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.

PEO/PO Mapping:

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(3-High, 2- Medium, 1- Low)
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### 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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*Audit course is optional

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### AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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### LIST OF OPEN ELECTIVES FOR PG PROGRAMMES

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MA4151  APPLIED PROBABILITY AND STATISTICS FOR  
COMPUTER SCIENCE ENGINEERS  

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  

UNIT II  PROBABILITY AND RANDOM VARIABLES  

UNIT III  TWO DIMENSIONAL RANDOM VARIABLES  
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT IV  TESTING OF HYPOTHESIS  
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  
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.
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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


REFERENCES:

Course Outcomes:
At the end of this course, the students will have the ability to
1. Formulate and Design research problem
2. Understand and Comprehend the Data Collection Methods
3. Perform Data analysis and acquire Insights
4. Understand IPR and follow research ethics
5. Understand and Practice Drafting and filing a Patent in research and development

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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


UNIT II  HIERARCHICAL DATA STRUCTURES


UNIT III  GRAPHS


UNIT IV  ALGORITHM DESIGN TECHNIQUES


UNIT V  NP COMPLETE AND NP HARD


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

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

UNIT I FUNDAMENTALS 9

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.

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MU4152 MULTIMEDIA COMMUNICATION NETWORKS

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


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.

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.
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MU4153 PRINCIPLES OF MULTIMEDIA

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

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

Suggested Activities:
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.

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.

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

COURSE OBJECTIVES:
- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
• To understand the necessary mathematical abstraction to solve problems.

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

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

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

TOTAL: 60 PERIODS

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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

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

UNIT I  INTRODUCTION  9
Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels. Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing, and sharpening spatial filters, combining the spatial enhancement methods.

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

Suggested Evaluation Methods:
• Tutorial – Image transforms.
• Assignments on histogram specification, histogram equalization and spatial filters.
• Quizzes on noise modeling.

UNIT II  IMAGE RESTORATION  9
A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function. Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation

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

Suggested Evaluation Methods:
• Tutorial – Wavelet transforms.
• Assignment problems on order statistics and multi-resolution expansions.
• Quizzes on wavelet transforms.

UNIT III  FEATURE EXTRACTION  9

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.

REFERENCES

CO-PO Mapping

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TOTA L: 45 PERIODS
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
- Project.

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

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

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

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.

TOTAL: 45+30=75 PERIODS

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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  9

Image Databases – Raw Images – Compressed Image Representations – Similarity Based
Retrieval – Alternative Image DB Paradigms – Representing Image DBs with Relations –

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

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

UNIT IV  AUDIO/VIDEO DATABASES  9

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

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

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

UNIT V  MULTIMEDIA DATABASE DESIGN  9

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

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

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

COURSE OUTCOMES:
CO1: Demonstrate the multidimensional data structures for multimedia applications
CO2: Apply database indexing methods for efficient storage and retrieval of multimedia content.
CO3: Work with Text databases, its storage and retrieval.
CO4: Formulate and generalize the use of audio and video databases for real time
multimedia applications.
CO5: Demonstrate about the Image database, its storage and retrieval. Apply multimedia database
design for multimedia architecture.
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MU4211 TERM PAPER WRITING AND SEMINAR

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

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

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

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<tr>
<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
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<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>
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<td>Stating an Objective</td>
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| 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 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)                                      |
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<tr>
<th>Reading and notes for first 5 papers</th>
<th>Reading Paper Process</th>
<th>5&lt;sup&gt;th&lt;/sup&gt; 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>
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<td>• For each paper form a Table answering the following questions:</td>
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<td>• What is the main topic of the article?</td>
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<td>• What was/were the main issue(s) the author said they want to discuss?</td>
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<td>• Why did the author claim it was important?</td>
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<td>• How does the work build on other’s work, in the author’s opinion?</td>
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<td>• What simplifying assumptions does the author claim to be making?</td>
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<td>• What did the author do?</td>
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<td>• How did the author claim they were going to evaluate their work and compare it to others?</td>
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<td>• What did the author say were the limitations of their research?</td>
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<td>• What did the author say were the important directions for future research? Conclude with limitations/issues not addressed by the paper (from the perspective of your survey)</td>
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<th>Reading and notes for next 5 papers</th>
<th>Repeat Reading Paper Process</th>
<th>6&lt;sup&gt;th&lt;/sup&gt; 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>
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<th>Reading and notes for final 5 papers</th>
<th>Repeat Reading Paper Process</th>
<th>7&lt;sup&gt;th&lt;/sup&gt; 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>
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<tr>
<th>Draft outline 1 and Linking papers</th>
<th>Prepare a draft Outline, your survey goals, along with a classification / categorization diagram</th>
<th>8&lt;sup&gt;th&lt;/sup&gt; week</th>
<th>8% (this component will be evaluated based on the linking and classification among the papers)</th>
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<th>Abstract</th>
<th>Prepare a draft abstract and give a presentation</th>
<th>9&lt;sup&gt;th&lt;/sup&gt; week</th>
<th>6% (Clarity, purpose and...)</th>
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<td>Introduction</td>
<td>Write an introduction and background sections</td>
<td>10th week</td>
<td>5%  (clarity)</td>
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<td>Background</td>
<td>Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey</td>
<td>11th week</td>
<td>10% (this component will be evaluated based on the linking and classification among the papers)</td>
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<td>Sections of the paper</td>
<td>Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey</td>
<td>11th week</td>
<td>10% (this component will be evaluated based on the linking and classification among the papers)</td>
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<td>Your conclusions</td>
<td>Write your conclusions and future work</td>
<td>12th week</td>
<td>5% (conclusions – clarity and your ideas)</td>
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<td>Final Draft</td>
<td>Complete the final draft of your paper</td>
<td>13th week</td>
<td>10% (formatting, English, Clarity and linking) 4% Plagiarism Check Report</td>
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<td>Seminar</td>
<td>A brief 15 slides on your paper</td>
<td>14th &amp; 15th week</td>
<td>10% (based on presentation and Viva-voce)</td>
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TOTAL: 30 PERIODS

Course Outcomes:

At the end of this course, the students will have the ability to

1. Select a topic and collect relevant literature for paper writing
2. Prepare a working outline of the Term paper
3. Summarize and link related papers for effective paper writing
4. Synthesize Conclusions on the topic under study
5. Effectively write and present a term paper

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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 spatial implementation of Relationships between Pixels
2. Transformations of an Image
3. Contrast stretching of a low contrast image,
   1. Histogram processing and Histogram Equalization
4. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
5. Implementation of image sharpening filters and Edge Detection using Gradient Filters
6. Image Compression by DCT, DPCM, HUFFMAN coding
7. Implementation of Image Enhancement
   Spatial filtering
   a. Filtering in frequency domain
8. Implementation of Image Segmentation
   Edge, line, Point
9. Segmentation
   Region based segmentation
   a. Segmentation using Watershed transformation
10. Analysis of different colour images
11. Image Compression and restoration techniques
12. Mini project on coloured images using maximum image processing techniques which support any format of pattern recognition.

TOTAL:30 PERIODS

COURSE OUTCOME:
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:

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

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

UNIT I ELEMENTS, PRINCIPLES AND THEORIES OF DESIGN 9

UNIT II DIGITAL AUDIO 9
UNIT III AUDIO PROCESSING AND CODING

UNIT IV VIDEO FUNDAMENTALS

UNIT V MOTION ESTIMATION AND VIDEO SEGMENTATION
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

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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.

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### 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.

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MU4002 3D GAME MODELING AND RENDERING

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  9
Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

UNIT V  GAME DEVELOPMENT  9
Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, MultiPlayer games.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the student will:
CO1: Analyze the fundamentals of 2D and 3D animation
CO2: Model a character with suitable actions.
CO3: Analyze the game design principle.
CO4: Explore different gaming platforms
CO5: Design an interactive game.

