ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.TECH INFORMATION TECHNOLOGY
(SPECIALIZATION IN MULTIMEDIA)
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF INFORMATION SCIENCE AND TECHNOLOGY

VISION OF THE DEPARTMENT:
The Department of Information Science and Technology pledges to educate students with conceptual knowledge and technical skills to forge ahead in the field of IT, while inculcating deep moral and ethical values to achieve excellence, by providing a vibrant academic and research environment in collaboration with industry.

MISSION OF THE DEPARTMENT:
1. To inculcate in students a firm foundation in theory and practice of IT skills coupled with the thought process for disruptive innovation and research methodologies, to keep pace with emerging technologies.
2. To provide a conducive environment for all academic, administrative and interdisciplinary research activities using state-of-the-art technologies.
3. To produce graduates and doctorates, who will enter the workforce as productive IT engineers, researchers and entrepreneurs with necessary soft skills, and continue higher professional education with competence in the global market.
4. To enable seamless collaboration with the IT industry and Government for consultancy and sponsored research.
5. To cater to cross-cultural, multinational and demographic diversity of students.
6. To educate the students on the social, ethical, and moral values needed to make significant contributions to society.
1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
   I. To prepare students to excel in research and to succeed in Information Technology Profession by adapting to the rapid advances in new emerging technologies through rigorous post-graduate education.
   II. To provide students with a solid foundation in mathematical, scientific and computing fundamentals required to develop IT solutions to real-world problems of Industries, Businesses and Society.
   III. To train students with multimedia computing knowledge and creative thinking so as to comprehend, analyze, design innovative products with immersive user experience.
   IV. To inculcate leadership qualities, team work and effective communication skills in students for successful professional growth.
   V. To be aware of and practice ethical codes and guidelines, and contribute to sustainable development of society.

2. PROGRAMME OUTCOMES (POs):
   After going through the two years of study, our students will exhibit the following:

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<td>1</td>
<td>An ability to independently carry out research/investigation and development work to solve practical problems.</td>
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<td>An ability to write and present a substantial technical report/document.</td>
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<td>An ability to demonstrate a degree of mastery over Multimedia Technology.</td>
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<td>An ability to apply multimedia tools and techniques to provide simple, and elegant solutions to complex real-world problems in multidisciplinary domains.</td>
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<td>An ability to become a leader/entrepreneur/software developer/media designer and developer in the domain of Multimedia enabled Information Technology.</td>
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<td>An ability to work individually and in teams with social obligation, ethical and environmental consciousness.</td>
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3. PEO / PO Mapping:

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**Open Elective Courses (OEC)**
*(out of 6 courses one course must be selected)*

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AUDIT COURSES (AC)
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Total Credits: 0
OBJECTIVES:
I. This course provides a sound and rigorous treatment of the basic principles for a proper understanding of the subject matter and for confidence in applying these principles to practical problem solving.
II. This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving problems in the real world.
III. To introduce the basic concepts of one dimensional and two dimensional Random Variables.
IV. To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I  ONE DIMENSIONAL RANDOM VARIABLES  12

UNIT II  TWO DIMENSIONAL RANDOM VARIABLES  12
Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III  ESTIMATION THEORY  12

UNIT IV  TESTING OF HYPOTHESES  12
Sampling distributions – Type I and Type II errors – Tests based on Normal, t, Chi-Square and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V  MULTIVARIATE ANALYSIS  12

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students will be able to
- Use the appropriate and relevant, fundamental and applied mathematical and statistics knowledge and methodologies in solving practical problem.
- Bring together and flexibly apply knowledge to characterize, analyse and solve a wide range of problems.
- Understand the balance between the complexity/accuracy of the mathematical/statistical models used and the timeliness of the delivery of the solution.
- Steeped in research methods and rigor.
- Develop critical thinking based on empirical evidence and the scientific approach to knowledge development.
REFERENCES:

IF5151 ADVANCED DATA STRUCTURES AND ALGORITHMICS L T P C
3 0 0 3

OBJECTIVES:
- To understand the usage of algorithms in computing.
- To understand and learn the algorithm design techniques.
- To learn and use hierarchical data structures and its operations.
- To learn the usage of graphs and its applications.
- To study about NP Completeness of problems.

UNIT I ALGORITHMS IN COMPUTING 9

Suggested Activities:
- Flipped classroom on divide & conquer strategy (Merge Sort, Quick Sort).
- External learning – Solving recurrence relations using Master's method.
- Formulation of recurrence relations for various recursive algorithms (such as Tower of Hanoi, Staircase problem).
- Assignment on finding order of growth for exponent and logarithmic time algorithms.

Suggested Evaluation Methods:
- Assignments on formulation of recurrence relations, Master's method, finding order of growth for algorithms.
- Quizzes on divide and conquer strategy.

UNIT II ALGORITHM DESIGN TECHNIQUES 8

Suggested Activities:
- Flipped classroom on basics of algorithm design strategies.
- Assignment on applying suitable algorithm design technique for solving real time problems/scenario such as Checker Board/Sequence Alignment/Puzzle Solving/Data Compression.
• Assignment on analysis of time complexity for memorization algorithms and Huffman Coding.

**Suggested Evaluation Methods:**
• Assignments on Knapsack problems.
• Quizzes on algorithm design strategies.
• Demonstration for practical learning.

**UNIT III  HIERARCHICAL DATA STRUCTURES**


**Suggested Activities:**
• Flipped classroom on AVL trees and binary heap concepts.
• External learning – Fibonacci heap operations.
• Assignment on choosing and apply a suitable tree/heap structure for solving a given real time problem/scenario such as the implementation of trees/heaps/PDF document creation.
• Assignment on analysis of time complexity for B-Trees and Binomial Heaps.

**Suggested Evaluation Methods:**
• Assignments on binomial heap operations.
• Quizzes on AVL trees, binary heaps, time complexity of trees.
• Demonstration of practical learning.

**UNIT IV  GRAPH ALGORITHMS**


**Suggested Activities:**
• Flipped classroom on basics of graphs and graph operations.
• External learning – Applications of graphs and DFS.
• Analysis of time complexity for Dijkstra’s algorithm and Floyd Warshall algorithm.
• Practical – To choose and apply a suitable graph algorithms for solving a real time problem/scenario such as network routing/shortest path updation in maps/relationship mining in graphs.

**Suggested Evaluation Methods:**
• Assignments on analysis of time complexity for Dijkstra’s algorithm and Floyd Warshall algorithm.
• Quizzes on graph operations.
• Demonstration of practical learning.

**UNIT V  NP-COMPLETE AND NP–HARD**

Suggested Activities:
- Flipped classroom on basics of approximation algorithms.
- External learning – Subset sum problem.
- Assignments on solving traveling salesman problem using approximation technique.
- Exploration of any two NP-complete problems with proofs.

Suggested Evaluation Methods:
- Assignments on NP-complete problems with proofs, traveling salesman problem using approximation techniques.
- Quizzes on approximation algorithms.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Apply suitable algorithms in real time computing.
2. Apply suitable design strategies to solve problems in an efficient manner.
3. Apply suitable hierarchical data structures to solve practical problems.
4. Design algorithms using graph structures to solve real-life problems.
5. Solve NP Complete problems efficiently.
6. Design data structures and algorithms that are appropriate for real time problems.

REFERENCES:
UNIT I  JAVA FUNDAMENTALS

Suggested Activities:
- Flipped classroom on basics of Java.
- Learning and implementation of the following topics:
  - Java frame and applet based application development.
  - Java I/O streams for text and binary data operations to read from and write to files.
  - Java based thread implementation using thread priorities.
  - Java networking applications using sockets and datagrams.
  - Java applications using generic collections.

Suggested Evaluation Methods:
- Quiz on Java fundamentals.
- Tutorial – Advanced Java features.

UNIT II  WEB AND SCRIPTING

Suggested Activities:
- Learning and implementation of the following topics
  - Developing complex web forms using HTML5 and validating using Javascript.
  - Enhancing website appearance with style sheets.
  - Validating string data using regular expressions.
  - Traversal of HTML5 document using HTML DOM.
- External learning – Usage of Angular JS in simple web applications.

Suggested Evaluation Methods:
- Quizzes on HTML5 features and Java scripts.
- Presentation on Jquery and Angular JS features.

UNIT III  WEB APPLICATION DEVELOPMENT

Suggested Activities:
- Learning and Implementation of the following topics
  - Develop a database application using JDBC.
  - Develop a servlet program that illustrates the usage of cookies and sessions.
  - Create a shopping cart application and guest book web apps using JSF.
  - Validate user input of an application such as singing contest using JSP.
- Flipped classroom on MVC architecture.
- External learning – Development of dynamic web applications.
Suggested Evaluation Methods:
- Quiz on JDBC.
- Quiz on cookies, JSF and Java Beans.
- Demonstration of web applications developed using servlets, JSP and JSF.

UNIT IV DISTRIBUTED OBJECTS

Suggested Activities:
- Learning and implementation of the following topics
  - Create XML schema for specifying and validating the structure of an XML document.
  - Retrieve and manipulate XML data programmatically.
- External learning – Creation of an AJAX-enabled version of the feedback form with appropriate fields.
- External learning – Creation of a SOAP and RESTful web services.

Suggested Evaluation Methods:
- Quiz on RMI, XML and web services.
- Demonstration of RMI, XML and web services implementation.

