques.
CO5: 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.

MU4005 USER INTERFACE DESIGN L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of User Interface Design.
- To design the user interface,menu creation and windows creation.
- To understand the UI Functions and Interfaces .
- To analyze problems with windows design and Non-anthropomorphic design
- To understand 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

COURSE OUTCOMES:

CO1:Knowledge on development methodologies, evaluation techniques and user interface building tools

CO2: Explore a representative range of design guidelines

CO3: Gain experience in applying design guidelines to user interface design tasks.

CO4: Ability to design their own Human Computer Interface.

CO5: Perform Usability testing of the UI

REFERENCES:

1. Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd., 2002.
2. “Interaction Design: Beyond Human Computer Interaction”, Sharp, Rogers, Preece, John Wiley & Sons; 2nd edition ,2007

3. Alan Dix et al, " Human - Computer Interaction ", Prentice Hall, 3rd edition,2014.
4. Ben Schneiderman, " Designing the User Interface ", Addison Wesley, 2000.
5. Deborah Mayhew, The Usability Engineering Lifecycle, Morgan Kaufmann, 1999Ben Shneiderman, “Design The User Interface”, Pearson Education, 1998.
6. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, John Wiley& Sons, 2001.

MU4006 VOICE TECHNOLOGIES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To Explain the speech recognition system and Automatic Speech Recognition
- To Extract features from the voice signal
- To apply difference voice classification techniques in the application
- To build virtual personal assistant using speech recognition techniques
- To perform voice synthesis techniques

UNIT I SPEECH PROCESSING AND RECOGNITION SYSTEM 8

Fundamental of Speech Recognition – Speech production process – Representation of voice in time and frequency domain – Speech sounds and features – Phonetics and Phonology - Phonetics - Phonology and Linguistics Suprasegmental Features of Speech - Automatic speech recognition system (ASR) - Structure of ASR – Neural network approach - Pronunciation Model - Language Model - Central Decoder.

UNIT II FEATURE EXTRACTION 9

Basic Audio Features – Pitch - Timbral Features - Rhythmic Features – Inharmonicity – Autocorrelation - MPEG-7 Features - Feature Extraction Techniques - Linear Prediction Coding (LPC) - Mel-Frequency Cepstral Coefficient (MFCC) - Perceptual Linear Prediction (PLP) - Discrete Wavelet Transform (DWT)

UNIT III VOICE CLASSIFICATION 8

Introduction - Classification Strategies - k-Nearest Neighbors (k-NN) - Naïve Bayes (NB) Classifier - Decision Tree and Speech Classification - Support Vector Machine (SVM) and Speech Classification - Neural Network in Speech Classification - Deep Neural Network in Speech Recognition and Classification

UNIT IV BUILDING VIRTUAL PERSONAL ASSISTANT (VPA) 10

Voice Recognition Module in Python – Building blocks of VPA - Build and Set a timer – Build and Alarm clock – Create Music module –News module – Live radio module – Text to Speech Module - Use cases – Google and Google Assistant – Apple & SIRI - Microsoft & CORTANA

UNIT V VOICE SYNTHESIS 10

Analogue signals - digital signals – filtering – source - filter model of speech production - Text analysis - dynamic time warping - hidden Markov models - statistical TTS paradigms

COURSE OUTCOMES:

CO1 Explain the speech recognition elements and apply Automatic Speech recognition
CO2 Apply the feature Extraction techniques to extract the of voice signal
CO3 Apply the voice classification techniques using different classification algorithm

CO4 Build virtual personal assistant and analyze the use cases
CO5 Perform voice synthesis using hidden Markov model

TOTAL PERIODS:45

REFERENCES

1. Lawrence Rabiner, Lawrence R. Rabiner, Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Prentice Hall,1993
2. Jinyu Li, Li Deng, Reinhold Haeb-Umbach, and Yifan Gong, "Robust automatic speech recognition a bridge to practical applications , Academic Press, 2016

MP4092 **HUMAN COMPUTER INTERACTION** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the foundations of Human Computer Interaction
- Understanding Interaction Styles and to become familiar with the design technologies for individuals and persons with disabilities.
- To understand the process of Evaluation of Interaction Design.
- To clarify the significance of task analysis for ubiquitous computing
- To get insight on web and mobile interaction.

UNIT I FOUNDATIONS OF HCI 9

Context of Interaction –Ergonomics - Designing Interactive systems – Understanding Users-cognition and cognitive frameworks, User Centred approaches Usability, Universal Usability, Understanding and conceptualizing interaction, Guidelines, Principles and Theories Importance of User Interface: Definition-Importance of good design-Benefits of good design-Human-centered development and Evaluation-Human Performance models-A Brief history of screen design.

UNIT II INTERACTION STYLES 9

GUI: Popularity of graphics - The concept of direct manipulation - Graphical system - Characteristics - Web user - Interface Popularity - Characteristics and Principles of User Interface. Understanding interaction styles, Direct Navigation and Immersive environments, Fluid navigation, Expressive Human and Command Languages, Communication and Collaboration Advancing the user experience, Timely user Experience, Information search, Data Visualization Design process: Human Interaction with computers - Importance of Human Characteristics - Human Consideration - Human Interaction Speeds and Understanding Business Junctions.