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**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  9
First Order Logic – Inference in First Order Logic - Using Predicate Logic - Knowledge
Representation - Issues - Ontological Engineering - Categories and Objects – Reasoning Systems
for Categories - Planning - Definition - Algorithms - Heuristics for Planning - Hierarchical Planning

UNIT IV  UNCERTAIN KNOWLEDGE AND REASONING  9
Quantifying Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning over Time Probabilistic
Explanation-Based Learning – Evolutionary Computation

UNIT V  PHILOSOPHY, ETHICS AND SAFETY OF AI  9
The Limits of AI – Knowledge in Learning – Statistical Learning Methods – Reinforcement Learning
- Introduction to Machine Learning and Deep Learning - Can Machines Really Think? - Distributed
AI Artificial Life - The Ethics of AI - Interpretable AI - Future of AI - AI Components - AI Architectures

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:
Education; 3rd edition, 2017
Learning”, Chapman and Hall/CRC; 2nd edition, 2018
New Delhi, 2013.
BD4251 BIG DATA MINING AND ANALYTICS L T P C
3 0 0 3

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

UNIT I DATA MINING AND LARGE SCALE FILES 9
Introduction to Statistical modeling – Machine Learning – Computational approaches to modeling
Summarization – Feature Extraction – Statistical Limits on Data Mining - Distributed File System

UNIT II SIMILAR ITEMS 9
Nearest Neighbor Search – Shingling of Documents – Similarity preserving summaries – Local

UNIT III MINING DATA STREAMS 9
Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements

UNIT IV LINK ANALYSIS AND FREQUENT ITEMSETS 9
A-priori algorithm – Handling Larger Datasets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets.

UNIT V CLUSTERING 9
Introduction to Clustering Techniques – Hierarchical Clustering – Algorithms – K-Means – CURFEW
Clustering in Non-Euclidean Spaces – Streams and Parallelism – Case Study: Advertising on

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/

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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


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.

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- 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval.
CO2: Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
CO3: Implement the process by exploring the open source tool for image retrieval and video retrieval.
CO4: Recognize the feasibility of applying machine learning for a particular problem.
CO5: Critically evaluate Multimedia retrieval system effectiveness and improvement techniques.
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IF4092

COMPUTER VISION

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
3.  A PRACTICAL INTRODUCTION TO COMPUTER VISION WITH OPENCV, Kenneth Dawson-Howe, Wiley, 2014
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IF4093 GPU COMPUTING LTPC 3 0 0 3

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

UNIT I GPU ARCHITECTURE 9
Evolution of GPU architectures - Understanding Parallelism with GPU - Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT II CUDA PROGRAMMING 9
Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT III PROGRAMMING ISSUES 9

UNIT IV OPENCL BASICS 9

UNIT V ALGORITHMS ON GPU 9
Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster.
SUGGESTED ACTIVITIES:
1. Debugging Lab
2. Performance Lab
3. Launching Nsight
4. Running Performance Analysis
5. Understanding Metrics
6. NVIDIA Visual Profiler
7. Matrix Transpose Optimization
8. Reduction Optimization

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

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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


UNIT II

SOCIAL NETWORK GRAPH ANALYSIS

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


UNIT IV

CASCADING IN SOCIAL NETWORKS


UNIT V

LINK ANALYSIS & COMMUNITY DETECTION


SUGGESTED ACTIVITIES:

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

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

TOTAL: 45 PERIODS

REFERENCES
1. Practical Social Network Analysis with Python, Krishna Raj P. M. Ankith Mohan and K. G. Srinivasa. Springer, 2018
2. SOCIAL NETWORK ANALYSIS: METHODS AND APPLICATIONS, STANLEY WASSERMAN, and KATHERINE F’ AUST. CAMBRIDGE UNIVERSITY PRESS, 2012

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MP4251

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


**UNIT III**

AWS CLOUD PLATFORM - IAAS


**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**

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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  9
Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

UNIT V  WORKING WITH AVID XPRESS DV 4  9
Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Compare the strengths and limitations of Nonlinear editing.
CO2: Identify the infrastructure and significance of storytelling.
CO3: Apply suitable methods for recording to CDs and VCDs.
CO4: Address the core issues of advanced editing and training techniques.
CO5: Design and develop projects using AVID XPRESS DV 4

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

COURSE OBJECTIVES:
- To understand the basics of User Interface Design.
- To design the user interface, menu creation and windows creation.
- To understand the UI Functions and Interfaces.
- To analyze problems with windows design and Non-anthropomorphic design.
- To understand the design process and evaluations.
UNIT I  INTERACTIVE SOFTWARE AND INTERACTION DEVICE  

UNIT II  HUMAN COMPUTER INTERACTION  

UNIT III  WINDOWS  

UNIT IV  MULTIMEDIA  

UNIT V  DESIGN PROCESS AND EVALUATION  
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

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MU4006 VOICE TECHNOLOGIES

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

UNIT II FEATURE EXTRACTION
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
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)
UNIT V  VOICE SYNTHESIS

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

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MP4092 HUMAN COMPUTER INTERACTION

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

62
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 L T P C 3 0 0 3

COURSE OBJECTIVES:

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

UNIT I WEB DESIGN STANDARDS AND USABILITY 8
Design Thinking, W3C Standards for HTML and CSS, JavaScript and Web APIs, Web Accessibility standards, Graphics, Audio and Video, Accessibility, Internationalization, Mobile Web and Privacy.

UNIT II WEB DESIGN PRINCIPLES 8
Setting a vision, strategies for simplicity, Understanding the web environment, Design for multiple screen resolutions, Planning the site, Planning navigation, create the look and feel, Designing for the user, Designing for accessibility, Don't make people think, How people really use the web, designing for scanning not reading, Designing the home page, Forms that work, Usability testing, Web Design best practices.

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

UNIT IV WEB HOSTING and SECURITY 9
Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website

UNIT V  CASE STUDY AND CMS
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.

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/
13. Steven M. Schafer, “HTML, XHTML, and CSS Bible, 5ed”, Wiley India, 2010

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TOTAL : 45 PERIODS
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
Basic Concepts and Terminology – Analog Video Standards – Digital Video Basics – Analog-to-
Digital Conversion – Color Representation and Chroma Sub Sampling – Video Sampling Rate and
Standards Conversion – Digital Video Formats – Video Features – Colour, Shape and Textural
Features.

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

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

UNIT II MOTION ESTIMATION AND VIDEO SEGMENTATION
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
Exploratory Data Analysis – Collection of Data – Graphical Presentation of Data – Classification of
Data – Storage and Retrieval of Data – Big Data – Challenges of Conventional Systems – Web

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.

TOTAL: 75 PERIODS
COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Discuss video processing fundamentals
CO2: Analyze video features for segmentation purpose
CO3: Derive numeric problems related to motion estimation
CO4: Process video streams for analytics purpose
CO5: Parse and index video segments
CO6: Design applications for video analytics in current trend

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MU4009 SHORT FILM DEVELOPMENT L T P C
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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  9

UNIT II  DEVELOPING THE STORY – PREPRODUCTION  9
Understanding story, story basics, finding the story – Developing story ideas, story structure, time on screen, researching for documentaries, kinds of information, finding people as sources, information management, choosing a subject – Visual scope and visual evidence, permissions, funding, pitching your ideas – Proposals, elements of proposals, resources for writing proposals, attracting funding – Ethics in documentary filmmaking.