UNIT V ADVANCED FRAMEWORKS

Suggested Activities:
- Learning and Implementation of the following topics
  - Create a simple application using struts.
  - Hibernate framework based O/R mapping.
  - To create simple applications using Spring framework.

Suggested Evaluation Methods:
- Demonstration of Hibernate, Struts and Spring framework based application.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
- Have knowledge on Java based implementation of object oriented features.
- Develop dynamic websites using client side technologies.
- Develop dynamic web applications with database connectivity using server side technologies.
- Create distributed applications using RMI and web services.
- Design and develop applications using advanced frameworks.
- Apply client and server side technologies for developing web applications with distributed objects and advanced framework features.
REFERENCES:
7. http://nptel.ac.in/courses/106105084/

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MM5101 PRINCIPLES OF MULTIMEDIA 3024

OBJECTIVES:
- To understand different forms of media in systems.
- To acquire knowledge in multimedia components.
- To acquire knowledge about multimedia tools and authoring.
- To acquire knowledge in the development of multimedia applications.
- To learn about the latest trends and technologies in multimedia.

UNIT I INTRODUCTION

Suggested Activities:
- Flipped classroom on media Components.
- External learning – Interactive power point presentation.

Suggested Evaluation Methods:
- Tutorial – Handling media components
- Quizzes on different types of data presentation.
UNIT II ELEMENTS OF MULTIMEDIA


Suggested Activities:
- Flipped classroom on different file formats of various media elements.
- External learning – Adobe after effects, Adobe Media Encoder, Adobe Audition.

Suggested Evaluation Methods:
- Demonstration on after affects animations.
- Quizzes on file formats and color models.

UNIT III MULTIMEDIA SYSTEMS


Suggested Activities:
- Flipped classroom on concepts of multimedia hardware architectures.
- External learning – Digital repositories and hypermedia design.

Suggested Evaluation Methods:
- Quizzes on multimedia hardware and compression techniques.
- Tutorial – Hypermedia design.

UNIT IV MULTIMEDIA TOOLS


Suggested Activities:
- Flipped classroom on multimedia tools.
- External learning – Comparison of various authoring tool.

Suggested Evaluation Methods:
- Tutorial – Audio editing tool.
- Quizzes on animation tool.

UNIT V MULTIMEDIA APPLICATION DEVELOPMENT


Suggested Activities:
- External learning – Game consoles.
- External learning – VRML scripting languages.
Suggested Evaluation Methods:
- Demonstration of simple interactive game.
- Tutorial – Simple VRML program.

PRACTICAL EXERCISES:
1. Install tools like Flash, Photoshop, Blender.
2. Design a simple web page with animated web advertisement.
3. Creating visual effects by editing and mixing various media elements using tools like adobe premier pro.
4. Use Adobe after effects for creating lighting effects and shades.
5. Use Adobe audition for sound mixing.
6. Use Adobe media encoder for coding an audio.
7. Use Photoshop to create a button, banner and texture.
8. Use Photoshop to create morphing and animation.
9. Develop a full-fledge multimedia application.
10. Develop a digital story boarding and 3D animation as mini project.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
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.
6. Manage and develop a game as a life-long activity individually or as a team.

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OBJECTIVES:
To impart knowledge and skills required for research and IPR:
- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I RESEARCH PROBLEM FORMULATION 6
Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II LITERATURE REVIEW 6
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III TECHNICALWRITING /PRESENTATION 6
Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR) 6

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR) 6

TOTAL: 30 PERIODS

OUTCOMES:
1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.

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IF5161 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY L T P C 0 0 4 2

OBJECTIVES:
- To learn the design strategies of various algorithms.
- To learn how to analyze the complexities of algorithms.
- To learn and understand the usage of advanced tree structures.
- To familiarize with the usage of heap structures.
- To understand the usage of graph structures and spanning trees.

LIST OF EXPERIMENTS:
Implement the following programs using C/ Python:
1. Iterative and recursive algorithms and its complexity analysis.
2. Merge sort algorithm analysis using divide and conquer approach.
3. Quick sort algorithm using randomized algorithmic approach.
5. Activity selection and Huffman coding using greedy approach.
7. Basic heaps operations.
8. Binomial heap operations.
9. Representation of graphs and graph traversals
10. A spanning tree for a given graph using Prim’s algorithm.
11. Shortest path of a given graph using Dijkstra’s algorithm and Bellman Ford algorithm.
12. All pair shortest path of a given graph using Floyd Warshall’s algorithm.

OUTCOMES:
On completion of the course, the students will be able to:
1. Design and implement iterative and recursive algorithms with minimum complexity.
2. Design and develop efficient algorithms for practical problems by adopting suitable algorithm design strategies.
3. Design and implement basic and advanced data structures extensively.
4. Apply suitable hierarchical data structures based on real time problems.
5. Design algorithms using graph structures.
6. Implement real world applications by proper usage of data structures and algorithms.

TOTAL: 60 PERIODS
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IF5162 WEB TECHNOLOGIES LABORATORY L T P C 0 0 4 2

OBJECTIVES:
- To develop simple Java programs using object orientation concepts.
- To program using files and threads for concurrent operations.
- To design attractive GUI using framework.
- To create more dynamic web pages using CSS, JavaScript and AJAX.
- To develop mobile based web applications in cloud environment.

LIST OF EXPERIMENTS:
1. Simple Java programs using arrays and lists.
2. Object orientation program using inheritance and polymorphism.
4. Simple GUI application development using applet and SWING.
5. Implement multithread program for concurrent operations.
6. Develop program to set priority and synchronize java threads.
7. Input and Output manipulation on files (Read/Write).
8. Java programs on generic and collections.
10. Dynamic web page creation using Javascript, Jquery and AJAX.
11. Develop servlet and JSF application with JDBC access.
12. Manage sessions in JSP using cookies.
14. Android application for location based service.
15. Develop cloud based web application.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of the course, the student should be able to:
1. Implement object oriented concepts using Java language
2. Develop GUI application by including I/O streams and threads.
3. Create web pages with proper client-side features
4. Design dynamic web pages with server-side and other technologies
5. Develop simple android based mobile application
6. Deploy web applications in a cloud based environment.
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MM5201 3D MODELING AND RENDERING L T P C 3 0 2 4

OBJECTIVES:
- To understand the fundamentals of modeling and rendering.
- To know the working principles of objects in three dimensional space.
- To acquire knowledge about the issues in Scene modelling.
- To learn rendering algorithms and application of special effects to the modelled objects.
- To gain skill in designing real time movie and games.

UNIT I MATHEMATICS FOR MODELING 9

Suggested Activities:
- Flipped classroom on properties of vectors.
- External learning – Simple program in OpenGL.

Suggested Evaluation Methods:
- Tutorial – Problems based on vectors.
- Assignment on the latest input and output devices.

UNIT II GEOMETRIC PRIMITIVES MODELING 9

Suggested Activities:
- Flipped classroom on graphical user Interface.
- External learning – Implementation of colour models and shades in OpenGL.
Suggested Evaluation Methods:
- Quizzes on interactive graphical user interface.
- Assignments on colour models and small programs in OpenGL.

UNIT III OBJECT MODELING

Suggested Activities:
- Flipped classroom on animation and rendering.
- External learning – Usage of asserts.

Suggested Evaluation Methods:
- Tutorial – Rendering algorithms.
- Assignment on various asserts.

UNIT IV SCRIPTING

Suggested Activities:
- Flipped classroom on special effects.
- External learning – Unity software.

Suggested Evaluation Methods:
- Quizzes on special effects.
- Tutorial – Basics of movement, force and trajectory.

UNIT V RENDERING AND SPECIAL EFFECTS

Suggested Activities:
- Flipped classroom on overview of 3D Maya.
- External learning – VR components: Oculus Rift, VR Headsets, VR Controllers.

Suggested Evaluation Methods:
- Tutorial – Animation coding in Maya.
- Quizzes on VR components.

PRACTICAL EXERCISES:
1. Implement an OpenGL program that determines the point of intersection between two lines and line with a plane.
2. Using vertex and color arrays, set up the description for a scene containing at least six two dimensional objects in OpenGL.
3. Implement a OpenGL program that removes the hidden surface of the objects in a scene of five objects that overlaps.
5. Creation of interactive presentation and portfolio using 2D animation (tweening, masking, audio effect) using Flash.
6. Video editing using iMovie/FinalCutPro/Adobe Premiere.
7. Creating, modifying, gravity and applying movements to particles.
8. Creating human, birds, animal characters in Unity/Maya.
9. Working with lights, applying different light for the scene.
10. Develop a simple Game using Unity/Maya as mini project.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Apply the knowledge related to concepts and techniques used in 3D Modeling.
2. Understand the physics and basic movements of character.
3. Conduct various experiments for effective modern interactive 3D Scene design.
4. Design and implement algorithms and techniques applied to 3D Modeling and Rendering.
5. Apply various tools and software related to three dimensional modelling efficiently to uphold the professional and social obligation.
6. Manage and develop a 3D animation movie and gaming as a life-long activity individually or as a team.

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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.

