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.
# ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M. E. MULTIMEDIA TECHNOLOGY
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABI

## SEMESTER I

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**TOTAL NO. OF CREDITS: 75**

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### SUMMARY

**NAME OF THE PROGRAMME: M.E. MULTIMEDIA TECHNOLOGY**

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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

UNIT II  PROBABILITY AND RANDOM VARIABLES  12

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:


RM4151 RESEARCH METHODOLOGY AND IPR

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

UNIT III DATA ANALYSIS AND REPORTING
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

UNIT V PATENTS

TOTAL : 30 PERIODS

REFERENCES:


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

UNIT II HIERARCHICAL DATA STRUCTURES 9

UNIT III GRAPHS 9

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

UNIT V NP COMPLETE AND NP HARD 9

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:

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
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

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

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
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

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:

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

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

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

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
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

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:
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

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
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.

Suggested Evaluation Methods:
1. Demonstration on after effects animations.
2. Quizzes on file formats and color models.

UNIT III MULTIMEDIA 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

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

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:
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.

REFERENCES:
MU4161 MULTIMEDIA AUTHORIZING TOOLS LABORATORY

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. Audio 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

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

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
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.
- 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**

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**


**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**

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

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

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


Suggested Activities:
1. External learning - cryptanalysis for algorithms such as AES, RSA.

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

UNIT II  DIGITAL WATERMARKING BASICS


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


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


Suggested Activities:
1. An application to be developed using Steganography.

Suggested Evaluation Methods:
- Can be done by hiding capacity, Distortion measure and Security
UNIT V  MULTIMEDIA ENCRYPTION


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

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
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**


**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**


**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**

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.
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

MU4201 MULTIMEDIA DATABASES

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


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


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.
3. Demonstration of the practical implementation.

**UNIT III  IMAGE RETRIEVAL MECHANISMS**


**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**


**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**


**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

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 (at least 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
<table>
<thead>
<tr>
<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection of area of interest and Topic</td>
<td>You are requested to select an area of interest, topic and state an objective</td>
<td>2nd week</td>
<td>3 % Based on clarity of thought, current relevance and clarity in writing</td>
</tr>
<tr>
<td>Stating an Objective</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 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                                                             |
<table>
<thead>
<tr>
<th>Reading and notes for next 5 papers</th>
<th>Repeat Reading Paper Process</th>
<th>6th week</th>
<th>8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading and notes for final 5 papers</td>
<td>Repeat Reading Paper Process</td>
<td>7th week</td>
<td>8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
</tr>
<tr>
<td>Draft outline 1 and Linking papers</td>
<td>Prepare a draft Outline, your survey goals, along with a classification / categorization diagram</td>
<td>8th week</td>
<td>8% (this component will be evaluated based on the linking and classification among the papers)</td>
</tr>
<tr>
<td>Abstract</td>
<td>Prepare a draft abstract and give a presentation</td>
<td>9th week</td>
<td>6% (Clarity, purpose and conclusion) 6% Presentation &amp; Viva Voce</td>
</tr>
</tbody>
</table>
**MU 4212 DIGITAL IMAGE PROCESSING LABORATORY**

**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 spital 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
  a. Edge, line, Point

9. Segmentation
  a. 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:
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:

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
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 –

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
   Limited
3. Fundamentals of Image, Audio, and Video Processing Using MATLAB, Taylor and
   Francis, CRC Press, 2021
5. John W. Woods, Multidimensional Signal, Image, And Video Processing And
   Coding", Academic Press, 2006
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

UNIT II  DATA BROADCASTING  9

UNIT III  DESIGN AND INSTALLATION OF VIDEO AND AUDIO SYSTEMS  9

UNIT IV  AUDIO VIDEO STREAMING  9

UNIT V  ALGORITHMS AND INTERFACES  9

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:

MU4091 MULTIMEDIA COMPRESSION TECHNIQUES

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

UNIT II TEXT COMPRESSION

UNIT III IMAGE COMPRESSION

UNIT IV AUDIO COMPRESSION

UNIT V VIDEO COMPRESSION

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

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

UNIT II CHARACTER MODELING AND SHADING
9

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
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
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:

ML4151 ARTIFICIAL INTELLIGENCE

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**  

**UNIT II  ADVERSARIAL SEARCH AND CONSTRAINT SATISFACTION PROBLEMS**  
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**  

**UNIT IV  UNCERTAIN KNOWLEDGE AND REASONING**  

**UNIT V  PHILOSOPHY, ETHICS AND SAFETY OF AI**  

**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:**
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

UNIT II SIMILAR ITEMS

UNIT III MINING DATA STREAMS

UNIT IV LINK ANALYSIS AND FREQUENT ITEMSETS

UNIT V CLUSTERING

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 consumption
CO5: Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