UNIT III  SHOOTING THE STORY – PRODUCTION  9
Treatment, unscripted and scripted documentaries, planning, and collecting the material – adapting the script, ways to tell a story – Interviews, recce, use of talents, re-enactments, reconstruction & docudrama. Choosing the team, bringing together right people, working together, getting the right camera & equipments, camerawork, producing, directing, directing the crew. Shooting, lighting, location sound, problems & issues.

UNIT IV  BUILDING THE STORY – POST PRODUCTION  9
Building the story in the editing table, working with an editor – Crafting the story, Finding your style – The paper edit, reviewing the footage, assembling of rushes, editing the footages, applying effects, transition – Adding sound effects and music, special effects dubbing, rerecording – Narration – Voiceover, using Music, titles and graphics – Colour exposure and colour correction – Credits & acknowledgements.

UNIT V  PROJECT – PRACTICE & SCREENING  9
Project involving the production and direction of an individually or group authored documentary film, accompanied by a research dossier, a proposal and a treatment. The students will also ensure the exhibition of their films for reviews

TOTAL: 45 PERIODS  30

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

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MX4291
MEDICAL IMAGE PROCESSING

COURSE OBJECTIVES:

- To understand the fundamentals of medical image processing techniques.
- To understand the basic concepts of image enhancement, image restoration, morphological image processing, image segmentation, feature recognition in medical images.
- To provide information about various medical imaging modalities.
- To provide information about classification and image visualization in medical image processing projects.
- To familiarize the student with the image processing facilities in Matlab, Python and openCV.
UNIT I  
FUNDAMENTALS OF IMAGE PROCESSING  
9  
Image perception, MTF of the visual system, Image fidelity criteria, Image model, Image sampling and quantization – two dimensional sampling theory, Image quantization, Optimum mean square quantizer, Image transforms – 2D-DFT and other transforms. DFT, DCT, KLT, SVD

UNIT II  
MEDICAL IMAGE ENHANCEMENT AND RESTORATION  
9  
Image Enhancement operation, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image enhancement. Image Restoration - degradation model, Unconstrained and constrained restoration, Inverse filtering- Wiener filtering

UNIT III  
MEDICAL IMAGE REPRESENTATION  
9  
Pixels and voxels – algebraic image operations - gray scale and color representation- depth-color and look up tables - image file formats- DICOM- other formats- Analyze 7.5, NifTI and Interfile, Image quality and the signal to noise ratio

UNIT IV  
MEDICAL IMAGE ANALYSIS AND CLASSIFICATION  
9  
Image segmentation- pixel based, edge based, region based segmentation. Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and image classification – Statistical, Rule based, Neural Network approaches

UNIT V  
IMAGE REGISTRATIONS AND VISUALIZATION  
9  
Image Registration: Rigid body transformation – Affine transformation, Principal axes registration, Iterative principal axes registration, Feature based registration, Elastic deformation based registration, Registration of Images from Different modalities, Evaluation of Registration Methods. Image visualization: 2-D display methods, 3-D display methods, surface and volume based 3-D display methods – Surface Visualization and Volume visualization, 3-D Echocardiography, 3D+time Echocardiography, virtual reality based interactive visualization.

45 PERIODS

PRACTICAL EXERCISES:  
30 PERIODS

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

LIST OF EXPERIMENTS
1. Preprocessing of medical images
2. Filtering of medical images.
3. Edge detection using Python
4. Segmentation of ROI in medical images.
5. Feature extraction in medical images
6. Steganography using OpenCV.
7. Medical image fusion.
8. Statistical analysis of features

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

**REFERENCES**


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TOTAL: 75 PERIODS
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

45 PERIODS

SUGGESTED ACTIVITIES:

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

PRACTICAL EXERCISES: 30 PERIODS

1. Implement a Linear Regression with a Real Dataset
   (https://www.kaggle.com/harrywang/housing). Experiment with different features in building a model. Tune the model's hyperparameters.

2. Implement a binary classification model. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?" (use data from exercise 1). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.

3. Classification with Nearest Neighbours. In this question, you will use the scikit-learn's KNN 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.


7. Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data.
   a. Your project may be a comparison of several existing algorithms, or it may propose a new algorithm in which case you still must compare it to at least one other approach.
   b. You can either pick a project of your own design, or you can choose from the set of pre-defined projects.
   c. You are free to use any third-party ideas or code that you wish as long as it is publicly available.
   d. You must properly provide references to any work that is not your own in the write-up.
   e. Project proposal You must turn in a brief project proposal. Your project proposal should describe the idea behind your project. You should also briefly describe software you will need to write, and papers (2-3) you plan to read.

List of Projects (datasets available)
1. Sentiment Analysis of Product Reviews
2. Stock Prediction
3. Sales Forecasting
4. Music Recommendation
5. Handwriting Digit Classification
6. Fake News Detection
7. Sports Prediction
8. Object Detection
9. Disease Prediction

COURSE OUTCOMES:
Upon the completion of course, students will be able to
CO1: Understand and outline problems for each type of machine learning
CO2: Design a Decision tree and Random forest for an application
CO3: Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.
CO4: Use a tool to implement typical Clustering algorithms for different types of applications.
CO5: Design and implement an HMM for a Sequence Model type of application and identify applications suitable for different types of Machine Learning with suitable justification.

TOTAL: 75 PERIODS

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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

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BC4151 BIOMETRIC SYSTEMS

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

UNIT II FINGERPRINT, FACE AND IRIS AS BIOMETRICS
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


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
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IF4291 FULL STACK WEB APPLICATION DEVELOPMENT

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

UNIT II ANGULAR

UNIT III NODE.Js

UNIT IV EXPRESS.Js

UNIT V MONGODB

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
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IF4071 DEEP LEARNING

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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 10

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

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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

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:
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
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

UNIT III  DISASTER PRONE AREAS IN INDIA
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
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

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:

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

COURSE OBJECTIVES:
Students will be able to:
• Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
• To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationalism 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

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

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.
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

UNIT I

1. தமிழ் துவக்கநூல் - எழுத்து, தொல், தபொருள்
2. அகநொனூறு (82)
3. குறிஞ்சிப் பொட்டின் மலர்க்கொட்சி
4. புறநொனூறு (95, 195)

UNIT II

1. அறநநறி வகுத்த திருவள்ளுவர் - அன்ம் வலியுறுத்தல், அன்ம் வலியுறுத்தல் (தூய்கமகய), வலியுறுத்தும் நூல்
2. அமிதாபாகம் - திருமகள் திருமகள் (கருவமக் வலியுறுத்தும் நூல்)

UNIT III

1. கணக்கியின் புரட்சி - சிலப்பதிகொர கொகல்
2. மூகப் பாகம் - சிகறக்கரம் கொகத
UNIT IV

அருள்நநறித்

1. சிறுபொணொற்றுப்பகட
   - பபொர் பொரொட்டமும் சிறுபொணொற்றுப்பகட முதல் புத்தகங்கள்
   பக்கத்துக்குத் தமிழிலும், அதிகமாக குற்றத்துக்கு நேர்வுக்கேற்றிட்டு
   குற்றத்துக்கு, அருள் பஞ்சாப்பு

2. நற்பிள்ளை
   - அலுவலக்கும் புத்தக கிரிப

3. திருமந்திரம் (617, 618)
   - திருமந்திரம் விதிகள்

4. தர்மொகைலேயும் தமிழ் முசன்று

5. புறநொனூறு
   - சிற்றுண்டு முதல் புத்தகங்கள்

6. அகநொனூறு (4)
   - அகநொனூறு

UNIT V

நவீனத் தமிழ் இலக்கியம்

1. உகரநகடத்
   - தமிழின் முதல் புதிதம்
   - தமிழின் முதல் சிற்றுண்டு
   - கட்டுகர இலக்கியம்
   - பயண இலக்கியம்
   - நொடகம்
   - தொடவை

2. தமிழ் அகரத் பார்பாட்டில் தமிழ் இலக்கியம்

3. தமிழ் முதல் பகடலப்படுத்தும் தமிழ் இலக்கியம்

4. புதாகம், புடைப்பிள்ளை, இலக்கியம்

5. ஆகிஏன் குணிக

6. இலக்கியம் குணிக

7. சுற்றுசூழல் விளிம்பு நேர்வுக்கேற்றிட்டு

TOTAL: 30 PERIODS

தமிழ் இலக்கியம் தமிழ்ப்புத்தகங்கள் / பத்திரகாலம்

1. தமிழ் இலக்கியம் கவிதைகள் (Tamil Virtual University)
   - www.tamilvu.org

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

3. தமிழ் விக்கிப்பீடியொ

4. தமிழ் விக்கிப்பீடியொ
   - தமிழ் விக்கிப்பீடியொ
OBJECTIVE

- Students will be introduced to the concepts and principles of IWRM, which is inclusive of the economics, public-private partnership, water & health, water & food security and legal & regulatory settings.