PRACTICAL EXERCISES:
1. Capturing data, reading data from different types of networks and browsing captured data via GUI using Wireshark (2 hours).
2. Exchanging messages between two programs using TCP sockets (2 hours).
3. Requesting for a response from a server using UDP sockets (2 hours).
4. Maintaining a queue based on WFQ and RED algorithms between a client and a server using TCP/UDP sockets (2 hours).
5. Streaming a video from a server to the client using RTSP using Python PI/JMF (2 hours).
6. Develop a client-server application in which the server extracts the frames from the video and send it to the client (2 hours).
7. Develop a client-server application in which client is able to buffer the video frames and playback the frames without violating end to end delay and jitter (2 hours).
8. Creating RTP header on the server side and interpret the RTP header on the client side using UDP sockets (2 hours).
10. Instant messaging and audio video streaming using JAIN SIP API/OSA-PARLAY API (2 hours).
11. Mini project (8 hours).

TOTAL: 75 PERIODS

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

REFERENCES:
OBJECTIVES:
- To provide a hands-on experience in R and Weka tool.
- To use the R packages for performing data preprocessing.
- To learn using Weka tool for data preprocessing.
- To familiarize the usage of R commands for visualizing data.
- To write and deploy simple algorithms as Map-Reduce tasks.

LIST OF EXPERIEMENTS:
1. Install standalone R. Install and configure Hadoop. Finally install Radoop.
2. Use R tool to explore various commands for descriptive data analytics using bench mark datasets.
3. Explore various variable and row filters in R for cleaning data.
4. Use R commands for probability distributions and probability statistics.
5. Formulate real business problems scenarios to hypothesis and solve using R statistical testing features.
6. Apply various plot features in R on sample data sets and visualize.
7. Write and execute word count, word search and pattern search problems from large text files using Map Reduce programs.
8. Write simple Map Reduce functions for sorting, grouping, joining, projecting, and filtering bench mark data sets.
10. Install Weka tool and explore various data preprocessing options using bench mark data sets.

TOTAL: 30 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Learn to install and use R.
2. Write and execute various data preprocessing experiments in the R platform.
3. Execute data cleaning processes on voluminous data sets.
4. Develop, implement and deploy simple data handling algorithms such as Map Reduce functions.
5. Learn to apply R functions on various applications.
6. Learn to install and use Weka tool.

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OBJECTIVES:
- To understand the concept of virtualization.
- To understand the various issues in virtualization.
- To familiarize themselves with the types of virtualization.
- To compare and analyze various virtual machines.
- To explore the virtualization tools and products.

UNIT INTRODUCTION TO VIRTUALIZATION

Suggested Activities:
- Quizzes on process virtual machines and system virtual machines.
- Practical – Install Oracle Virtual Box/Vmware Workstation and create a blackboard application [Hint: One VM should act as a master and other VMs acts as a listeners, when any content is written by the master VM, the content should be displayed in all the Listener VMs].

Suggested Evaluation Methods:
- Report submission and evaluation of the working of application in virtual environment.

UNIT II SERVER VIRTUALIZATION

Suggested Activities
- Install any one Sever Virtualization Tool (Vmware Esx,Xen,KVM) and run and create two VM and configure one vm as Web Server and another as File Server.

Suggested Evaluation Methods
- Review the Working of Installed Server Virtualization Tools (Access the Service offered by Remote Virtual machine via web browser)

UNIT III NETWORK VIRTUALIZATION

Suggested Activities:
- Create and configure a VLAN using Cisco packet tracer.
- Connect the Created VLANs using router in Cisco packet tracer.

Suggested Evaluation Methods:
- Demo – Inter VLAN Communication.
UNIT IV

STORAGE VIRTUALIZATION


Suggested Activities:
- Setup Iscsi in Linux Machine.

Suggested Evaluation Methods:
- Created storage luns should be accessed from target/remote system.

UNIT V

APPLYING VIRTUALIZATION


Suggested Activities:
- Mini project – Must use any virtualization Concept.

Suggested Evaluation Methods:
- Demonstration of the mini project.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Create a virtual machine and to extend it to a virtual network.
2. Discuss on various virtual machine.
3. Compile all types of virtualization techniques and utilize them in design of virtual machines.
4. Apply the concepts of virtualization in network and storage.
5. Explore the various virtualization tools.
6. Be able to use cisco packet tracer to simulate network virtualization.

REFERENCES:
OBJECTIVES:
- To learn about the design of the Unix operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in Unix.
- To understand the various Unix system calls.
- To explore the process and memory management concepts.

UNIT I  
OVERVIEW  

Suggested Activities:
- External learning – Usage of disk blocks and buffer cache.
- Assignment on system calls related to various UNIX commands.

Suggested Evaluation Methods:
- Quizzes on services of OS.
- Quizzes on advantages and disadvantages of buffer cache.

UNIT II  
FILE SUBSYSTEM  
Internal Representation of Files: Inodes – Structure of a Regular File – Directories – Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

Suggested Activities:
- Quizzes on inode.
- Practical – Implement superblock structure to handle the allocation and releasing of inode.

Suggested Evaluation Methods:
- Demonstration of the practical implementation.
- Assignment on disk block allocation.
UNIT III SYSTEM CALLS FOR THE FILE SYSTEM

Suggested Activities:
- Practical – Implement the following UNIX commands using System calls in C Program: cat and mv
- Practical – Write a C program to determine the size of a file using the lseek command. Once you found out the size, calculate the number of blocks assigned for the file.
- Practical – Write two simple programs pipe reader.c and pipe writer.c that use a named pipe to communicate. The pipe reader program will set up a named pipe using mkfifo(), open it read only, and read strings from it until it visualizes the string exit. The writer will open the named pipe file, read strings from the user and write them to the named pipe. When the user enters exit, the program will write the string to the pipe and then exit.

Suggested Evaluation Methods:
- Demonstration of the practical implementations and quizzes on the implementations.

UNIT IV PROCESSES

Suggested Activities:
- Practical – Write a program in C that creates a child process, waits for the termination of the child and lists its PID, together with the state in which the process was terminated (in decimal and hexadecimal)
- Practical – In a C program, print the address of the variable and enter into a long loop (say using while (1)). Start three to four processes of the same program and observe the printed address values. Show how two processes which are members of the relationship parent child are concurrent from execution point of view, initially the child is copy of the parent, but every process has its own data.

Suggested Evaluation Methods:
- Demonstration of the practical implementations and quizzes on the implementations.

UNIT V MEMORY MANAGEMENT AND I/O

Suggested Activities:
- Practical – Implement memory management Policies (Group Activity)
- Practical – Modify the functionality of basic commands in xv6 system (Group Activity)

Suggested Evaluation Methods:
- Demonstration of the mini project.

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Understand UNIX architecture and describe the component of operating system
2. Explain how they interact with computer hardware.
3. Deeper understanding of system calls in Unix operating system.
4. Apply the concepts of operating systems design to practical problems.
5. Design and implement the subsystems of an operating system.
6. Critically analyze different data structures and algorithms used in the building of a kernel.

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Suggested Activities:
- Flipped classroom on Ten Pillars of 5G.
- Assignment on millimeter wave mobile communication.
- External learning – 5G in global level.

Suggested Evaluation Methods:
- Viva Voce on assignment topic.
- Group discussion on different generations of telecommunication networks.
- Quiz on spectrum allocation strategies for 5G.

UNIT II SMALL CELLS FOR 5G MOBILE NETWORKS

Suggested Activities:
- Flipped classroom on types of small cells.
- Assignments on issues in fem to cells.
- External learning – Small cell challenges.

Suggested Evaluation Methods:
- Viva Voce on assignment topic.
- Quizzes on the drawbacks of dense deployment of wifi systems.

UNIT III COOPERATION FOR NEXT GENERATION WIRELESS NETWORKS

Suggested Activities:
- Flipped classroom on network coding.
- External learning – Cooperative MAC protocols.
- Assignment on packet exchange in PRCSMA.

Suggested Evaluation Methods:
- Viva voce on assignment topic.
- Quiz on NCCARQ operation under realistic channel conditions.
- Practical – Assessing the performance of NC-aided MAC protocols in event-driven C++ simulator.

UNIT IV MOBILE CLOUDS AND COGNITIVE RADIO

Suggested Activities:
- External learning – Network coding.
- Assignment on spectrum optimization using cognitive radio.
- External learning – Key Requirements and Challenges for 5G Cognitive Terminals.
- Assignment on component of a cognitive radio terminal.

Suggested Evaluation Methods:
- Viva voce on assignment topics.
- Quiz on carrier aggregation.
UNIT V SECURITY & SELF ORGANISING NETWORKS


Suggested Activities:
- External learning – 5G communications system architecture.
- Flipped classroom on security issues and challenges in communication systems.
- Assignment on centralised 5G mobile botnet.

Suggested Evaluation Methods:
- Viva voce on assignment topics.
- Quiz on D-SON and C-SON architectures.
- Group discussion on attacks on 4G Access Network.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Compare the 5G network with older generations of networks.
2. Identify suitable small cells for different applications in 5G networks.
3. Simulate 5G network scenarios.
4. Connect applications to mobile cloud.
5. Design applications with 5G network support.
6. Analyze the security risks in 5G networks.

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OBJECTIVES:
- To learn about the physical layer and MAC layer of WSNs.
- To understand the data centric computing to be followed in WSNs.
- To study about the routing protocols followed in WSNs.
- To study about data aggregation and in-network processing.
- To explore various motes, sensor network operating systems, databases and development platforms.