REFERENCES:


WEB REFERENCES:

1. https://swayam.gov.in/nd2_arp19_ap60/preview

ONLINE RESOURCES:

1. https://examupdates.in/big-data-analytics/

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
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

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

<table>
<thead>
<tr>
<th></th>
<th>Doc1</th>
<th>Doc2</th>
<th>Doc3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>27</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Auto</td>
<td>3</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>Insurance</td>
<td>0</td>
<td>33</td>
<td>29</td>
</tr>
<tr>
<td>Best</td>
<td>14</td>
<td>0</td>
<td>17</td>
</tr>
</tbody>
</table>
- 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

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
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

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.

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:
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


UNIT II  PIXEL-BASED MANIPULATIONS & TRANSFORMATION


UNIT III  STRUCTURE IDENTIFICATION


UNIT IV  CLUSTERING IMAGES & IMAGE RETRIEVAL


UNIT V  IMAGE CLASSIFICATION USING DEEP LEARNING


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
UNIT III PROGRAMMING ISSUES

UNIT IV OPENCL BASICS

UNIT V ALGORITHMS ON GPU
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
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


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


UNIT IV  CASCADING IN SOCIAL NETWORKS  8


UNIT V  LINK ANALYSIS & COMMUNITY DETECTION  9

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.

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

TOTAL: 45 PERIODS

MP4251 CLOUD COMPUTING TECHNOLOGIES

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

UNIT II CLOUD PLATFORM ARCHITECTURE
Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform,
A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges

UNIT III  AWS CLOUD PLATFORM - IAAAS

UNIT IV  PAAS CLOUD PLATFORM

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

UNIT II STORYTELLING
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
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
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
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:
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

UNIT II  HUMAN COMPUTER INTERACTION  9

UNIT III  WINDOWS  9

UNIT IV  MULTIMEDIA  9

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:
5. Deborah Mayhew, The Usability Engineering Lifecycle, Morgan Kaufmann, 1999

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

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

UNIT V VOICE SYNTHESIS 10

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

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

UNIT II
INTERACTION STYLES

UNIT III
EVALUATION OF INTERACTION
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
Task analysis, dialog notations and design, Models of the system, Modeling rich interaction, Ubiquitous computing.
UNIT V WEB AND MOBILE INTERACTION

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

MU4007 WEB DESIGN AND MANAGEMENT

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
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
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

UNIT IV WEB HOSTING and SECURITY 9

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/
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

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
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

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

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:
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.
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:

MU4009 SHORT FILM DEVELOPMENT

COURSE OBJECTIVES:
- To understand 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

UNIT II DEVELOPING THE STORY – PREPRODUCTION
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

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

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

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:
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.
5. Implementing various transition animations using Unity.
7. Creating Lighting effects using Adobe LightRoom.
8. Working on color correction and color exposure using Photoshop.
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:


<table>
<thead>
<tr>
<th>Course Code</th>
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<td>MX4291</td>
<td>MEDICAL IMAGE PROCESSING</td>
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**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
- 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

**UNIT III ** MEDICAL IMAGE REPRESENTATION
- 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
- 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

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.

PRACTICAL EXERCISES:

45 PERIODS
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

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
6. John L.Semmlow, —Biosignal and Biomedical Image Processing Matlab Based
applications‖ Marcel Dekker Inc., New York, 2004

CP4252 MACHINE LEARNING

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

UNIT II SUPERVISED LEARNING

UNIT III UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING

UNIT IV PROBABILISTIC METHODS FOR LEARNING-
UNIT V NEURAL NETWORKS AND DEEP LEARNING

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

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:

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 classifier 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
Sales Forecasting
Music Recommendation
Handwriting Digit Classification
Fake News Detection
Sports Prediction
Object Detection
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

CP4291
INTERNET OF THINGS

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 architecture
- To gain experience in Raspberry PI and experiment simple IoT application on it

UNIT I
INTRODUCTION
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

UNIT III  IoT PROTOCOLS AND TECHNOLOGY  9+6

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:
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

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

UNIT III  PRIVACY ENHANCEMENT AND MULTIMODAL BIOMETRICS  9+6

UNIT IV  WATERMARKING TECHNIQUES & BIOMETRICS: SCOPE AND FUTURE  9+6
watermarking techniques – Watermarking algorithm – Effect of attacks on watermarking techniques – Scope and future market of biometrics

UNIT V IMAGE ENHANCEMENT TECHNIQUES & BIOMETRICS STANDARDS 9+6

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:
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