UNIT I CONTEXT FOR IWRM

- Water as a global issue: key challenges – Definition of IWRM within the broader context of development – Key elements of IWRM - Principles – Paradigm shift in water management - Complexity of the IWRM process – UN World Water Assessment - SDGs.

UNIT II WATER ECONOMICS

- Economic view of water issues: economic characteristics of water good and services – Non-market monetary valuation methods – Water economic instruments – Private sector involvement in water resources management: PPP objectives, PPP models, PPP processes, PPP experiences through case studies.

UNIT III LEGAL AND REGULATORY SETTINGS

- Basic notion of law and governance: principles of international and national law in the area of water management - Understanding UN law on non-navigable uses of international water courses – International law for groundwater management – World Water Forums – Global Water Partnerships - Development of IWRM in line with legal and regulatory framework.

UNIT IV WATER AND HEALTH WITHIN THE IWRM CONTEXT

- Links between water and health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Global burden of Diseases - Health impact assessment of water resources development projects – Case studies.

UNIT V AGRICULTURE IN THE CONCEPT OF IWRM

- Water for food production: ‘blue’ versus ‘green’ water debate – Water foot print - Virtual water trade for achieving global water and food security — Irrigation efficiencies, irrigation methods - current water pricing policy– scope to relook pricing.

TOTAL: 45 PERIODS

OUTCOMES

- On completion of the course, the student is expected to be able to

CO1 Describe the context and principles of IWRM; Compare the conventional and integrated ways of water management.
CO2 Select the best economic option among the alternatives; illustrate the pros and cons of PPP through case studies.

CO3 Apply law and governance in the context of IWRM.

CO4 Discuss the linkages between water-health; develop a HIA framework.

CO5 Analyse how the virtual water concept pave way to alternate policy options.

REFERENCES:

OCE432 WATER, SANITATION AND HEALTH L T P C 3 0 0 3

OBJECTIVES:
• Understand the accelerating health impacts due to the present managerial aspects and initiatives in water and sanitation and health sectors in the developing scenario

UNIT I FUNDAMENTALS WASH 9
Meanings and Definition: Safe Water - Health, Nexus: Water - Sanitation - Health and Hygiene – Equity issues-Water security - Food Security. Sanitation And Hygiene (WASH) and Integrated Water Resources Management (IWRM) - Need and Importance of WASH

UNIT II MANAGERIAL IMPLICATIONS AND IMPACT 9

UNIT III CHALLENGES IN MANAGEMENT AND DEVELOPMENT 9

UNIT IV GOVERNANCE 9
Public health -Community Health Assessment and Improvement Planning (CHA/CHIP)-Infrastructure and Investments on Water, (WASH) - Cost Benefit Analysis – Institutional Intervention-Public Private Partnership - Policy Directives - Social Insurance -Political Will vs Participatory Governance -
UNIT V INITIATIVES

Management vs Development - Accelerating Development - Development Indicators - Inclusive Development - Global and Local - Millennium Development Goal (MDG) and Targets - Five Year Plans - Implementation - Capacity Building - Case studies on WASH.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 Capture to fundamental concepts and terms which are to be applied and understood all through the study.

CO2 Comprehend the various factors affecting water sanitation and health through the lens of third world scenario.

CO3 Critically analyse and articulate the underlying common challenges in water, sanitation and health.

CO4 Acquire knowledge on the attributes of governance and its say on water sanitation and health.

CO5 Gain an overarching insight in to the aspects of sustainable resource management in the absence of a clear level playing field in the developmental aspects.

REFERENCES


OCE433 PRINCIPLES OF SUSTAINABLE DEVELOPMENT L T P C 3 0 0 3

OBJECTIVES:

- To impart knowledge on environmental, social and economic dimensions of sustainability and the principles evolved through landmark events so as to develop an action mindset for sustainable development.

UNIT I SUSTAINABILITY AND DEVELOPMENT CHALLENGES


UNIT II PRINCIPLES AND FRAME WORK

History and emergence of the concept of sustainable development - our common future - Stockholm to Rio plus 20– Rio Principles of sustainable development – Agenda 21 natural step-
peoples earth charter – business charter for sustainable development – UN Global Compact - Role of civil society, business and government – United Nations’ 2030 Agenda for sustainable development – 17 sustainable development goals and targets, indicators and intervention areas

UNIT III  SUSTAINABLE DEVELOPMENT AND WELLBEING

UNIT IV  SUSTAINABLE SOCIO-ECONOMIC SYSTEMS

UNIT V  ASSESSING PROGRESS AND WAY FORWARD

TOTAL: 45 PERIODS

OUTCOMES:
• On completion of the course, the student is expected to be able to
  CO1 Explain and evaluate current challenges to sustainability, including modern world social, environmental, and economic structures and crises.
  CO2 Identify and critically analyze the social environmental, and economic dimensions of sustainability in terms of UN Sustainable development goals
  CO3 Develop a fair understanding of the social, economic and ecological linkage of Human well being, production and consumption
  CO4 Evaluate sustainability issues and solutions using a holistic approach that focuses on connections between complex human and natural systems.
  CO5 Integrate knowledge from multiple sources and perspectives to understand environmental limits governing human societies and economies and social justice dimensions of sustainability.

REFERENCES:
4. The New Global Frontier - Urbanization, Poverty and Environment in the 21st Century -
George Martine, Gordon McGranahan, Mark Montgomery and Rogelio Fernández-Castilla,
IIED and UNFPA, Earthscan, UK, 2008

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<td>OCE434</td>
<td>ENVIRONMENTAL IMPACT ASSESSMENT</td>
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**OBJECTIVES:**
- To make the students to understand environmental clearance, its legal requirements and to
  provide knowledge on overall methodology of EIA, prediction tools and models, environmental
  management plan and case studies.

**UNIT I  INTRODUCTION**
9
Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA
in project cycle. legal and regulatory aspects in India – types and limitations of EIA – EIA process-
issues –public hearing in EIA- EIA consultant accreditation.