UNIT I  
FUNDAMENTALS OF WSN

Suggested Activities:
- External learning – Exploring various sensors, the corresponding actuators, various motes and their configuration (sensors supported, microcontroller and the clock speed, Flash, RAM, Battery capacity, RF transceivers and data rate supported).
- Flipped classroom on accuracy, hysteresis and resolution of sensors.
- Exploring energy required for transmission, receiving and channel sensing.

Suggested Evaluation Methods:
- Assignments on various types of sensors, actuators and motes.
- Quiz and discussion on accuracy, hysteresis and resolution of sensors.
- Assignments on problem solving related to energy consumption in WSNs.

UNIT II  
MAC LAYER OF WSN AND ZIGBEE STANDARD

Suggested Activities:
- External learning – A study of Wireless HART, 6LoWPAN and ISA 100.11a standards.
- Flipped classroom on different roles of nodes in WSNs and different types of ZigBee devices.
- Analyzing duty cycle and sleep cycle of S–MAC protocol.

Suggested Evaluation Methods:
- Assignments on various standards available for WSNs.
- Quiz and discussion on roles of nodes and different types of ZigBee devices.
- Assignments on solving problems related to duty cycle of S–MAC protocol.

UNIT III  
DATA CENTRIC COMPUTING IN WSN
Suggested Activities:
- Flipped classroom on data centric computing and information centric networks.
- Assignments on analyzing the generation and consumption of energy with non-conventional energy sources.
- External learning – Sensor network platforms and tools and sensor network databases.

Suggested Evaluation Methods:
- Quiz and discussion on data-centric computing and Information-centric networks.
- Assignments on solving problems regarding generation and consumption of energy sources.
- Assignments on sensor network platforms, tools and sensor network databases.

UNIT IV SYNCHRONIZATION, LOCALIZATION AND TRACKING IN WSNs

Suggested Activities:
- External learning – Exploring tracking of objects using ultrasonic sensors and camera nodes.
- Exploring the idea of smart cities using Object Tracking Sensor Networks (OTSN).
- Flipped classroom on scene analysis, GPS, RFID and location based services.

Suggested Evaluation Methods:
- Assignments on tracking of objects using ultrasonic sensors and camera nodes.
- Practical – Designing WSNs to locate and track moving objects using ultrasonic sensors or camera nodes for smart cities.
- Quiz and discussion on scene analysis, GPS, RFID and location based services.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS

Suggested Activities:
- Explore various network simulators available to carry out experiments in WSNs and various WSN testbeds: WISBED, SensLAB, MoteLAB, CitySense and Sensei
- Flipped classroom on Contiki OS and COOJA IDE
- Practical – Developing Arduino sketches and WSN simulation in ns-3.

Evaluation Methods:
- Assignments on various WSN simulators and WSN testbeds
- Quiz and discussion on Contiki OS and COOJA IDE
- Writing Arduino sketches for socially relevant projects and creating a sensor network topology in ns–2.35 with Mannasim patch or in ns–3

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Understand different types of sensors, their actuators and the architecture of motes.
2. Design the topology of WSNs using different types of ZigBee devices and understanding their roles.
4. Apply appropriate localization techniques for different scenarios.
5. Manage sensor networks by synchronizing the time, locating and tracking objects.
6. Carry out experiments in simulators and real sensors.

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IF5084 SOFTWARE ARCHITECTURE AND PRINCIPLES  

OBJECTIVES:
- To study the basics of software architecture and drivers.
- To be exposed to architectural styles and views.
- To study the need for software architectural standards.
- To be familiar with architectural patterns.
- To understand the basics of software architecture documentation and tools.

UNIT I INTRODUCTION
Suggested Activities:
- Study of the problem in a detailed fashion.
- Identifying the underlying software architecture.

Suggested Evaluation Methods:
- Case studies evaluation – Keyword in Context; Mobile robotics; Cruise control.

UNIT II   ARCHITECTURAL REQUIREMENTS

Suggested Activities:
- Draw a mind map of quality attributes.
- Identify the quality attributes of a given system.

Suggested Evaluation Methods:
- Evaluating the mind map for Railway Reservation System.
- Quality Attributes for food management system.

UNIT III   ARCHITECTURAL PATTERNS

Suggested Activities:
- Case studies for styles like Data flow systems, Call-and-return systems, Virtual machines, Independent components, Data-centered systems (repositories) etc.
- Match appropriate software architectures to applications.

Suggested Evaluation Methods:
- Evaluate various style of Architectural pattern for a given system.
- Assignment on various styles of different architecture.

UNIT IV   ARCHITECTURAL VIEWS

Suggested Activities:
- Study of need for organizational standards.
- Case studies for understanding the choice of architectural views.

Suggested Evaluation Methods:
- Exploring the various views for cruise control system, mobile robot system, etc.
- Assignment for identifying the choice of views for a keyword in context system.

UNIT V   DOCUMENTATION AND TOOLS
Suggested Activities:
- Documentation for Keyword in Context; Mobile robotics; Cruise control.
- In class discussion for identifying tools that match the current style in software architecture design.

Suggested Evaluation Methods:
- Documentation of Software architecture systems like internet information systems, automotive systems, scenario-based architectural analysis etc...
- Exploring tools like Open Model Sphere etc

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Explain influence of software architecture on business and technical activities.
2. Identify key architectural structures.
3. Use styles and views to specify architecture.
4. Design document for a given architecture.
5. Able to match appropriate software architectures to applications.
6. Develop standard process and to follow standard practices.

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OBJECTIVES:
- To know the underlying structure behind intelligence mathematically.
- To know the logical implications in computational intelligence.
- To know the automated learning techniques.
- To study the techniques of Knowledge Representation.
- To explore Artificial Intelligence techniques in real-time scenarios.

UNIT I  INTELLIGENT AGENTS AND KNOWLEDGE REPRESENTATION  9

Suggested Activities:
- Flipped classroom on intelligent agents, means of knowledge representation
- Assignment on exercise questions on PEAS formulation from the text-book.
- Examples of knowledge representation through different methods and reasoning.
- Practical – Ontology creation using Protégé.

Suggested Evaluation Methods:
- Tutorial on intelligent agents and PEAS formulation.
- Assignments on semantic nets, frames.
- Quizzes on agents.
- Practical – Programming exercises on object oriented structure, semantic nets and frames.

UNIT II  SEARCH TECHNIQUES  9

Suggested Activities:
- Flipped classroom on uninformed search and searching with costs.
- In-class activity – Solve puzzles with uninformed and informed searches.
- Practical – Implementation of search through Python/ Other languages.

Suggested Evaluation Methods:
- Tutorial – Different types of searches.
- Assignments on uninformed and informed searches.
- Quizzes on heuristic methods.
- Practical – Programming exercises on different search strategies.

UNIT III  REASONING WITH LOWER ORDER LOGICS  9

Suggested Activities:
- Reasoning methods through puzzles and real life scenarios.
- Implementation: Inference through prolog/ python.
Suggested Evaluation Methods:
- Tutorial – Inference methods.
- Assignments on theorem proving and resolution.
- Quizzes on basics of logic – syntax and semantics.
- Practical – Programming exercises for theorem proving.

UNIT IV  ARTIFICIAL INTELLIGENCE PLANNING

Suggested Activities:
- Flipped classroom on planning methods.
- Assignments on derivation of plan through partial order plan, graph plan and hierarchical plan.

Suggested Evaluation Methods:
- Tutorial – Different planning methods.
- Assignments on graph plan, SAT plan.
- Quizzes on planning in non-deterministic domains.
- Practical – Programming exercises on planning with PDDL/PDL/Python.

UNIT V  LEARNING TECHNIQUES

Suggested Activities:
- Flipped classroom on theoretical study of learning methods
- Assignment on solving problem in statistical learning
- Practical – Programming exercises using Python/ other programming languages.

Suggested Evaluation Methods:
- Tutorial – Learning methods.
- Assignments on statistical methods in learning.
- Quizzes on learning methods.
- Practical – Programming exercises on Statistical learning.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the search techniques.
2. Apply the search techniques to real-time problems.
3. Apply the reasoning techniques to real world problems.
4. Understand the representation of knowledge.
5. Understand the learning techniques.
6. Apply AI techniques in developing real world applications.

REFERENCES:
IF5071 ADVANCED COMPUTER ARCHITECTURE

OBJECTIVES:
- To evaluate different computer systems based on performance metrics.
- To explore parallelism in instruction and processor functional block.
- To understand the fundamentals of Graphics processing unit.
- To compare different approaches of memory interfacing in multiprocessor.
- To understand and analyze interconnection in multicore.

UNIT I INSTRUCTION LEVEL PARALLELISM

Suggested Activities:
- Flipped classroom on classes of processor.
- External learning – Static (compiler) scheduling for instruction execution.
- Survey on multi core and draw a mind map on trends of multicore processor.

Suggested Evaluation Methods:
- Quizzes on out of order scheduling.
- Group discussion on how to reduce CPI lesser than 1.

UNIT II THREAD–LEVEL PARALLELISM
Suggested Activities:
- Flipped classroom on Flynn taxonomy.
- External learning – True and false sharing.
- Survey on memory consistency protocol.

Suggested Evaluation Methods:
- Quizzes on memory consistency.
- Group discussion on memory models.

UNIT III  SIMD AND GPU ARCHITECTURES  8

Suggested Activities:
- Flipped class on evolution of GPU.
- External learning – Vector architecture.
- Survey on multi core and draw a mind map on trends of multicore.