UNIT II  ANGULAR  10

UNIT III  NODE.Js  10

UNIT IV  EXPRESS.Js  7

UNIT V  MONGODDB  8
LIST OF EXPERIMENTS:
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

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

UNIT II NEURAL NETWORKS 9

UNIT III CONVOLUTIONAL NEURAL NETWORK 10

UNIT VI NATURAL LANGUAGE PROCESSING USING RNN

UNIT V DEEP REINFORCEMENT & UNSUPERVISED LEARNING

LIST OF EXPERIMENTS:
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
4. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND, 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
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman’s

70
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 Sicks 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 &
2. Nishitha Rai, Singh AK, “Disaster Management in India: Perspectives, issues and
3. Sahni, Pardeep Et.Al. ,” Disaster Mitigation Experiences And Reflections”, Prentice Hall
OfIndia, New Delhi,2001.

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
Revolution in 1917 and 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
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.

AX4094 கிளாஞ்சு தரந்தல் L T P C

UNIT I கிளாஞ்சு தரந்தல் 6
1. கிளாஞ்சு தரந்தல் மற்றும் செயல்கருத்தையை அறியும் விளக்கம்
- சமூகவு விளக்க
2. அதனாலும் (82)
- தற்போது பிரிவிற்கு அளவை
3. கிளாஞ்சு பாராள் மற்றும் வேதியியல்
4. புதுக்காலம் (95,195)
- பொறுபொருட்கள் வழிநீளம்

UNIT II கிளாஞ்சு தரந்தல் 6
1. கிளாஞ்சு தரந்தல் மற்றும் செயல்கருத்தையை அறியும் விளக்கம்
- பின் விளக்க
2. பின் விளக்கம் - பிரிவிற்கு விளக்க
- துடுப்பை, சிற்பகம் வழியாக்கம், சிற்பகம், அக்காலநூற்றாண்டு

UNIT III கிளாஞ்சு தரந்தல் 6
1. கிளாஞ்சு தரந்தல் மற்றும் செயல்கருத்தை அறியும் விளக்கம்
- துடுப்பை, சிற்பகம் வழியாக்கம்
UNIT IV

அலையதொகிய கொடுத்தது
1. கேத்தொழிறாசெயலாலான
   - பார்க்க கொண்டாது பண்டை கொண்டாது, பாறையாலும் கொண்டாது, ஏழியான தொண்டாது கொண்டாது, அடுத்து பாதாக்கால்
2. பின்னொக்கால
   - கைலோகத் தின்ம கொட்டால
3. திண்மதிக் (617, 618)
   - தமை திண்மம் கிளையால
4. தொழில்தொழிலாகவை திண்மம் வள்ளலொன்றால
5. போர்கொடுத்தது
   - கைலோக என்னொன்றால
6. அடையதொக (4) - கொண்டால
   - கொண்டால தொன்னொக (11) - கொண்டால
   - கொண்டால தொன்னொக (11) - பார்க்க, புறா
   - கொண்டால 50 (27) - பார்க்க

தமிழ் புரியும் வழிகள்

UNIT V

தமிழ் கல்வி தொழிக்கலம்
1. தமிழ் தமிழ்
   - கல்வி முழும் பதித்மம்
   - கல்வி முழும் சிறுகக்தில்
   - கல்வி திண்மம்
   - பார்க்க திண்மம்
   - போர்கொடுத்தது
   - தந்தான
2. செப்ப கிளையால வெள்ளாண்டல கொண்டால தொழிக்கலம்
3. செப்ப கிளையால கொண்டால தொழிக்கலம்
4. செப்ப கிளையால கொண்டால சிறுகக்தில் வெள்ளாண்டல கொண்டால தொழிக்கலம்
5. உரியம்பொட்டி
6. அர்த்தமுற்றின் கொண்டால
7. கொண்டால கொண்டால வெள்ளாண்டல கொண்டால தொழிக்கலம்

நெளித்த தமிழ் தொழிக்கிளையால்/பக்கச்சாதா
1. தமிழ் தொழில்தொழிலால் கல்விக்கழகம் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் திண்மத்தியப்பேருணம் (Tamil Wikipedia)
   - https://ta.wikipedia.org

TOTAL: 30 PERIODS
3. தர்மபுர ஆட்ட வருடம்
4. வாருநாள் கல்கத்தரியம்
   - தமிழ் பல்கலைக்கழகம், தஞ் ஊவூர்
5. பிறப்புகள் கல்கத்தரியம்
   - தமிழ் மாணிக்க குறும்ப செயற்கை (thamilvalarchithurai.com)
6. பிறப்புகள் கல்கத்தரியம்
   - தமிழ் பல்கலைக்கழகம், தஞ் ஊவூர்