**UNIT II  IMPACT IDENTIFICATION AND PREDICTION**
10
in EIA. prediction tools for EIA – mathematical modeling for impact prediction – assessment of

**UNIT III  SOCIO-ECONOMIC IMPACT ASSESSMENT**
8
Socio-economic impact assessment - relationship between social impacts and change in
community and institutional arrangements, factors and methodologies- individual and family level
impacts. communities in transition-rehabilitation

**UNIT IV  EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN**
9
Environmental management plan - preparation, implementation and review – mitigation and
rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project
audit – documentation of EIA findings – ethical and quality aspects of environmental impact
assessment

**UNIT V  CASE STUDIES**
9
Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of
hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and
construction projects

**TOTAL: 45 PERIODS**

**OUTCOMES:**
- On completion of the course, the student is expected to be able to
  
  **CO1** Understand need for environmental clearance, its legal procedure, need of EIA, its
types, stakeholders and their roles

  **CO2** Understand various impact identification methodologies, prediction techniques
  and model of impacts on various environments

  **CO3** Understand relationship between social impacts and change in community due
to development activities and rehabilitation methods
CO4 Document the EIA findings and prepare environmental management and monitoring plan
CO5 Identify, predict and assess impacts of similar projects based on case studies

REFERENCES:
1. EIA Notification 2006 including recent amendments, by Ministry of Environment, Forest and Climate Change, Government of India
2. Sectoral Guidelines under EIA Notification by Ministry of Environment, Forest and Climate Change, Government of India

OME431 VIBRATION AND NOISE CONTROL STRATEGIES

OBJECTIVES
- To appreciate the basic concepts of vibration in damped and undamped systems
- To appreciate the basic concepts of noise, its effect on hearing and related terminology
- To use the instruments for measuring and analyzing the vibration levels in a body
- To use the instruments for measuring and analyzing the noise levels in a system
- To learn the standards of vibration and noise levels and their control techniques

UNIT- I BASICS OF VIBRATION

UNIT- II BASICS OF NOISE
Introduction - Anatomy of human ear - Mechanism of hearing - Amplitude, frequency, wavelength and sound pressure level - Relationship between sound power, sound intensity and sound pressure level - Addition, subtraction and averaging decibel levels - sound spectra -Types of sound fields - Octave band analysis - Loudness.

UNIT- III INSTRUMENTATION FOR VIBRATION MEASUREMENT
UNIT- IV INSTRUMENTATION FOR NOISE MEASUREMENT AND ANALYSIS


UNIT- V METHODS OF VIBRATION CONTROL, SOURCES OF NOISE AND ITS CONTROL


TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course the student will be able to

- apply the basic concepts of vibration in damped and undamped systems
- apply the basic concepts of noise and to understand its effects on systems
- select the instruments required for vibration measurement and its analysis
- select the instruments required for noise measurement and its analysis.
- recognize the noise sources and to control the vibration levels in a body and to control noise under different strategies.

REFERENCES:

OME432 ENERGY CONSERVATION AND MANAGEMENT IN DOMESTIC SECTORS

L T P  C
3 0 0  3

COURSE OBJECTIVES:
- To learn the present energy scenario and the need for energy conservation.
- To understand the different measures for energy conservation in utilities.
- Acquaint students with principle theories, materials, and construction techniques to create energy efficient buildings.
- To identify the energy demand and bridge the gap with suitable technology for sustainable habitat
To get familiar with the energy technology, current status of research and find the ways to optimize a system as per the user requirement.

UNIT I ENERGY SCENARIO

UNIT II HEATING, VENTILLATION & AIR CONDITIONING

UNIT III LIGHTING, COMPUTER, TV

UNIT IV ENERGY EFFICIENT BUILDINGS

UNIT V ENERGY STORAGE TECHNOLOGIES
Necessity & types of energy storage – Thermal energy storage – Battery energy storage, charging and discharging – Hydrogen energy storage & Super capacitors – energy density and safety issues – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
• Understand technical aspects of energy conservation scenario.
• Energy audit in any type for domestic buildings and suggest the conservation measures.
• Perform building load estimates and design the energy efficient landscape system.
• Gain knowledge to utilize an appliance/device sustainably.
• Understand the status and current technological advancement in energy storage field.

REFERENCES:
6. (Could be downloaded from www.energymanagertraining.com)
UNIT I  INTRODUCTION

UNIT II  DESIGN FOR ADDITIVE MANUFACTURING

UNIT III  VAT POLYMERIZATION

UNIT IV  MATERIAL EXTRUSION AND SHEET LAMINATION

POWDER BASED PROCESS

UNIT V  CASE STUDIES AND OPPORTUNITIES ADDITIVE MANUFACTURING PROCESSES

REFERENCES:
UNIT I  
NEED FOR ELECTRIC VEHICLES  
History and need for electric and hybrid vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, comparison of diesel, petrol, electric and hybrid vehicles, limitations, technical challenges

UNIT II  
ELECTRIC VEHICLE ARCHITECHTURE  
Electric vehicle types, layout and power delivery, performance – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, Concepts of hybrid electric drive train, architecture of series and parallel hybrid electric drive train, merits and demerits, mild and full hybrids, plug-in hybrid electric vehicles and range extended hybrid electric vehicles, Fuel cell vehicles.

UNIT III  
ENERGY STORAGE  
Batteries – types – lead acid batteries, nickel based batteries, and lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency, Battery modeling and equivalent circuit, battery charging and types, battery cooling, Ultra-capacitors, Flywheel technology, Hydrogen fuel cell, Thermal Management of the PEM fuel cell

UNIT IV  
ELECTRIC DRIVES AND CONTROL  
Types of electric motors – working principle of AC and DC motors, advantages and limitations, DC motor drives and control, Induction motor drives and control, PMSM and brushless DC motor - drives and control, AC and Switch reluctance motor drives and control – Drive system efficiency – Inverters – DC and AC motor speed controllers

UNIT V  
DESIGN OF ELECTRIC VEHICLES  

TOTAL: 45 PERIODS

REFERENCES:
- Generating, selecting, and testing the concepts for new product design and development.
- Applying the principles of Industrial design and prototype for new product design and development.

UNIT I  INTRODUCTION TO PRODUCT DESIGN & DEVELOPMENT  9

UNIT II  OPPORTUNITY IDENTIFICATION & PRODUCT PLANNING  9

UNIT III  IDENTIFYING CUSTOMER NEEDS & PRODUCT SPECIFICATIONS  9

UNIT IV  CONCEPT GENERATION, SELECTION & TESTING  9

UNIT V  INDUSTRIAL DESIGN & PROTOTYPING  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply the principles of generic development process; and understand the organization structure for new product design and development.
- Identify opportunity and plan for new product design and development.
- Conduct customer need analysis; and set product specification for new product design and development.
- Generate, select, and test the concepts for new product design and development.
- Apply the principles of Industrial design and prototype for design and develop new products.

TEXT BOOK:

REFERENCES:
3. Rosenthal S.,“Effective Product Design and Development”, Business One Orwin, Homewood,
COURSE OBJECTIVES:
- To provide students with fundamental knowledge of the notion of corporate sustainability.
- To determine how organizations impacts on the environment and socio-technical systems, the relationship between social and environmental performance and competitiveness, the approaches and methods.

UNIT I    MANAGEMENT OF SUSTAINABILITY
Management of sustainability -rationale and political trends: An introduction to sustainability management, International and European policies on sustainable development, theoretical pillars in sustainability management studies.

UNIT II   CORPORATE SUSTAINABILITY AND RESPONSIBILITY
Corporate sustainability parameter, corporate sustainability institutional framework, integration of sustainability into strategic planning and regular business practices, fundamentals of stakeholder engagement.

UNIT III  SUSTAINABILITY MANAGEMENT: STRATEGIES AND APPROACHES
Corporate sustainability management and competitiveness: Sustainability-oriented corporate strategies, markets and competitiveness, Green Management between theory and practice, Sustainable Consumption and Green Marketing strategies, Environmental regulation and strategic postures; Green Management approaches and tools; Green engineering: clean technologies and innovation processes; Sustainable Supply Chain Management and Procurement.

UNIT IV   SUSTAINABILITY AND INNOVATION
Socio-technical transitions and sustainability, Sustainable entrepreneurship, Sustainable pioneers in green market niches, Smart communities and smart specializations.