Suggested Evaluation Methods:
- Quizzes on multicore and GPU.
- Group discussion on GPU vs. Vector architecture.

UNIT IV  MEMORY HIERARCHY DESIGN  9

Suggested Activities:
- Flipped classroom on memory hierarchy in Intel i7 and ARM Cortex.
- Practical – Implement a simple functional model for memory mapping in cache using C/C++.
- Study hit/miss rates for various access patterns. Experiment with different replacement policies.

Suggested Evaluation Methods:
- Mock test for problems on memory mapping.
- Quizzes on memory management in ARM and Intel processor.

UNIT V  INTERCONNECT AND STORAGE  9

Suggested Activities:
- Flipped classroom on static and dynamic interconnection.
- Practical – Implement a simple map reduce program for counting a word.
- Case study on warehouse scale computers

Suggested Evaluation Methods:
- Mock test for problems on types of interconnection.
- Quizzes on large scale computer programming.

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the students should be able to:
1. Compare and evaluate the performance of various architectures.
2. Design a coherent and consistent memory system for multiprocessor.
3. Analyze the requirements of large systems to select and build the right infrastructure.
4. Design and analyze memory and interconnection system for processor.
5. Distinguish and model multiprocessor architecture styles.
6. Point out the hazards present in a pipeline and suggest remedies.

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MM5001 REASONING METHODS IN COMPUTER SCIENCE L T P C
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OBJECTIVES:
- To know the mathematical background of Logic.
- To learn the basics of Lower Order Logic.
- To study the background of Higher Order Logic.
- To explore the real world applications with Lower Order Logic.
- To explore the real world applications with Higher Order Logic.

UNIT I PROPOSITION LOGIC
Introduction to Logic – Foundation in mathematics – Natural Deduction – Formal language Syntax and Semantics – Normal Forms – Applications in AI.

Suggested Activities:
- Flipped classroom on natural deduction.
- In-class activity – Solving puzzles through proposition logic.
- Practical – Programming exercises for SAT solver.
Suggested Evaluation Methods
- Quiz on formal proof methods.
- Assignment problems on natural deduction and SAT Solvers.
- Programming exercises on resolution and SAT Solvers.

UNIT II PREDICATE LOGIC 9
Syntax and semantics – Natural Deduction rules – Expressiveness – Micromodels of software – Inference mechanisms in AI.

Suggested Activities:
- Flipped classroom on micromodels of software.
- In-class activity – Problem solving exercise on natural deduction rules.

Suggested Evaluation Methods:
- Quiz on reasoning methods.
- Assignment problems on inference mechanisms in AI.

UNIT III MODAL LOGIC 9
Higher order logic – Modal logic syntax – Semantics – Accessibility relation – Types of modal logic – Natural deduction.

Suggested Activities:
- Flipped classroom on types of modal logic.
- In-class activity – Entailment through Kripke semantics.

Suggested Evaluation Methods
- Quiz on different accessibility relations.
- Assignment problems based on Kripke structures.

UNIT IV TEMPORAL LOGIC 9

Suggested Activities:
- Flipped classroom on applications.
- In-class activity – Solving problems with model checking.

Suggested Evaluation Methods:
- Quiz on Model Logic with types, temporal logic syntax and semantics.
- Assignment problems on semantics.
- Programming assignment on Model Checking.

UNIT V EPISTEMIC LOGIC 9
Logic of knowledge – Syntax – Semantics – Natural Deduction – Multi-agent reasoning – Applications in Distributed systems.

Suggested Activities:
- Flipped classroom on multi-agent reasoning.
- In-class activity – Solving puzzles like Muddy Children and Three Wise Men puzzle.

Suggested Evaluation Methods:
- Quiz on Reasoning methods using Muddy Children and Three Wise Men puzzle.
- Assignment problems on Deduction and other reasoning methods.

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the mathematical underpinnings of Logic
2. Apply Proposition Logic to Computer Science domains
3. Understand the reasoning process of Predicate Logic
4. Understand the advantages of Higher Order Logic over Lower Order Logic
5. Apply Temporal Logic to Distributed Systems
6. Design Multiagent systems using Epistemic Logic

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IF5078 DISTRIBUTED AND CLOUD COMPUTING L T P C
3 0 2 4

OBJECTIVES:
- To learn distributed communication.
- To understand distributed resource management.
- To study the basics of cloud computing.
- To study about virtualization and cloud resource management.
- Be able to install and use current cloud technologies.

UNIT I INTRODUCTION TO DISTRIBUTED SYSTEM AND COMMUNICATION 8
Suggested Activities:
- Practical – Implement clock synchronization in distributed system using Lamport’s algorithm.
- Practical – Create and distribute a Torrent file to share a file in LAN environment.

Suggested Evaluation Methods:
- Demonstration and assessment of the working of the implemented algorithm.

UNIT II DISTRIBUTED RESOURCE MANAGEMENT
10

Suggested Activities:
- Practical – Implement Election Algorithm.
- Practical – Implement any one deadlock detection Algorithm.

Suggested Evaluation Methods:
- Demonstration and assessment of the working of the implemented algorithm.

UNIT III CLOUD COMPUTING, ARCHITECTURE MODELS AND SERVICES
9

Suggested Activities:
- Practical – Use Google Collaboration Tools: Create Google Docs, Sheets, and Slides and share it with others.
- Practical – Explore public cloud services including Amazon, Google, Sales force, and Digital Ocean etc.

Suggested Evaluation Methods:
- Quizzes on different service models and deployment models.
- Report submission – Comparison of various services provided by different Cloud Service Provider (Configuration of VM, Cost, Network Bandwidth etc).

UNIT IV CLOUD ENABLELING TECHNOLOGIES
10

Suggested Activities:
- Create a simple web service using Python Flask/Java/any language [Web Service: Client-server model should be implemented using socket/http].
- Install Oracle Virtual Box/Vmware Workstation and Create a blackboard application [Hint: One VM should act as a master and other VMs acts as a listeners, when any content is written by the master VM, the content should be displayed in all the Listener VMs].
Suggested Evaluation Methods:
- Review of the Web Service Implementation: Proper Connection should be established between the client and server to make use of the service offered by the Server.
- Assessment of the workings of installed Virtualization Tools.
- Review the workings of application in virtual environment [Implemented using basic echo and chat concepts].

UNIT V  CLOUD MANAGEMENT, SECURITY AND COMPUTING PLATFORMS  8

Suggested Activities:
- Practical – Use security tools like ACUNETIX, ETTERCAP to scan web applications on the cloud, cloud networks for finding vulnerabilities, verifying leakage of information to an unauthorized third party.
- Practical – Install and configure OpenStack all in one using Devstack/Packstack and Launch VMs in OpenStack through dashboard:

Suggested Evaluation Methods:
- Report Submission – A detailed report describing vulnerabilities along with the suitable action that can be taken to remedy the loopholes.
- Evaluation of the practical: OpenStack Dashboard should be accessed though web browser and the working of the instances must be verified by logging in to it/pinging the instance.

PRACTICAL EXCISES:
1. Connect a minimum of 3 nodes and implement a group chat amongst them.
2. Implement any one of the message ordering algorithms on the previously implemented system.
3. Implement an election algorithm to elect a co–ordinator for the system.
4. Perform clock synchronization on the system, with the co–ordinator node’s time as reference.Create a VM image which has a C compiler along with an operating system and do the following experiments
   a. Fibonacci Series  b. File Operations
5. Install Virtualbox with different flavours of linux or windows OS on top of windows7 or 8
6. Install Google App Engine/Heroku and run a run a simple webapp using python/java.
7. Install and run Openstack using Packstack/Devstack
8. Create two VMs in Openstack and exchange data.
9. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in Cloud Sim.
10. Install hadoop and manipulate a large dataset and run on Hadoop.

TOTAL: 75 PERIODS
OUTCOMES:

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

1. Appreciate distributed communication, distributed resource management.
2. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
3. Learn the key and enabling technologies that help in the development of cloud.
4. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
5. Explain the core issues of cloud computing such as resource management and security.
6. Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

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IF5074 BUILDING INTERNET OF THINGS L T P C
3 0 2 4

OBJECTIVES:

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To learn communication protocols that is frequently used in IoT ecosystems.
- To explore the ways of processing enormous amount of data generated in IoT based systems.
- To understand the role of cloud computing in IoT and to become familiar with various cloud offerings.
UNIT I  ENABLING TECHNOLOGIES AND REFERENCE MODELS


Suggested Activities:
- Flipped classroom on enabling technologies.
- External learning – Exploring proprietary protocols used in IoT and M2M.
- Analyzing the required level of design for different IoT based ecosystems.

Suggested Evaluation Methods:
- Quiz and discussion on enabling technologies (WSN, Cloud and Big Data).
- Assignments on proprietary protocols used in IoT and M2M.
- Deciding the level and designing the IoT framework for case studies.

UNIT II  DESIGN OF END DEVICES


Suggested Activities:
- Flipped classroom on open source movement in hardware and SDLC for embedded systems.
- Explore the variants of Arduino Boards, Atmel Microcontrollers, Cypress Pioneer and NXP Freedom.
- Learning to write Arduino Sketches and Python Programs.

Suggested Evaluation Methods:
- Quiz and discussion on open source movement in hardware and SDLC for embedded systems.
- Assignments on Arduino boards, Atmel Microcontrollers, Cypress Pioneer and NXP Freedom.
- Practical – Developing Arduino Scripts and Python Programs.