UNIT III EVALUATION OF INTERACTION 9

Evaluation Techniques- assessing user experience- usability testing – Heuristic evaluation and walkthroughs, analytics predictive models. Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models

UNIT IV MODELS AND THEORIES 9

Task analysis, dialog notations and design, Models of the system, Modeling rich interaction, Ubiquitous computing

UNIT V WEB AND MOBILE INTERACTION 9

Hypertext, Multimedia and WWW, Designing for the web Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Use Transitions-Lookup patterns-Feedback patterns Mobile apps, Mobile navigation, content and control idioms, Multi-touch gestures, Inter-app integration, Mobile web

COURSE OUTCOMES:

CO1: Understand the basics of human computer interactions via usability engineering and cognitive modeling.

CO2: Understand the basic design paradigms, complex interaction styles.

CO3. Understand the models and theories for user interaction

CO4: Examine the evaluation of interaction designs and implementations.

CO5: Elaborate the above issues for web and mobile applications.

TOTAL: 45 PERIODS

REFERENCES

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, NiklasElmqvist, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, Sixth Edition, Pearson Education, 2016.
2. Alan Dix, Janet Finlay, G D Abowd and Russel Beale, "Human Computer Interaction", Pearson Education, Third Edition, 2004.
3. Helen Sharp Jennifer Preece Yvonne Rogers, “Interaction Design: Beyond Human-Computer Interaction”, Wiley, 5th Edition, 2019.
4. Alan Cooper,RobertReimann, David Cronin, Christopher Noessel,“About Face: The Essentials of Interaction Design”, 4th Edition, Wiley, 2014.
5. Donald A. Norman, “Design of Everyday Things”, MIT Press, 2013.
6. Wilbert O Galitz, "The Essential Guide to User Interface Design", Third Edition, Wiley India Pvt., Ltd., 2007.

MU4007 WEB DESIGN AND MANAGEMENT L T P C

3 0 0 3

COURSE OBJECTIVES:

- To have the exposure to Design Thinking and Web Design standards
- To assimilate the Design Principles
- To Understand the responsive design and development with front end web technologies and frameworks
- To get familiarity with Web Hosting services and Security
- To Design and build a Website with HTML, JS, CSS / CMS - Word press or other open source tools

UNIT I WEB DESIGN STANDARDS AND USABILITY 8

Design Thinking, W3C Standards for HTML and CSS, JavaScript and Web APIs, Web Accessibility standards, Graphics, AUdio and Video, Accessibility, Internationalization, Mobile Web and Privacy.

UNIT II WEB DESIGN PRINCIPLES 8

Setting a vision, strategies for simplicity, Understanding the web environment, Design for multiple screen resolutions, Planning the site, Planning navigation, create the look and feel, Designing for the user, Designing for accessibility, Don't make people think, How people really use the web,

designing for scanning not reading, Designing the home page, Forms that work, Usability testing, Web Design best practices.

UNIT III WEB DESIGN WITH CSS, JAVASCRIPT AND OTHER LIBRARIES 11

Web Authoring tools - Creating Web Graphics - using CSS - CSS Selectors, Typography, Color Modes, aesthetics - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Fluid Layout, Flexbox, and Responsive Images Layout with CSS Grid, Using SVGs for Resolution Independence, Transitions, Transforms and Animation, Media Queries – Supporting Different Viewports- Sass for Responsive Web Design - Mobile-First or Desktop-First - Images and Videos in Responsive Web Design - Javascript - Using Java Script, Jquery, React, ANGULAR for designing web pages

UNIT IV WEB HOSTING and SECURITY 9

Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel , Using FTP Client, Maintaining a Website
Concepts of SEO : Basics of SEO, Importance of SEO, Onpage Optimization Basics, WebSite Security.

UNIT V CASE STUDY AND CMS 9

Using HTML, CSS, JS or using Opensource CMS like Wordpress, zoomla, DRUPAL, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On Successful completion of the course ,Students will be able to
CO1: Use Web standards guidelines for designing websites
CO2: Design and build responsive web pages with CSS
CO3: Design and build interactive web pages with JavaScript Jquery, React, Angular,
CO4:Explore the hosting services available and Manage, Maintain and Support Web Apps
CO5: Use Web authoring tools and create websites consistent with standards.

REFERENCES:

1. https://www.w3.org/WAI/standards-guidelines/
2. Steve Krug, “Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability (Voices That Matter)”, New Riders Press, 2014.
3. Giles Colborne, “Simple and Usable Web, Mobile, and Interaction Design”, 2nd Edition, New Riders Press, 2018.
4. Jeol Sklar, Principles of Web Design, Course Technology Inc, 6th Edition, 2014.
5. Jennifer Niederst Robbins, "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics”, O'REILLY 5th Edition, 2018.
6. Ben Frain, “Responsive Web Design with HTML5 and CSS: Develop future-proof responsive websites using the latest HTML5 and CSS techniques”, 3rd Edition, Packt Publishing, 2020
7. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
8. Jon Duckett, Jack Moore, "JavaScript and JQuery: Interactive Front-End Web Development ", 1st Edition, Wiley, 2014
10. Wordpress - http://www.wpbeginner.com/category/wp-tutorials/
11. Harvey M. Deitel,Paul J,,Abbey Deitel.,”Internet & World Wide Web How to Program”, fifth edition , Pearson Education, 2020.