UNIT V    SUSTAINABLE MANAGEMENT OF RESOURCES, COMMODITIES AND COMMONS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: An understanding of sustainability management as an approach to aid in evaluating and minimizing environmental impacts while achieving the expected social impact.
CO2: An understanding of corporate sustainability and responsible Business Practices
CO3: Knowledge and skills to understand, to measure and interpret sustainabilityperformances.
CO4: Knowledge of innovative practices in sustainable business and community management
CO5: Deep understanding of sustainable management of resources and commodities

REFERENCES:
4. Margaret Robertson, Sustainability Principles and Practice, 2014
5. Peter Rogers, An Introduction to Sustainable Development, 2006

OBA432 MICRO AND SMALL BUSINESS MANAGEMENT

COURSE OBJECTIVES
- To familiarize students with the theory and practice of small business management.
- To learn the legal issues faced by small business and how they impact operations.

UNIT I INTRODUCTION TO SMALL BUSINESS

UNIT II SCREENING THE BUSINESS OPPORTUNITY AND FORMULATING THE BUSINESS PLAN
Concepts of opportunity recognition; Key factors leading to new venture failure; New venture screening process; Applying new venture screening process to the early stage small firm Role planning in small business – importance of strategy formulation – management skills for small business creation and development.

UNIT III BUILDING THE RIGHT TEAM AND MARKETING STRATEGY
Management and Leadership – employee assessments – Tuckman's stages of group development - The entrepreneurial process model - Delegation and team building - Comparison of HR management in small and large firms - Importance of coaching and how to apply a coaching model. Marketing within the small business - success strategies for small business marketing - customer delight and business generating systems, - market research, - assessing market performance-sales management and strategy - the marketing mix and marketing strategy.

UNIT IV FINANCING SMALL BUSINESS
Main sources of entrepreneurial capital; Nature of ‘bootstrap’ financing - Difference between cash and profit - Nature of bank financing and equity financing - Funding-equity gap for small firms. Importance of working capital cycle - Calculation of break-even point - Power of gross profit margin- Pricing for profit - Credit policy issues and relating these to cash flow management and profitability.
UNIT V VALUING SMALL BUSINESS AND CRISIS MANAGEMENT

Causes of small business failure - Danger signals of impending trouble - Characteristics of poorly performing firms - Turnaround strategies - Concept of business valuation - Different valuation measurements - Nature of goodwill and how to measure it - Advantages and disadvantages of buying an established small firm - Process of preparing a business for sale.

TOTAL: 45 PERIODS

COURSE OUTCOMES
CO1. Familiarise the students with the concept of small business
CO2. In depth knowledge on small business opportunities and challenges
CO3. Ability to devise plans for small business by building the right skills and marketing strategies
CO4. Identify the funding source for small start ups
CO5. Business evaluation for buying and selling of small firms

REFERENCES
3. Journal articles on SME’s.

OBA433 INTELLECTUAL PROPERTY RIGHTS

COURSE OBJECTIVE
➢ To understand intellectual property rights and its valuation.

UNIT I INTRODUCTION
Intellectual property rights - Introduction, Basic concepts, Patents, Copyrights, Trademarks, Trade Secrets, Geographic Indicators; Nature of Intellectual Property, Technological Research, Inventions and Innovations, History - the way from WTO to WIPO, TRIPS.

UNIT II PROCESS
New Developments in IPR, Procedure for grant of Patents, TM, GIs, Patenting under Patent Cooperation Treaty, Administration of Patent system in India, Patenting in foreign countries.

UNIT III STATUTES

UNIT IV STRATEGIES IN INTELLECTUAL PROPERTY
Strategies for investing in R&D, Patent Information and databases, IPR strength in India, Traditional Knowledge, Case studies.

UNIT V MODELS
The technologies Know-how, concept of ownership, Significance of IP in Value Creation, IP Valuation and IP Valuation Models, Application of Real Option Model in Strategic Decision Making, Transfer and Licensing.
COURSE OUTCOMES

CO1: Understanding of intellectual property and appreciation of the need to protect it
CO2: Awareness about the process of patenting
CO3: Understanding of the statutes related to IPR
CO4: Ability to apply strategies to protect intellectual property
CO5: Ability to apply models for making strategic decisions related to IPR

REFERENCES
2. Intellectual Property rights and copyrights, EssEss Publications.

OBA434 ETHICAL MANAGEMENT

COURSE OBJECTIVE

• To help students develop knowledge and competence in ethical management and decision making in organizational contexts.

UNIT I ETHICS AND SOCIETY
Ethical Management- Definition, Motivation, Advantages-Practical implications of ethical management. Managerial ethics, professional ethics, and social Responsibility-Role of culture and society’s expectations- Individual and organizational responsibility to society and the community.

UNIT II ETHICAL DECISION MAKING AND MANAGEMENT IN A CRISIS
Managing in an ethical crisis, the nature of a crisis, ethics in crisis management, discuss case studies, analyze real-world scenarios, develop ethical management skills, knowledge, and competencies. Proactive crisis management.

UNIT III STAKEHOLDERS IN ETHICAL MANAGEMENT
Stakeholders in ethical management, identifying internal and external stakeholders, nature of stakeholders, ethical management of various kinds of stakeholders: customers (product and service issues), employees (leadership, fairness, justice, diversity) suppliers, collaborators, business, community, the natural environment (the sustainability imperative, green management, Contemporary issues).

UNIT IV INDIVIDUAL VARIABLES IN ETHICAL MANAGEMENT
Understanding individual variables in ethics, managerial ethics, concepts in ethical psychology-ethical awareness, ethical courage, ethical judgment, ethical foundations, ethical emotions/intuitions/intensity. Utilization of these concepts and competencies for ethical decision-making and management.
UNIT V  PRACTICAL FIELD-GUIDE, TECHNIQUES AND SKILLS

Ethical management in practice, development of techniques and skills, navigating challenges and dilemmas, resolving issues and preventing unethical management proactively. Role modelling and creating a culture of ethical management and human flourishing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

CO1: Role modelling and influencing the ethical and cultural context.
CO2: Respond to ethical crises and proactively address potential crises situations.
CO3: Understand and implement stakeholder management decisions.
CO4: Develop the ability, knowledge, and skills for ethical management.
CO5: Develop practical skills to navigate, resolve and thrive in management situations

REFERENCES

ET4251  IoT FOR SMART SYSTEMS  LT P C
3 0 0 3

COURSE OBJECTIVES:
- To study about Internet of Things technologies and its role in real time applications.
- To introduce the infrastructure required for IoT
- To familiarize the accessories and communication techniques for IoT.
- To provide insight about the embedded processor and sensors required for IoT
- To familiarize the different platforms and Attributes for IoT

UNIT I  INTRODUCTION TO INTERNET OF THINGS
Overview, Hardware and software requirements for IOT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications.

UNIT II  IOT ARCHITECTURE

UNIT III  PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT
PROTOCOLS:
NFC, SCADA and RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe GSM, CDMA, LTE, GPRS, small cell.

Wireless technologies for IoT: WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.