UNIT III  IoT PROTOCOLS

MAC Layer Protocols – IEEE 802.15.4 – G And E Variants of IEEE 802.15.4 – IEEE 802.11ah – IEEE 1901.2a – LoRaWAN – 6LoWPAN – From 6LoWPAN to 6Lo – NBIoT – REST Based Protocols – SCADA, CoAP and MQTT.

Suggested Activities:
- External learning – Explore various software tools that support Coap and MQTT.
- Flipped classroom on role of Ipv6 in designing IoT based systems.

Suggested Evaluation Methods:
- Assignments on software tools that support Coap and MQTT.
- Quiz and discussion on role of Ipv6 in IoT based systems.
- Assignments on the IoT policy of Meity (Government of India).
UNIT IV DATA ANALYTICS

Suggested Activities:
- External learning – Exploring popular machine learning algorithms (both supervised and unsupervised).
- Flipped classroom on MapReduce programming.
- Learning dataflow programming using open source software library.

Suggested Evaluation Methods:
- Assignments on supervised, unsupervised and reinforcement algorithms.
- Quiz and discussion on MapReduce programming.
- Practicing dataflow programming languages using libraries like Tensorflow/CNTK/Theano etc.

UNIT V CLOUD OFFERINGS

Suggested Activities:
- Flipped classroom on cloud models and type of clouds.
- External learning – Django framework.

Suggested Evaluation Methods:
- Quiz and discussion on cloud models and types of clouds.
- Developing web apps for IoT ecosystems using Django framework.

PRACTICAL EXERCISE:
1. Develop a BLINK sketch in Arduino.
2. Develop an Arduino sketch that repeats an LED to glow brightly, decrease the brightness, switches off the LED, increases the brightness and LED glows with maximum intensity (a sketch for fading).
3. Develop an Arduino sketch that takes sensor readings for five seconds during the startup, and tracks the highest and lowest values it gets. These sensor readings during the first five seconds of the sketch execution define the minimum and maximum of expected values for the readings taken during the loop (a sketch for calibrating a sensor).
4. Develop an Arduino sketch that reads the value of a variable resistor as an analog input and changes blink rate of the LED.
5. Develop an Arduino sketch to use a piezo element to detect the vibration.
6. Develop a Python program to control an LED using Raspberry Pi.
7. Develop a Python program to interface an LED with a switch using Raspberry Pi.
8. Implement a map reduce program that produces a weather data set.
9. Implement an application that stores big data in Hbase/Mongo DB using Hadoop/R.
10. Use Google Collaboration Tools: Create Google Docs, Sheets, and Slides and share it with others.
11. Mini project.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the enabling technologies and reference models of IoT.
3. Apply appropriate protocols in various parts of IoT based systems.
4. Understand Big Data tools and technologies and apply them in IoT based systems.
5. Design and deploy IoT based systems and connect them to cloud offerings.
6. Design IoT systems for various real time applications.

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IF5081 INFORMATION RETRIEVAL

OBJECTIVES:
- To understand the basics of Information Retrieval with pertinence to modelling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of Information Retrieval giving emphasis to Multimedia IR and Web Search.
- To understand the concepts of digital libraries.
- To learn the procedure for recommendation system.
UNIT I  INTRODUCTION

Suggested Activities:
- Install Lucene, LingPipe, and Gate.

Suggested Evaluation Methods:
- Group discussion on applications of vector space model.

UNIT II  PREPROCESSING

Suggested Activities:
- Construct manually a frequency table for the collection of documents after removing stop words.
- Index the frequency table using Latent semantic indexing techniques.

Suggested Evaluation Methods:
- Apply query document information and usually manually the performance of the retrieval.

UNIT III  METRICS

Suggested Activities:
- Assignments on problems on precision and recall like the following:
  - An IR system returns 8 relevant documents and 10 non-relevant documents. There are a total of 20 relevant documents in the collection. What is the precision of the system on this search and what is its recall?

Suggested Evaluation Methods:
- Group discussion on metrics.

UNIT IV  CATEGORIZATION AND CLUSTERING

Suggested Activities:
- Categorize documents by topic using classifiers and build groups of self-organized documents using clustering algorithms.
Suggested Evaluation Methods:
- Analyze the algorithm by changing the input set.

UNIT V EXTRACTION AND INTEGRATION

Suggested Activities:
- External learning – Survey on recommendation process that takes place in various online shopping portals.

Suggested Evaluation Methods:
- Group discussion on recommendation process in a real time scenario.

PRACTICAL EXERCISES:
Implement the following exercises using python libraries.
1. Construct a vector space model for the collection of text documents and also compute the similarity between them. (4 hrs)
2. Perform the preprocessing on any text document collection. (4 hrs)
3. Classification and clustering approach on standard text database and also compute performance measures Precision, Recall and F-measure (4 hrs)
4. Construct a search engine index with an optional backend database to manage large document collections. (4 hrs)
5. Parse XML text and compute topic specific page rank. (4 hrs)
6. Mini project. (10 hrs)

TOTAL: 75PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Build an Information Retrieval system using the available tools.
2. Identify and design the various components of an Information Retrieval system.
3. Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
4. Analyze the Web content structure.
5. Analyze the approaches used for recommendation systems.
6. Design an efficient search engine.

REFERENCES:
OBJECTIVES:
- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in social web and related communities.
- To learn visualization of social networks.
- To understand the importance of security and privacy in social networks.

UNIT I - INTRODUCTION TO SOCIAL NETWORKS

Suggested Activities:
- Given a social graph derive the various graph metrics.
- Group discussion on pros and cons of various online discussion forums.
- Convert a graph into equivalent matrix representation.

Suggested Evaluation Methods:
- Assignment on graph metrics.
- Report submission on features of online social forums.
- Quizzes on graph and matrix representations.
UNIT II  ONTOLOGY FOR SOCIAL NETWORK ANALYSIS


Suggested Activities:
- Group activity – Defining concepts and relations for sample scenarios using benchmark ontology.
- Practical – Developing ontology using tools.
- Assignment on inferring the entities involved from a sample RDF schema.

Suggested Evaluation Methods:
- Report submission on benchmark ontology.
- Quizzes and assignments on RDF/FOAF and other related vocabulary.

UNIT III  SOCIAL MEDIA MINING AND SEARCH


Suggested Activities:
- Group discussion on the pros and cons of communities in social networks.
- Charting the metrics for evaluating real time online communities.

Suggested Evaluation Methods:
- Group assignment on evaluating real time social network communities.
- Assignment on scenario based comparative analysis of community discovery.
- Open book quizzes on Recommender Systems for specific social networking scenarios.

UNIT IV  SOCIAL NETWORK INFRASTRUCTURES AND COMMUNITIES


Suggested Activities:
- User interaction data collection from real time social network applications.
- Comparison of behavior models in social networks using sample data.

Suggested Evaluation Methods:
- Tutorial – Scenarios to identify suitable web accessibility testing.
- Group projects – Use open source data collection tools and predict user behavior.
UNIT V PRIVACY IN SOCIAL NETWORKS AND VISUALIZATION


Suggested Activities:
- Case studies on applications of social network analysis.
- In-class activities – Network visualization using benchmark data and network visualization tools.

Suggested Evaluation Methods:
- Assignments on chart work for modeling social networks using node-edge diagrams.
- Mini project on applications of social network analysis.

PRACTICAL EXERCISES:
1. Download and install open source social network analysis tools like UCINET, Net Miner, Smart Network Analyzer, Pajek, Gephi and explore the visualization and analytical features of that tool using sample real world data.
2. Construct any graph representing a real life social network scenario, feed the same as a matrix input to any tool and explore the graph theoretical metrics of the graph and note down your observations and inferences on those values.
3. Download any RDF schema on tourism and explore various tags in the schema. To visualize, open them using a Word Editor. Highlight the subject, predicate and object in each file. If necessary use the RDF validator service by W3C to obtain the triplets.
4. Download and install any open source RDF/Ontology editing tool like protégé, Onto Studio, etc. Try the following in that tool: (i) Load existing RDF schema and visualize and (ii) Add, modify and delete RDF.
5. Do the following using W3C RDF Validator: (i) Enter a URI or paste an RDF/XML document and parse the RDF and (ii) Visualize the RDF/XML as Triples and/or Graph.
6. Download any benchmark FOAF ontology/RDF and study the various FOAF classes used in that RDF/Ontology.
7. Download and install Gephi tool and explore importing graph file formats from (i) Spreadsheet import wizard, (ii) Database import. Also use the statistics and metrics framework in Gephi to calculate the following: Betweenness Centrality, Closeness, Diameter, Clustering Coefficient, Page Rank.
8. Load different social network data into Gephi tool and perform community detection using the features available and also compute the shortest path.
9. Explore various forced layout and random forest algorithms in Gephi tool to create a network layout. Compare the outputs of various layouts algorithms.
10. Study of various bibliometric RDFs and visualization of citation networks.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Convert a social network data into its equivalent graph data and derive social graph metrics.
2. Develop social blogs with necessary tags.
3. Design and develop ontology for various domains.
4. Predict human behavior in social web and related communities using community prediction and mining algorithms.
5. Design and develop trust models for social networks.
6. Visualize social network data and quantify its structural properties.
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OBJECTIVES:
- To learn about the basic concepts of Digital Image Processing and various Image Transforms.
- To familiarize the student with the Image Enhancement Techniques.
- To expose the student to a broad range of Image Processing Techniques and their Applications.
- To appreciate the use of current technologies those are specific to Image Processing Systems.
- To expose the students to real-world applications of Image Processing.