12. Scobey, Pawan Lingras, “Web Programming and Internet Technologies An ECommerce Approach”, Second Edition, Jones & Bartlett Publishers, 2016.
13. Laura Lemay Rafe Coburn Jennifer Kyrnin, “Mastering Html, Css & Javascript Web Publishing”, SAMS/BPB Publishers, 1st Edition, 2016.
14. Steven M. Schafer, “HTML, XHTML, and CSS Bible, 5ed”, Wiley India, 2010
15. https://www.d.umn.edu/itss/training/online/webdesign/books.html

MU4008 VIDEO PROCESSING AND ANALYTICS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To have a better knowledge about videos representation and its formats
- To know the fundamental concepts of data science and analytics
- To enrich students with video processing for analytics
- To understand the data analytics for processing video content
- To expose the student to emerging trends in video analytics

UNIT I VIDEO FUNDAMENTALS 9

Basic Concepts and Terminology – Analog Video Standards – Digital Video Basics – Analog-to Digital Conversion – Color Representation and Chroma Sub Sampling – Video Sampling Rate and Standards Conversion – Digital Video Formats –Video Features – Colour, Shape and Textural Features.

Suggested Activities

- In class activity – Numerical problems related to sampling and standards conversion.
- Flipped classroom – Discussion on video features.

Suggested Evaluation Methods

- Online quiz on video features.
- Assignments on sampling and standards conversion.

UNIT II MOTION ESTIMATION AND VIDEO SEGMENTATION 9

Fundamentals of Motion Estimation – Optical Flow – 2D and 3D Motion Estimation – Block Based Point Correspondences – Gradient Based Intensity Matching – Feature Matching – Frequency Domain Motion Estimation – Video Segmentation.

Suggested Activities

- In-class activity – Numerical problems related to motion estimation.
- External learning – Survey on optical flow techniques.

Suggested Evaluation Methods

- Online quiz on optical flow techniques.
- Assignments on numerical problems in motion estimation.

UNIT III FUNDAMENTAL DATA ANALYSIS 9

Exploratory Data Analysis – Collection of Data – Graphical Presentation of Data – Classification of Data – Storage and Retrieval of Data – Big Data – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis vs. Reporting.

Suggested Activities

- In class activity – Graphical presentation of data for visualization.
- External learning – Survey on Modern Data Analytic Tools.

Suggested Evaluation Methods

- Quiz on modern data analytic tools.
- Assignments on data visualization.

UNIT IV MINING DATA STREAMS AND VIDEO ANALYTICS 9

Introduction To Streams Concepts – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Analytic Processes and Tools – Video shot boundary detection – Model Based Annotation and Video Mining – Video Database – Video Categorization – Video Query Categorization.

Suggested Activities

- Flipped classroom on discussion on automatic video trailer generation.
- External learning – Survey on analytic processes and tools.

Suggested Evaluation Methods

- Quiz on video trailer generation.
- Assignments on analytic processes and tools.

UNIT V EMERGING TRENDS 9

Affective Video Content Analysis – Parsing a Video Into Semantic Segments – Video Indexing and Abstraction for Retrievals – Automatic Video Trailer Generation – Video In painting – Forensic Video Analysis.

Suggested Activities

- External learning – Survey on Affective Video Content Analysis.
- Flipped classroom on discussion on forensic video analysis.

Suggested Evaluation Methods

- Online quiz on forensic video analysis.
- Assignments on affective video content analysis.

PRACTICAL EXERCISES: 30

1. Choose appropriate features for video segmentation for given sample video.
2. Compute two dimension motion estimation using block based match technique.
3. Calculate the motion estimation based on Frequency domain.
4. Compare the video features extracted from a given video dataset using graphical representation.
5. Compute the number of distinct elements found in the given sample data stream.
6. Detect shot boundary for given sample video.
7. Parse the given sample video for indexing and faster retrieval.
8. Generate an automatic video trailer for given sample video.
9. Design simple application using video in painting technique.
10. Mini project for video categorization based on content analysis.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

CO1: Discuss video processing fundamentals
CO2: Analyze video features for segmentation purpose
CO3: Derive numeric problems related to motion estimation
CO4: Process video streams for analytics purpose
CO5: Parse and index video segments
CO6: Design applications for video analytics in current trend

REFERENCES:

1. Roy, A., Dixit, R., Naskar, R., Chakraborty, R.S., "Digital Image Forensics: Theory and Implementation", Springer, 2018.
2. Paul Kinley, "Data Analytics for Beginners: Basic Guide to Master Data Analytics", CreateSpace Independent Publishing Platform, 2016.
3. Henrique C. M. Andrade, Bugra Gedik, Deepak S. Turaga, "Fundamentals of Stream Processing: Application Design, Systems, and Analytics", Cambridge University Press, 2014.
4. Murat Tekalp, "Digital Video Processing" Second Edition, Prentice Hall, 2015.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, 2014.
6. Oges Marques, "Practical Image and Video Processing Using MATLAB", Wiley-IEEE Press, 2011.