UNIT IV  IOT PROCESSORS
Services/Attributes: Big-Data Analytics for IOT, Dependability, Interoperability, Security, Maintainability.
Embedded processors for IOT: Introduction to Python programming - Building IOT with RASPERRY PI and Arduino.
UNIT V CASE STUDIES

Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IOT Defense

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will have the ability to
CO1: Analyze the concepts of IoT and its present developments.
CO2: Compare and contrast different platforms and infrastructures available for IoT
CO3: Explain different protocols and communication technologies used in IoT
CO4: Analyze the big data analytic and programming of IoT
CO5: Implement IoT solutions for smart applications

REFERENCES:

ET4072 MACHINE LEARNING AND DEEP LEARNING

COURSE OBJECTIVES:
The course is aimed at
• Understanding about the learning problem and algorithms
• Providing insight about neural networks
• Introducing the machine learning fundamentals and significance
• Enabling the students to acquire knowledge about pattern recognition.
• Motivating the students to apply deep learning algorithms for solving real life problems.
UNIT I          LEARNING PROBLEMS AND ALGORITHMS  9
Various paradigms of learning problems, Supervised, Semi-supervised and Unsupervised algorithms

UNIT II         NEURAL NETWORKS  9

UNIT III        MACHINE LEARNING – FUNDAMENTALS & FEATURE SELECTIONS & CLASSIFICATIONS  9
Classifying Samples: The confusion matrix, Accuracy, Precision, Recall, F1- Score, the curse of dimensionality, training, testing, validation, cross validation, overfitting, under-fitting the data, early stopping, regularization, bias and variance. Feature Selection, normalization, dimensionality reduction, Classifiers: KNN, SVM, Decision trees, Naïve Bayes, Binary classification, multi class classification, clustering.

UNIT IV        DEEP LEARNING: CONVOLUTIONAL NEURAL NETWORKS  9
Feed forward networks, Activation functions, back propagation in CNN, optimizers, batch normalization, convolution layers, pooling layers, fully connected layers, dropout, Examples of CNNs.

UNIT V          DEEP LEARNING: RNNS, AUTOENCODERS AND GANS  9
State, Structure of RNN Cell, LSTM and GRU, Time distributed layers, Generating Text, Autoencoders: Convolutional Autoencoders, Denoising autoencoders, Variational autoencoders, GANs: The discriminator, generator, DCGANs

TOTAL : 45 PERIODS

COURSE OUTCOMES (CO):
At the end of the course the student will be able to
CO1 : Illustrate the categorization of machine learning algorithms.
CO2: Compare and contrast the types of neural network architectures, activation functions
CO3: Acquaint with the pattern association using neural networks
CO4: Elaborate various terminologies related with pattern recognition and architectures of convolutional neural networks
CO5: Construct different feature selection and classification techniques and advanced neural network architectures such as RNN, Autoencoders, and GANs.

REFERENCES:
OBJECTIVES:
To impart knowledge on
- Different types of renewable energy technologies
- Standalone operation, grid connected operation of renewable energy systems

UNIT I INTRODUCTION
Classification of energy sources – Co2 Emission - Features of Renewable energy - Renewable energy scenario in India - Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment Per Capital Consumption - CO2 Emission - importance of renewable energy sources, Potentials – Achievements– Applications.

UNIT II SOLAR PHOTOVOLTAICS

UNIT III PHOTOVOLTAIC SYSTEM DESIGN
Block diagram of solar photo voltaic system : Line commutated converters (inversion mode) - Boost and buck-boost converters - selection of inverter, battery sizing, array sizing - PV systems classification- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.

UNIT IV WIND ENERGY CONVERSION SYSTEMS

UNIT V OTHER RENEWABLE ENERGY SOURCES
Qualitative study of different renewable energy resources: ocean, Biomass, Hydrogen energy systems, Fuel cells, Ocean Thermal Energy Conversion (OTEC), Tidal and wave energy, Geothermal Energy Resources.

OUTCOMES:
After completion of this course, the student will be able to:
CO1: Demonstrate the need for renewable energy sources.
CO2: Develop a stand-alone photo voltaic system and implement a maximum power point tracking in the PV system.
CO3: Design a stand-alone and Grid connected PV system.
CO4: Analyze the different configurations of the wind energy conversion systems.
CO5: Realize the basic of various available renewable energy sources
REFERENCES:

PS4093 SMART GRID L T P C 3 0 0 3

COURSE OBJECTIVES
- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To know about the function of smart grid.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications
- To get familiarized with the communication networks for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Comparison of Micro grid and Smart grid, Present development & International policies in Smart Grid, Smart Grid Initiative for Power Distribution Utility in India – Case Study.

UNIT II SMART GRID TECHNOLOGIES
Technology Drivers, Smart Integration of energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV) – Grid to Vehicle and Vehicle to Grid charging concepts.

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE
Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU) & their application for monitoring & protection. Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID
Unit V  HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS  
Architecture and Standards - Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), PLC, Zigbee, GSM, IP based Protocols, Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

COURSE OUTCOME:
Students able to
CO1: Relate with the smart resources, smart meters and other smart devices.
CO2: Explain the function of Smart Grid.
CO3: Experiment the issues of Power Quality in Smart Grid.
CO4: Analyze the performance of Smart Grid.
CO5: Recommend suitable communication networks for smart grid applications

REFERENCES

DS4015  BIG DATA ANALYTICS  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To understand the basics of big data analytics
- To understand the search methods and visualization
- To learn mining data streams
- To learn frameworks
- To gain knowledge on R language

UNIT I  INTRODUCTION TO BIG DATA  

UNIT II  SEARCH METHODS AND VISUALIZATION  
UNIT III MINING DATA STREAMS

UNIT IV FRAMEWORKS
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Case Study- Preventing Private Information Inference Attacks on Social Networks- Grand Challenge: Applying Regulatory Science and Big Data to Improve Medical Device Innovation

UNIT V R LANGUAGE

COURSE OUTCOMES:
CO1: understand the basics of big data analytics
CO2: Ability to use Hadoop, Map Reduce Framework.
CO3: Ability to identify the areas for applying big data analytics for increasing the business outcome.
CO4: gain knowledge on R language
CO5: Contextually integrate and correlate large amounts of information to gain faster insights.

TOTAL: 45 PERIODS

REFERENCE:

NC4201 INTERNET OF THINGS AND CLOUD L T P C
3 0 0 3

COURSE OBJECTIVES:
• To understand Smart Objects and IoT Architectures
• To learn about various IOT-related protocols
• To build simple IoT Systems using Arduino and Raspberry Pi.
• To understand data analytics and cloud in the context of IoT
• To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF IoT
Arduino, Raspberry Pi, Node MCU. A Case study with any one of the boards and data acquisition from sensors.

UNIT II PROTOCOLS FOR IoT

UNIT III CASE STUDIES/INDUSTRIAL APPLICATIONS
Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.

UNIT IV CLOUD COMPUTING INTRODUCTION

UNIT V IoT AND CLOUD

TOTAL:45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will be able to:
CO1: Understand the various concept of the IoT and their technologies.
CO2: Develop 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

REFERENCES

MX4073 MEDICAL ROBOTICS L T P C
3 0 0 3

COURSE OBJECTIVES:
- To explain the basic concepts of robots and types of robots
- To discuss the designing procedure of manipulators, actuators and grippers
- To impart knowledge on various types of sensors and power sources
- To explore various applications of Robots in Medicine
- To impart knowledge on wearable robots

UNIT I INTRODUCTION TO ROBOTICS
Introduction to Robotics, Overview of robot subsystems, Degrees of freedom, configurations and
concept of workspace, Dynamic Stabilization

**Sensors and Actuators**
Sensors and controllers, Internal and external sensors, position, velocity and acceleration sensors, Proximity sensors, force sensors Pneumatic and hydraulic actuators, Stepper motor control circuits, End effectors, Various types of Grippers, PD and PID feedback actuator models

**UNIT II** MANIPULATORS & BASIC KINEMATICS
9
Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and pneumatic manipulator, Forward Kinematic Problems, Inverse Kinematic Problems, Solutions of Inverse Kinematic problems

**Navigation and Treatment Planning**
Variable speed arrangements, Path determination – Machinery vision, Ranging – Laser – Acoustic, Magnetic, fiber optic and Tactile sensor