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9
Suggested Activities:
- Discussion on Image Processing applications.
- External learning – Open Source Tools like Octave/SciLab/OpenCV.
- External learning – Matlab/Octave Toolboxes.
- Installation of OpenCV/SciLab.
- Numerical Problems in Pixel connectivity and Distance measures.

Suggested Evaluation Methods:
- Tutorial problems in image operations, image connectivity and distance measures.
- Assignment on sampling, quantization and image operations.
- Quizzes on image types.

UNIT II IMAGE ENHANCEMENT


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

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

UNIT III IMAGE RESTORATION AND MULTI-RESOLUTION ANALYSIS


Suggested Activities:
- Discussion on Image Artefacts 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 IV IMAGESEGMENTATIONANDFEATUREEXTRACTION

Suggested Activities:
- Flipped classroom on importance of segmentation.
- External learning – Feature selection and reduction.
- External learning – Image salient features.
- Assignment on numerical problems in texture computation.

Suggested Evaluation Methods:
- Tutorial – Image segmentation and edge detection.
- Assignment problems on feature extraction and reduction.
- Quizzes on feature selection and extraction.

UNIT V  IMAGE PROCESSING APPLICATIONS


Suggested Activities:
- Discussion on machine learning in image processing.
- Discussion on image classifiers.
- External learning – Study of visual effects, image processing in security, forensic applications.

Suggested Evaluation Methods:
- Tutorial – Image classifier and clustering.
- Assignment problems on support vector machines and EM algorithm.
- Quizzes on image processing applications.

PRACTICAL EXERCISES:
1. Implementation of Reading and Writing of Images in Matlab and OpenCV/Octave/SciLab.
2. Implementation of simple spatial filters like Low Pass Filters and High Pass Filters in Matlab/OpenCV.
3. Implementation of Histogram Techniques in Matlab/Octave/OpenCV.
10. Implementation of Feature extraction Fingerprint using Matlab/Octave.

OUTCOMES:
On completion of the course, the students will be able to:
1. Implement basic Image Processing Operations.
2. Apply and develop new techniques in the areas of Image Enhancement and Restoration.
3. Understand the Image segmentation algorithms.
4. Extract features from Images.
5. Apply classifier and Clustering algorithms for Image classification and Clustering.
6. Design and develop an image processing application that uses different concepts of Image Processing.

TOTAL: 75 PERIODS
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IF5075  COMPUTER VISION  L T P C  3 0 2 4

OBJECTIVES:
- To provide knowledge about computer vision algorithms.
- To understand the basic concepts of camera calibration, stereoscopic imaging and higher level image processing operations.
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like OpenCV.
- To appreciate the use of computer vision in Industrial applications and to understand the role of computer vision.
- To understand and implement Object detection and Object tracking Algorithms.

UNIT I  FUNDAMENTALS OF VISION  9

Suggested Activities:
- Installation of OpenCV.
- Numerical Problems on Filtering, Masking, Smoothing and sharpening.

Suggested Evaluation Methods:
- Quizzes on various camera models and its effect.
- Practical – Programming assignments on types of filters for different applications.
UNIT II IMAGE SEGMENTATION and CAMERA CALIBRATION

Suggested Activities
- Flipped classroom on importance of segmentation.
- External learning – Various camera calibration methods.

Suggested Evaluation Methods
- Quizzes on various segmentation methods.
- Practical – Programming assignments on edge and shape detection methods.

UNIT III FEATURE DETECTION AND TRACKING

Suggested Activities
- Flipped classroom on various feature reduction methods.
- External learning – Optical flow algorithms.

Suggested Evaluation Methods
- Quizzes on various feature detection methods.
- Practical – Programming assignments on object tracking algorithms.

UNIT IV SHAPE FROM CUES AND OBJECT DETECTION

Suggested Activities
- Flipped classroom on pedestrian detection methods.
- Assignments on numerical problems on Shading and Texture Model based Vision.
- Assignments on numerical problems on AdaBoost and Random Decision Forests.

Suggested Evaluation Methods
- Quizzes on methods to identify the shape of an object in an image.
- Practical – Programming assignments on algorithms and methods used for identification of objects.

UNIT V COMPUTER VISION APPLICATION

Suggested Activities
- External learning – Exploring advancement in computer vision.
- Discussion on Emotion Recognition methods.

Suggested Evaluation Methods
- Quizzes on various real time computer vision application.
- Group discussion on methods to solve the real world problems in computer vision applications.
PRACTICAL EXERCISE:
1. Implementation of Noise removal algorithms using OpenCV.
2. Implementation of Object detection based on Edge detection algorithms on any application using OpenCV.
3. Implementation of Perspective projection of the lane borders using OpenCV.
4. Implementations of Feature Extraction of an object using SIFT in OpenCV.
5. Implementation of Feature Extraction of an object using SURF in OpenCV.
6. Implementation of Emotion Recognition in OpenCV.
7. Implementation of Gesture Recognition in OpenCV.
8. Implementation of Face Detection in OpenCV.
9. Implementation of Object detection using AdaBoost in OpenCV.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Implement basic computer vision algorithms.
2. Familiar with the use of MATLAB and OpenCV environment.
3. Apply and develop various object detection methods.
4. Design and implement industrial applications that incorporate different concepts of Image Processing.
5. Analyze different Object detection algorithms used in Computer Vision.
6. Understand the proper use of shape and Shape related cue features for Computer Vision Applications.

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OBJECTIVES:
- To understand the basic ideas and principles of Neural Networks
- To understand the basic concepts of Big Data and Statistical Data Analysis
- To familiarize the student with The Image Processing facilities like Tensorflow and Keras
- To appreciate the use of Deep Learning Applications
- To understand and implement Deep Learning Architectures

UNIT I  BASICS OF NEURAL NETWORKS  9
Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

Suggested Activities:
- Discussion of role of Neural Networks.
- Practical – Installation of TensorFlow and Keras.

Suggested Evaluation Methods:
- Tutorial – Perceptron.
- Assignment problems on backpropagation networks.
- Quizzes on Neural Networks.

UNIT II  INTRODUCTION TO DEEP LEARNING  9

Suggested Activities:
- Discussion of role of Gradient Descent in Deep Learning.
- External learning – Feature extraction and feature learning.
- Discussion of Gradient Descent Problem.

Suggested Evaluation Methods
- Tutorial – Gradient descent in deep learning.
- Assignment problems in optimization.
- Quizzes on deep learning regularization and optimization.

UNIT III  CONVOLUTIONAL NEURAL NETWORKS  9
CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

Suggested Activities:
- Discussion of role of Convolutional Networks in Machine Learning.
- External learning – Concept of convolution and need for Pooling.

Suggested Evaluation Methods:
- Tutorial – Image classification and recurrent nets.
- Assignment problems in image classification performances.
- Quizzes on Convolutional Neural Networks.
UNIT IV  MORE DEEP LEARNING ARCHITECTURES  

Suggested Activities:
- Discussion of role of Deep Learning architectures.
- External learning – Compression of features using Autoencoders.

Suggested Evaluation Methods:
- Tutorial – LSTM and Autoencoders.
- Assignment problems in deep generative models, Deep Belief Networks.
- Quizzes on deep learning architectures.

UNIT V  APPLICATIONS OF DEEP LEARNING  

Suggested Activities:
- Discussion of role of Deep Learning in Image and NLP applications.
- External learning – NLP concepts.

Suggested Evaluation Methods:
- Tutorial – Image segmentation.
- Assignment problems in parsing and sentiment analysis.
- Quizzes on deep learning architectures.

PRACTICAL EXERCISES:
1. Implement Simple Programs like vector addition in TensorFlow.
2. Implement a simple problem like regression model in Keras.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Implement a Transfer Learning concept in Image Classification.
8. Implement a SimpleLSTM using TensorFlow/Keras.
9. Implement an Opinion Mining in Recurrent Neural network.
10. Implement an Object Detection using CNN.
11. Mini Project

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the role of Deep learning in Machine Learning Applications.
2. To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
3. To design and implement Deep Learning Applications.
5. To design and implement Convolutional Neural Networks.
6. To know about applications of Deep Learning in NLP and Image Processing.
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IF5080 HUMAN COMPUTER INTERACTION TECHNIQUES L T P C
3 0 2 4

OBJECTIVES:
- To learn the principles and fundamentals of HCI.
- To understand components of interfaces and screens, including windows, menus and controls.
- To understand user interface design principles, and apply them to designing an interface.
- To learn user interface designs through usability inspection and user models.
- To understand the rationale and guidelines for an effective interface design methodology.

UNIT I DESIGN PROCESS 9

Suggested Activities:
- Flipped classroom on knowledge on the HCI design process.
- External learning – Exploration of various human computer interfaces.
Suggested Evaluation Methods:
- Tutorials – HCI design process.
- Assignment on comparison of various interfaces.

UNIT II  DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS  9

Suggested Activities:
- Flipped classroom on designing a good User Interface system based on design rules.
- External learning – Techniques related to evaluation of HCI design.

Suggested Evaluation Methods:
- Tutorial – Usage of design rules to create interfaces.
- Assignment on applying evaluation techniques on different user interfaces.