MU4009 SHORT FILM DEVELOPMENT L T P C
3 0 2 4

COURSE OBJECTIVES:

- To undeest6and step by step procedure in making a documentary on any topic.
- Able to handle post production work
- At the end of the course, students will produce a documentary as part of their assessment.
- The students will be able to ensure the exhibition of their films for reviews.
- To learn the process of production and direction of an individually or group authored documentary film.

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

PRACTICALS: 30

1. Powerpoint presentation on Current public issues topics.
2. Song mixing using Adobe Audition.
3. Creating new sound effects and voice over for the short film using Adobe Audition.
4. Creating graphics for titles using Adobe illustrator.
5. Implementing various transition animations using Unity.
6. Editing short films using Adobe Premiere Pro.
7. Creating Lighting effects using Adobe LightRoom.
8. Working on color correction and color exposure using Photoshop.
9. Preparing shooting script and Editing Script.
10. Develop a short film based on current public issues as a mini project.

COURSE OUTCOMES:

CO1: Understands the basic skills of developing the documentary.

CO2: At the end of the course, students will be able to gain adequate skills about pre production.

CO3: Students will be able to apply principles of factual program production in their future productions

CO4: Apply various tools and software for lighting and sound to uphold the professional and social obligation

CO5: Understands the steps involved in post production and screening.

TOTAL:75 PERIODS

REFERENCES:

1. Alan Rosenthal. Writing, Directing, and Producing Documentary Film, SIU Press,4th Edition 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 , Second Edition, Bloomsbury Publishing India Private Limited, 2012
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.

MX4291 **MEDICAL IMAGE PROCESSING** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand the fundamentals of medical image processing techniques.
- To understand the basic concepts of image enhancement, image restoration, morphological image processing, image segmentation, feature recognition in medical images
- To provide information about various medical imaging modalities
- To provide information about classification and image visualization in medical image processing projects.
- To familiarize the student with the image processing facilities in Matlab, Python and openCV

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. DFT, DCT, KLT, SVD

UNIT II MEDICAL IMAGE ENHANCEMENT AND RESTORATION 9

Image Enhancement operation, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image enhancement. Image Restoration - degradation model, Unconstrained and constrained restoration, Inverse filtering- Wiener filtering

UNIT III MEDICAL IMAGE REPRESENTATION 9

Pixels and voxels – algebraic image operations - gray scale and color representation- depth-color and look up tables - image file formats- DICOM- other formats- Analyze 7.5, NifTI and Interfile, Image quality and the signal to noise ratio

UNIT IV MEDICAL IMAGE ANALYSIS AND CLASSIFICATION 9

Image segmentation- pixel based, edge based, region based segmentation. Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and image classification – Statistical, Rule based, Neural Network approaches

UNIT V IMAGE REGISTRATIONS AND VISUALIZATION 9

Image Registration: Rigid body transformation – Affine transformation, Principal axes registration, Iterative principal axes registration, Feature based registration, Elastic deformation based registration, Registration of Images from Different modalities, Evaluation of Registration Methods. **Image visualization**: 2-D display methods, 3-D display methods, surface and volume based 3-D display methods – Surface Visualization and Volume visualization, 3-D Echocardiography, 3D+time Echocardiography, virtual reality based interactive visualization.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

The following experiments should be performed in OpenCV / Python / Scilab / Matlab Octave / other Open source software.

LIST OF EXPERIMENTS

1. Preprocessing of medical images
2. Filtering of medical images.
3. Edge detection using Python
4. Segmentation of ROI in medical images.
5. Feature extraction in medical images
6. Steganography using OpenCV.
7. Medical image fusion.
8. Statistical analysis of features
9. Neural network based classification.

COURSE OUTCOMES:

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

CO1: Apply basic medical image processing algorithms

CO2: Image pre-processing applications that incorporates different concepts of filters for medical Image Processing and reconstruction of an image

CO3: Describe the image representation model

CO4: Analysis of image segmentation, feature extraction and image classification

CO5: Explore the knowledge in image registration and visualization and possibility of applying Image processing concepts in modern hospitals

TOTAL:75 PERIODS

REFERENCES

1. Atam P.Dhawan, Medical Image Analysis, 2nd Edition, John Wiley & Sons, Inc., Hoboken, New Jersey, 2011.
2. Anil K Jain, Fundamentals of Digital Image Processing, 1st Edition, Pearson Education India, 2015.
3. Rafael C.Gonzalez and Richard E.Woods, Digital Image Processing, 4th Edition, Pearson Education, 2018.
4. Wolfgang Birkfellner, —Applied Medical Image Processing – A Basic coursell, CRC Press, 2011
5. Geoff Dougherty, Digital Image Processing for Medical Applications, 1st Edition, 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. Milan Sonka et aI, —Image Processing, Analysis and Machine Vision‖, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.
9. Ravikanth Malladi, Geometric Methods in Biomedical Image Processing (Mathematics and Visualization), 1st Edition, Springer-Verlag Berlin Heidelberg 2002.
10. Joseph V. Hajnal, Derek L.G. Hill and David J. Hawkes, Medical Image Registration, CRC Press, 2001.