**UNIT III** SURGICAL ROBOTS
9
Da Vinci Surgical System, Image guided robotic systems for focal ultrasound based surgical applications, System concept for robotic Tele-surgical system for off-pump, CABG surgery, Urologic applications, Cardiac surgery, Neuro-surgery, Pediatric and General Surgery, Gynecologic Surgery, General Surgery and Nanorobotics. Case Study

**UNIT IV** REHABILITATION AND ASSISTIVE ROBOTS
9
Pediatric Rehabilitation, Robotic Therapy for the Upper Extremity and Walking, Clinical-Based Gait Rehabilitation Robots, Motion Correlation and Tracking, Motion Prediction, Motion Replication. Portable Robot for Tele rehabilitation, Robotic Exoskeletons – Design considerations, Hybrid assistive limb. Case Study

**UNIT V** WEARABLE ROBOTS
9
Augmented Reality, Kinematics and Dynamics for Wearable Robots, Wearable Robot technology, Sensors, Actuators, Portable Energy Storage, Human–robot cognitive interaction (cHRI), Human–robot physical interaction (pHRI), Wearable Robotic Communication - case study

**COURSE OUTCOMES:**
**CO1:** Describe the configuration, applications of robots and the concept of grippers and actuators
**CO2:** Explain the functions of manipulators and basic kinematics
**CO3:** Describe the application of robots in various surgeries
**CO4:** Design and analyze the robotic systems for rehabilitation
**CO5:** Design the wearable robots

**REFERENCES**
VE4202 EMBEDDED AUTOMATION L T P C
3 0 0 3

COURSE OBJECTIVES:
- To learn about the process involved in the design and development of real-time embedded system
- To develop the embedded C programming skills on 8-bit microcontroller
- To study about the interfacing mechanism of peripheral devices with 8-bit microcontrollers
- To learn about the tools, firmware related to microcontroller programming
- To build a home automation system

UNIT - I INTRODUCTION TO EMBEDDED C PROGRAMMING 9
C Overview and Program Structure - C Types, Operators and Expressions - C Control Flow - C Functions and Program Structures - C Pointers And Arrays - FIFO and LIFO - C Structures - Development Tools

UNIT - II AVR MICROCONTROLLER 9
ATMEGA 16 Architecture - Nonvolatile and Data Memories - Port System - Peripheral Features: Time Base, Timing Subsystem, Pulse Width Modulation, USART, SPI, Two Wire Serial Interface, ADC, Interrupts - Physical and Operating Parameters

UNIT – III HARDWARE AND SOFTWARE INTERFACING WITH 8-BIT SERIES CONTROLLERS 9
Lights and Switches - Stack Operation - Implementing Combinational Logic - Expanding I/O - Interfacing Analog To Digital Convertors - Interfacing Digital To Analog Convertors - LED Displays: Seven Segment Displays, Dot Matrix Displays - LCD Displays - Driving Relays - Stepper Motor Interface - Serial EEPROM - Real Time Clock - Accessing Constants Table - Arbitrary Waveform Generation - Communication Links - System Development Tools

UNIT – IV VISION SYSTEM 9
UNIT – V  HOME AUTOMATION
Home Automation - Requirements - Water Level Notifier - Electric Guard Dog - Tweeting Bird Feeder - Package Delivery Detector - Web Enabled Light Switch - Curtain Automation - Android Door Lock - Voice Controlled Home Automation - Smart Lighting - Smart Mailbox - Electricity Usage Monitor - Proximity Garage Door Opener - Vision Based Authentic Entry System

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On successful completion of this course, students will be able to
CO1: analyze the 8-bit series microcontroller architecture, features and pin details
CO2: write embedded C programs for embedded system application
CO3: design and develop real time systems using AVR microcontrollers
CO4: design and develop the systems based on vision mechanism
CO5: design and develop a real time home automation system

REFERENCES:

CX4016  ENVIRONMENTAL SUSTAINABILITY  L  T  P  C
UNIT I  INTRODUCTION  3  0  3  3
Valuing the Environment: Concepts, Valuing the Environment: Methods, Property Rights, Externalities, and Environmental Problems

UNIT II  CONCEPT OF SUSTAINABILITY  9
Sustainable Development: Defining the Concept, the Population Problem, Natural Resource Economics: An Overview, Energy, Water, Agriculture

UNIT III  SIGNIFICANCE OF BIODIVERSITY  9
Biodiversity, Forest Habitat, Commercially Valuable Species, Stationary - Source Local Air Pollution, Acid Rain and Atmospheric Modification, Transportation

UNIT IV  POLLUTION IMPACTS  9
Water Pollution, Solid Waste and Recycling, Toxic Substances and Hazardous Wastes, Global Warming.
UNIT V ENVIRONMENTAL ECONOMICS

Development, Poverty, and the Environment, Visions of the Future, Environmental economics and policy by Tom Tietenberg, Environmental Economics

TOTAL : 45 PERIODS

REFERENCES

TOTAL : 45 PERIODS

REFERENCES

UNIT I REINFORCEMENTS
Introduction – composites – classification and application; reinforcements- fibres and its properties; preparation of reinforced materials and quality evaluation; preforms for various composites

UNIT II MATRICES
Preparation, chemistry, properties and applications of thermoplastic and thermoset resins; mechanism of interaction of matrices and reinforcements; optimization of matrices

UNIT III COMPOSITE MANUFACTURING
Classification; methods of composites manufacturing for both thermoplastics and thermosets- Hand layup, Filament Winding, Resin transfer moulding, prepregs and autoclave moulding, pultrusion, vacuum impregnation methods, compression moulding; post processing of composites and composite design requirements

UNIT IV TESTING
Fibre volume and weight fraction, specific gravity of composites, tensile, flexural, impact, compression, inter laminar shear stress and fatigue properties of thermoset and thermoplastic composites.

UNIT V MECHANICS
Micro mechanics, macro mechanics of single layer, macro mechanics of laminate, classical lamination theory, failure theories and prediction of inter laminar stresses using at ware

TOTAL : 45 PERIODS

REFERENCES

114

NT4002 NANOCOMPOSITE MATERIALS

UNIT I BASICS OF NANOCOMPOSITES

UNIT II METAL BASED NANOCOMPOSITES
Metal-metal nanocomposites, some simple preparation techniques and their properties. Metal-Oxide or Metal-Ceramic composites, Different aspects of their preparation techniques and their final properties and functionality. Fractal based glass-metal nanocomposites, its designing and fractal dimension analysis. Core-Shell structured nanocomposites

UNIT III POLYMER BASED NANOCOMPOSITES
Preparation and characterization of diblock Copolymer based nanocomposites; Polymer Carbon nanotubes based composites, their mechanical properties, and industrial possibilities.

UNIT IV NANOCOMPOSITE FROM BIOMATERIALS
Natural nanocomposite systems - spider silk, bones, shells; organic-inorganic nanocomposite formation through self-assembly. Biomimetic synthesis of nanocomposites material; Use of synthetic nanocomposites for bone, teeth replacement.

UNIT V NANOCOMPOSITE TECHNOLOGY

TOTAL : 45 PERIODS

REFERENCES:
5. The search for novel, superhard materials- Stan Vepřek (Review Article) JVST A, 1999
UNIT I    IPR

UNIT II AGREEMENTS, TREATIES AND PATENT FILING PROCEDURES

UNIT III BIOSAFETY

UNIT IV GENETICALLY MODIFIED ORGANISMS
Definition of GMOs & LMOs – Roles of Institutional Biosafety Committee – RCGM – GEAC etc. for GMO applications in food and agriculture – Environmental release of GMOs – Risk Analysis – Risk Assessment – Risk management and communication – Overview of National Regulations and relevant International Agreements including Cartagena Protocol.

UNIT V ENTREPRENEURSHIP DEVELOPMENT

TOTAL : 45 PERIODS

REFERENCES