CP4252 **MACHINE LEARNING** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand the concepts and mathematical foundations of machine learning and types of problems tackled by machine learning
- To explore the different supervised learning techniques including ensemble methods
- To learn different aspects of unsupervised learning and reinforcement learning
- To learn the role of probabilistic methods for machine learning
- To understand the basic concepts of neural networks and deep learning

UNIT I INTRODUCTION AND MATHEMATICAL FOUNDATIONS 9

What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges -Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry -Probability and Statistics- Bayesian Conditional Probability -Vector Calculus & Optimization - Decision Theory - Information theory

UNIT II SUPERVISED LEARNING 9

Introduction-Discriminative and Generative Models -Linear Regression - Least Squares -Under-fitting / Overfitting -Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbours - Tree based Methods –Decision Trees –ID3 – CART - Ensemble Methods –Random Forest - Evaluation of Classification Algorithms

UNIT III UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING 9

Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis – Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning

UNIT IV PROBABILISTIC METHODS FOR LEARNING- 9

Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Models

UNIT V NEURAL NETWORKS AND DEEP LEARNING **9**

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Use cases

45 PERIODS

SUGGESTED ACTIVITIES:

1. Give an example from our daily life for each type of machine learning problem
2. Study at least 3 Tools available for Machine Learning and discuss pros & cons of each
3. Take an example of a classification problem. Draw different decision trees for the example and explain the pros and cons of each decision variable at each level of the tree
4. Outline 10 machine learning applications in healthcare
5. Give 5 examples where sequential models are suitable.
6. Give at least 5 recent applications of CNN

PRACTICAL EXERCISES: **30 PERIODS**

1. Implement a Linear Regression with a Real Dataset (https://www.kaggle.com/harrywang/housing). Experiment with different features in building a model. Tune the model's hyperparameters.
2. Implement a binary classification model. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?"(use data from exercise 1). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.
3. Classification with Nearest Neighbours. In this question, you will use the scikit-learn's KNN classifer to classify real vs. fake news headlines. The aim of this question is for you to read the scikit-learn API and get comfortable with training/validation splits. Use California Housing Dataset
4. In this exercise, you'll experiment with validation sets and test sets using the dataset. Split a training set into a smaller training set and a validation set. Analyze deltas between training set and validation set results. Test the trained model with a test set to determine whether your trained model is overfitting. Detect and fix a common training problem.
5. Implement the k-means algorithm using https://archive.ics.uci.edu/ml/datasets/Codon+usage dataset
6. Implement the Naïve Bayes Classifier using https://archive.ics.uci.edu/ml/datasets/Gait+Classification dataset
7. Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data.
    - **a.** Your project may be a comparison of several existing algorithms, or it may propose a new algorithm in which case you still must compare it to at least one other approach.
    - **b.** You can either pick a project of your own design, or you can choose from the set of pre-defined projects.
    - **c.** You are free to use any third-party ideas or code that you wish as long as it is publicly available.
    - **d.** You must properly provide references to any work that is not your own in the write-up.
    - **e.** Project proposal You must turn in a brief project proposal. Your project proposal should describe the idea behind your project. You should also briefly describe software you will need to write, and papers (2-3) you plan to read.

List of Projects (datasets available)

1. Sentiment Analysis of Product Reviews
2. Stock Prediction

3. Sales Forecasting
4. Music Recommendation
5. Handwriting Digit Classification
6. Fake News Detection
7. Sports Prediction
8. Object Detection
9. Disease Prediction

COURSE OUTCOMES:

Upon the completion of course, students will be able to

CO1: Understand and outline problems for each type of machine learning

CO2: Design a Decision tree and Random forest for an application

CO3: Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.

CO4: Use a tool to implement typical Clustering algorithms for different types of applications.

CO5: Design and implement an HMM for a Sequence Model type of application and identify applications suitable for different types of Machine Learning with suitable justification.

TOTAL:75 PERIODS

REFERENCES

1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Chapman & Hall/CRC, 2nd Edition, 2014.
2. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
3. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014
4. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.
5. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
6. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2015
7. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
8. Hal Daumé III, "A Course in Machine Learning", 2017 (freely available online)
9. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, 2009 (freely available online)
10. Aurélien Géron , Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition, o'reilly, (2017)

CP4291 **INTERNET OF THINGS** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and Real World Design Constraints
- To Understand the various IoT levels
- To understand the basics of cloud architectue
- To gain experience in Raspberry PI and experiment simple IoT application on it

UNIT I INTRODUCTION **9+6**

Internet of Things- Domain Specific IoTs - IoT and M2M-Sensors for IoT Applications–Structure of

IoT– IoT Map Device- IoT System Management with NETCONF-YANG

UNIT II IoT ARCHITECTURE, GENERATIONS AND PROTOCOLS 9+6

IETF architecture for IoT - IoT reference architecture -First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics

UNIT III IoT PROTOCOLS AND TECHNOLOGY 9+6

SCADA and RFID Protocols - BACNet Protocol -Zigbee Architecture - 6LowPAN - CoAP -Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

UNIT IV CLOUD ARCHITECTURE BASICS 9+6

The Cloud types; IaaS, PaaS, SaaS.- Development environments for service development; Amazon, Azure, Google Appcloud platform in industry

UNIT V IOT PROJECTS ON RASPBERRY PI 9+6

Building IOT with RASPBERRY PI- Creating the sensor project - Preparing Raspberry Pi - Clayster libraries – Hardware Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data

SUGGESTED ACTIVITIES:

1. Develop an application for LED Blink and Pattern using arduino or Raspberry Pi
2. Develop an application for LED Pattern with Push Button Control using arduino or Raspberry Pi
3. Develop an application for LM35 Temperature Sensor to display temperature values using arduino or Raspberry Pi
4. Develop an application for Forest fire detection end node using Raspberry Pi device and sensor
5. Develop an application for home intrusion detection web application
6. Develop an application for Smart parking application using python and Django for web application

COURSE OUTCOMES:

CO1: Understand the various concept of the IoT and their technologies
CO2: Develop the IoT application using different hardware platforms
CO3: Implement the various IoT Protocols
CO4: Understand the basic principles of cloud computing
CO5: Develop and deploy the IoT application into cloud environment

TOTAL: 75 PERIODS

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A hands-on approach, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles (Eds), Architecting the Internet of Things, Springer, 2011
3. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

4. Ovidiu Vermesan Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces: A Multidisciplinary Introduction, 2nd EditionScitech Publishers, 202014
6. Reese, G. (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. Sebastopol, CA: O'Reilly Media, Inc. (2009)

BC4151 BIOMETRIC SYSTEMS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To learn and understand biometric technologies and their functionalities.
- To learn the role of biometric in the organization
- To Learn the computational methods involved in the biometric systems.
- To expose the context of Biometric Applications
- To learn to develop applications with biometric security

UNIT I INTRODUCTION 9+6

Introduction – history – type of biometrics – General architecture of biometric systems – Basic working of biometric matching – Biometric system error and performance measures – Design of biometric systems – Applications of biometrics – Biometrics versus traditional authentication methods – character recognition – authentication technologies, biometric technologies, Finger, face, voice and iris biometric technologies.

UNIT II FINGERPRINT, FACE AND IRIS AS BIOMETRICS 9+6

Fingerprint biometrics – Fingerprint recognition system – Minutiae extraction – Fingerprint indexing – experimental results – Biometrics using vein pattern of palm – Advantages and disadvantages – Basics of hand geometry

Background of face recognition – Design of face recognition system – Neural network for face recognition – Face detection in video sequences – Challenges in face biometrics – Face recognition methods – Advantages and disadvantages

Iris segmentation method – Determination of iris region – Experimental results of iris localization – applications of iris biometrics – Advantages and disadvantages.

UNIT III PRIVACY ENHANCEMENT AND MULTIMODAL BIOMETRICS 9+6

Privacy concerns associated with biometric developments – Identity and privacy – Privacy concerns – biometrics with privacy enhancement – Comparison of various biometrics in terms of privacy – Soft biometrics - Introduction to biometric cryptography – General purpose cryptosystem – Modern cryptography and attacks – Symmetric key ciphers – Cryptographic algorithms – Introduction to multimodal biometrics – Basic architecture using face and ear – Characteristics and advantages of multimodal biometrics characters – AADHAAR : An Application of Multimodal Biometrics.

UNIT IV WATERMARKING TECHNIQUES & BIOMETRICS: SCOPE AND FUTURE 9+6

Data hiding methods – Basic framework of watermarking – Classification, Applications, Attacks, Performance Evaluation and Characteristics – General Watermarking process – Image

watermarking techniques – Watermarking algorithm – Effect of attacks on watermarking techniques –Scope and future market of biometrics

Applications of Biometrics and information technology infrastructure – Role of biometrics in enterprise security – Role of biometrics in border security – Smart card technology and biometric – Radio frequency identification biometrics – DNA Biometrics – Comparative study of various biometrics techniques.

UNIT V IMAGE ENHANCEMENT TECHNIQUES & BIOMETRICS STANDARDS 9+6

Current research in image enhancement techniques – Image enhancement algorithms– Frequency domain filters – Databases and implementation – Standard development organizations – Application programming interface – Information security and biometric standards – Biometric template interoperability biometrics for network security and biometrics for transaction.

LIST OF EXPERIMENTS:

1. Student school smart card
2. Secure lab access using card scanner plus face recognition
3. Student bus pass with barcode card scan
4. Student bus pass with webcam scan
5. Employee attendance system by Qr scan
6. Student examination datacard
7. School student attendance system by barcode scan
8. School student attendance system by Qr scan
9. School student attendance with fingerprint reader
10. Fingerprint voting system project
11. Employee hourly attendance by barcode scan
12. Visual product identification for blind

COURSE OUTCOMES:

CO1: Identify the various biometric technologies.
CO2: Design of biometric recognition for the organization.
CO3: Develop simple applications for privacy.
CO4: Understand the need of biometric in the society
CO5: Understand the research in biometric techniques.

TOTAL : 75 PERIODS

REFERENCES:

1. G R Sinha and Sandeep B. Patil, Biometrics: Concepts and Applications, Wiley, 2013
2. Paul Reid, Biometrics for Network Security, Pearson Education, 2003
3. Samir Nanavathi, Micheal Thieme, Raj Nanavathi, Biometrics – Identity verification in a networked world, Wiley – dream Tech, 2002.
4. John D Woodward, Jr.; Nicholas M Orlans; Peter T Higgins, Biometrics – The Ultimate Reference, Wiley Dreamtech.College Publications, 2015.
5. Khalid Saeed, “New Directions in Behavioral Biometrics', CRC Press 2020.
6. Ruud M. Bolle, Sharath Pankanti, Nalini K. Ratha, Andrew W. Senior, Jonathan H. Connell, Guide to Biometrics, Springer 2009.
7. Rafael C. Gonzalez, Richard Eugene Woods, Digital Image Processing using MATLAB, 2nd Edition, Tata McGraw-Hill Education 2010.

IF4291 FULL STACK WEB APPLICATION DEVELOPMENT L T P C
3 0 2 4

COURSE OBJECTIVES:

- Develop TypeScript Application
- Develop Single Page Application (SPA)
- Able to communicate with a server over the HTTP protocol
- Learning all the tools need to start building applications with Node.js
- Implement the Full Stack Development using MEAN Stack

UNIT I FUNDAMENTALS & TYPESCRIPT LANGUAGE 10

Server-Side Web Applications. Client-Side Web Applications. Single Page Application. About TypeScript. Creating TypeScript Projects. TypeScript Data Types. Variables. Expression and Operators. Functions. OOP in Typescript. Interfaces. Generics. Modules. Enums. Decorators. Enums. Iterators. Generators.

UNIT II ANGULAR 10

About Angular. Angular CLI. Creating an Angular Project. Components. Components Interaction. Dynamic Components. Angular Elements. Angular Forms. Template Driven Forms. Property, Style, Class and Event Binding. Two way Bindings. Reactive Forms. Form Group. Form Controls. About Angular Router. Router Configuration. Router State. Navigation Pages. Router Link. Query Parameters. URL matching. Matching Strategies. Services. Dependency Injection. HttpClient. Read Data from the Server. CRUD Operations. Http Header Operations. Intercepting requests and responses.

UNIT III NODE.Js 10

About Node.js. Configuring Node.js environment. Node Package Manager NPM. Modules. Asynchronous Programming. Call Stack and Event Loop. Callback functions. Callback errors. Abstracting callbacks. Chaining callbacks. File System. Synchronous vs. asynchronous I/O. Path and directory operations. File Handle. File Synchronous API. File Asynchronous API. File Callback API. Timers. Scheduling Timers. Timers Promises API. Node.js Events. Event Emitter. Event Target and Event API. Buffers. Buffers and TypedArrays. Buffers and iteration. Using buffers for binary data. Flowing vs. non-flowing streams. JSON.

UNIT IV EXPRESS.Js 7

Express.js. How Express.js Works. Configuring Express.js App Settings. Defining Routes. Starting the App. Express.js Application Structure. Configuration, Settings. Middleware. body-parser. cookie-parser. express-session. response-time. Template Engine. Jade. EJS. Parameters. Routing. router.route(path). Router Class. Request Object. Response Object. Error Handling. RESTful.

UNIT V MONGODB 8

Introduction to MongoDB. Documents. Collections. Subcollections. Database. Data Types. Dates. Arrays. Embedded Documents. CRUD Operations. Batch Insert. Insert Validation. Querying The Documents. Cursors. Indexing. Unique Indexes. Sparse Indexes. Special Index and Collection Types. Full-Text Indexes. Geospatial Indexing. Aggregation framework.

LIST OF EXPERIMENTS : **30**

1: Accessing the Weather API from Angular
2: Accessing the Stock Market API from Angular
3: Call the Web Services of Express.js From Angular
4: Read the data in Node.js from MongoDB
5: CRUD operation in MongoDB using Angular

COURSE OUTCOMES:

CO1: Develop basic programming skills using Javascript
CO2: Implement a front-end web application using Angular.
CO3: Will be able to create modules to organise the server
CO4: Build RESTful APIs with Node, Express and MongoDB with confidence.
CO5: Will learn to Store complex, relational data in MongoDB using Mongoose

TOTAL : 45 + 30=75 PERIODS

REFERENCES

1. Adam Freeman, Essential TypeScript, Apress, 2019
2. Mark Clow, Angular Projects, Apress, 2018
3. Alex R. Young, Marc Harter,Node.js in Practice, Manning Publication, 2014
4. Pro Express.js, Azat Mardan, Apress, 2015
5. MongoDB in Action, Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, Manning Publication, Second edition, 2016

IF4071 **DEEP LEARNING** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- Develop and Train Deep Neural Networks.
- Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition
- Build and train RNNs, work with NLP and Word Embeddings
- The internal structure of LSTM and GRU and the differences between them
- The Auto Encoders for Image Processing

UNIT I DEEP LEARNING CONCEPTS **6**

Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modelling. Early Neural Networks. How Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data. Video Data.

UNIT II NEURAL NETWORKS **9**

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Overfitting and Underfitting. Hyperparameters.

UNIT III CONVOLUTIONAL NEURAL NETWORK **10**

About CNN. Linear Time Invariant. Image Processing Filtering. Building a convolutional neural

network. Input Layers, Convolution Layers. Pooling Layers. Dense Layers. Backpropagation Through the Convolutional Layer. Filters and Feature Maps. Backpropagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions. Various Optimizers. LeNet, AlexNet, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, Microsoft ResNet Model. R-CNN, Fast R-CNN, Faster R-CNN, Mask-RCNN, YOLO

UNIT VI NATURAL LANGUAGE PROCESSING USING RNN 10

About NLP & its Toolkits. Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Backpropagation Through Time. Bidirectional RNNs (BRNN) . Long Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to-Sequence Models (Seq2Seq). Gated recurrent unit GRU.

UNIT V DEEP REINFORCEMENT & UNSUPERVISED LEARNING 10

About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy Gradient Methods. Actor-Critic Algorithm. About Autoencoding. Convolutional Auto Encoding. Variational Auto Encoding. Generative Adversarial Networks. Autoencoders for Feature Extraction. Auto Encoders for Classification. Denoising Autoencoders. Sparse Autoencoders

LIST OF EXPERIMENTS: 30

1: Feature Selection from Video and Image Data
2: Image and video recognition
3: Image Colorization
4: Aspect Oriented Topic Detection & Sentiment Analysis
5: Object Detection using Autoencoder

COURSE OUTCOMES:

CO1: Feature Extraction from Image and Video Data
CO2: Implement Image Segmentation and Instance Segmentation in Images
CO3: Implement image recognition and image classification using a pretrained network (Transfer Learning)
CO4: Traffic Information analysis using Twitter Data
CO5: Autoencoder for Classification & Feature Extraction

TOTAL : 45+30 =75 PERIODS

REFERENCES

1. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017
2. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
3. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
4. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017
5. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C
2 0 0 0

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1 –Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AX4092 **DISASTER MANAGEMENT** **L T P C**
2 0 0 0

COURSE OBJECTIVES:

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION **6**

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS **6**

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA **6**

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT **6**

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT **6**

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES:

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

AX4093 CONSTITUTION OF INDIA L T P C
2 0 0 0

COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization
- of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

AX4094 **நற்றமிழ் இலக்கியம்** **L T P C**
2 0 0 0

UNIT I **சங்க இலக்கியம்** **6**

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
   – எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
   - இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
   - போரை நிறுத்திய ஔவையார்

UNIT II **அறநெறித் தமிழ்** **6**

1. அறநெறி வகுத்த திருவள்ளுவர்
   - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து
   – ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III **இரட்டைக் காப்பியங்கள்** **6**

1. கண்ணகியின் புரட்சி
   - சிலப்பதிகார வழக்குரை காதை

2. சமூகசேவை இலக்கியம் மணிமேகலை
- சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV **அருள்நெறித் தமிழ்** **6**

1. சிறுபாணாற்றுப்படை
- பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்

2. நற்றிணை
- அன்னைக்குரிய புன்னை சிறப்பு

3. திருமந்திரம் (617, 618)
- இயமம் நியமம் விதிகள்

4. தர்மச்சாலையை நிறுவிய வள்ளலார்

5. புறநானூறு
- சிறுவனே வள்ளலானான்

6. அகநானூறு (4) - வண்டு
நற்றிணை (11) - நண்டு
கலித்தொகை (11) - யானை, புறா
ஐந்திணை 50 (27) - மான்

ஆகியவை பற்றிய செய்திகள்

UNIT V **நவீன தமிழ் இலக்கியம்** **6**

1. உரைநடைத் தமிழ்,
- தமிழின் முதல் புதினம்,
- தமிழின் முதல் சிறுகதை,
- கட்டுரை இலக்கியம்,
- பயண இலக்கியம்,
- நாடகம்,

2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL: 30 PERIODS

<u>தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்</u>

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
- www.tamilvu.org

2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
-https://ta.wikipedia.org

3. தர்மபுர ஆதீன வெளியீடு
4. வாழ்வியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
   - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்