UNIT III  COMMUNICATION MODELS  9

Suggested Activities:
- Flipped classroom on basic knowledge of various models used in HCI design.
- External learning – Design and implementation of various models used in HCI design.

Suggested Evaluation Methods:
- Tutorial – Task models.
- Assignment on dialog models and task models.

UNIT IV  EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI  9

Suggested Activities:
- Flipped classroom on basic concepts of probability and statistics.
- External learning – Practical problems related to hypothesis testing.

Suggested Evaluation Methods:
- Tutorial – Statistical testing related to UI evaluation parameters.
- Assignment on problems on hypothesis testing for UI parameters.
UNIT V  DIALOGUE AND CURRENT TRENDS


Suggested Activities:
- Flipped classroom on basic concepts of dialogue notations and design.
- External learning – Study of how Virtual Reality interface are used in various real time applications.

Suggested Evaluation Methods:
- Tutorial – Recent trends in human computer interface systems.
- Assignment on dialogue notation representation for various interfaces.

PRACTICAL EXERCISES:

2. Study of user interfaces of common applications like Facebook, UberEats, Twitter, IRCTC, Anna university Sems, Amazon etc. Prepare a comparative Design document.
3. Design and development of simple user interface for an E-commerce website.
4. Design and development of the user interface of a university Web portal.
5. Design and development of movie ticket booking interface for Physically Challenged people. Prepare design document for the following interfaces which should include the design process, design methodology and the design rules used in the development of the UI application. The document should also justify the chosen methodology for the given application. Using an evaluation technique, evaluate the way in which user experiences with your proposed design would be satisfiable to the end user.
7. Implementation of user interfaces for video streaming application which caters to the need of older people.
8. Design and development of mobile application interfaces for chat bots.
9. Design and development of novel user interfaces for any wearable device.
10. Design and develop an interface for geographical information system.

TOTAL: 75 PERIODS

OUTCOMES:

On completion of the course, the students will be able to:
1. Interpret the contributions of human factors and technical constraints on human-computer interaction.
2. Evaluate the role of current HCI theories in the design of software.
3. Design and develop interfaces related to real applications.
4. Apply exploratory and experimental research methods in HCI.
5. Familiarize with principles and guidelines of user centered interface design process, evaluation methodologies and tools to analyze the interfaces.
6. Implement human computer interfaces for different applications using various tools and technologies.
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IF5083               PATTERN RECOGNITION     L T P C
                      3 0 2 4

OBJECTIVES:
- To provide basic knowledge about the fundamentals of pattern recognition and its application.
- To understand about unsupervised algorithms suitable for pattern classification.
- To familiarize with the feature selection algorithms and method of implementing them in applications.
- To learn about the basis of algorithm used for training and testing the dataset.
- To learn basic fuzzy system and neural network architectures, for applications in pattern recognition, image processing, and computer vision.

UNIT I               PATTERN CLASSIFIER   9

Suggested Activities:
- Discussion on pattern recognition application like image classification.
- Installation of Matlab.
- Assignment on numerical problem solving on Naive Bayesian classifier.

Suggested Evaluation Methods:
- Quizzes on importance of classifier in recognizing various patterns.
- Practical – Programming assignments on implementation of Bayes theorem.
UNIT II  CLUSTERING
Clustering Concept – Hierarchical Clustering Procedures – Partitional Clustering – Clustering of Large Data Sets – EM Algorithm – Grid Based Clustering– Density Based Clustering.

Suggested Activities:
- Assignments on numerical problem solving using hierarchical Clustering in Matlab.
- Assignments on numerical problem solving using EM Algorithm in Matlab.

Suggested Evaluation Methods:
- Quizzes on various clustering methods in pattern recognition.
- Practical – Programming assignments on the working of clustering algorithms on various applications.

UNIT III  FEATURE EXTRACTION AND SELECTION
Entropy Minimization – Karhunenloeve Transformation – Feature Selection through Functions Approximation – Binary Feature Selection – K-NN.

Suggested Activities:
- Assignment on numerical problem solving using K-NN algorithm.
- Assignment on numerical problem solving using Decision Tree algorithm.

Suggested Evaluation Methods:
- Quizzes on various feature selection methods.
- Practical – Programming assignments on various feature extraction algorithms for various applications.

UNIT IV  HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE

Suggested Activities:
- Assignments on numerical problem solving using HMM algorithm in Matlab.
- Assignments on numerical problem solving using SVM classifier in Matlab.

Suggested Evaluation Methods:
- Quizzes on various Markov models.
- Practical – Programming assignments on working of SVM and HMM over real world application.

UNIT V  RECENT ADVANCES
Fuzzy Classification: Fuzzy Set Theory, Fuzzy and Crisp Classification, Fuzzy Clustering, Fuzzy Pattern Recognition– Introduction to Neural Networks: Elementary Neural Network for Pattern Recognition, Hebbnet, Perceptron, ADALINE, and Back Propagation.

Suggested Activities:
- Numerical problem solving on simple neuron in Matlab.
- Numerical problem solving on custom neural networks in Matlab.

Suggested Evaluation Methods:
- Quizzes on various fuzzy classification methods.
- Practical – Programming assignments on neural network for pattern recognition applications.
PRACTICAL EXERCISE:
1. Implementation of Image classification using Hebbnet method in Matlab.
3. Implementation of Fuzzy pattern recognition in Matlab/OpenCV.
4. Implementation of Feature extraction using KL transform Matlab/OpenCV.
5. Implementation of Clustering using partitional based clustering in Matlab/OpenCV.
6. Implementation of Clustering using density based clustering in Matlab/OpenCV.
7. Implementation of Classification using SVM in Matlab/OpenCV.
8. Implementation of Classification using HMM in Matlab/OpenCV.
9. Implementation of Classification using Bayes in Matlab/OpenCV.
10. Implementation of Neural Network methods using OpenCV.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Implement basic pattern classifier algorithms.
2. Have knowledge about the working principle of unsupervised algorithm.
3. Have knowledge about functionality of classifiers.
4. Perceive the recent advancement in pattern recognition.
5. Apply SVM and HMM algorithms for real time applications.
6. Implement advanced methodologies over image processing applications.

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IF5073 AUTONOMOUS GROUND VEHICLE SYSTEMS L T P C 3 0 2 4

OBJECTIVES:
- To learn the fundamentals of autonomous driving.
- To study the different ways of sensing internal states of Autonomous Ground Vehicles (AGVs).
- To learn the environment perception for autonomous driving.
- To explore the navigation techniques of AGVs.
- To learn the fundamentals of vehicle control systems and connected vehicles.
UNIT I  INTRODUCTION TO AUTONOMOUS DRIVING


Suggested Activities:
- Flipped classroom on autonomous driving system architecture.
- External learning – Building blocks of typical Unmanned Aerial Vehicles.
- Flipped classroom on robot operating system.
- External learning – Applications of autonomous vehicles (aerial, under water, ground vehicles).
- Assignment on the design requirement specifications of autonomous vehicles (aerial, under water, ground vehicles).

Suggested Evaluation Methods:
- Viva voce on assignment topics.
- Quizzes on Advanced Driver Assistance Systems (ADAS).
- Group Discussion on Google’s self-driving car.

UNIT II  SENSORS FOR AUTONOMOUS GROUND VEHICLES


Suggested Activities:
- Flipped Classroom on sensor characteristics.
- External learning – Exploring Velodyne Lidar sensor dataset in Veloview software.

Suggested Evaluation Methods:
- Practical – Experiments on interfacing IMU sensor to Raspberry Pi board and recording the acceleration of a dummy vehicle.
- Practical – Experiments on interfacing Lidar/RADAR sensor to Raspberry Pi board and recording the distances to the nearby objects.

UNIT III  ENVIRONMENT PERCEPTION AND MODELING

Road Recognition: Basic Mean Shift Algorithm, Mean Shift Clustering, Mean Shift Segmentation, Mean Shift Tracking, Road Recognition Algorithm –Vehicle Detection and Tracking: Generating ROIs, Multi Resolution Vehicle Hypothesis, Vehicle Validation using Gabor Features and SVM, Boosted Gabor Features –Multiple Sensor Based Multiple Object Tracking.

Suggested Activities:
- Flipped classroom on Basic Mean Shift Algorithm.
- External learning – Lane detection algorithm.
- Flipped classroom on vehicle tracking.

Suggested Evaluation Methods:
- Practical – Implementation of Mean Shift Clustering / Mean Shift Segmentation Algorithm.
- Practical – Experiments on stationary obstacle detection algorithm using Lidar sensor.
UNIT IV  NAVIGATION FUNDAMENTALS


Suggested Activities:
- Flipped classroom on GPS orbits/GPS Signals.
- External learning – Indian Regional Navigation Satellite System (IRNSS).
- Assignment on the working principles of Google Map.

Suggested Evaluation Methods:
- Quizzes on GNSS signal structure.
- Viva Voce on assignment topics.
- Practical – Simulation of Waypoint Navigation Algorithm.

UNIT V  VEHICLE CONTROL AND CONNECTED VEHICLE


Suggested Activities:
- Flipped classroom on cruise control.
- External learning – Study on proportional integral derivative (PID) control.
- Assignment – Communication protocols for connected vehicles.

Suggested Evaluation Methods:
- Viva Voce on assignment topic.
- Practical – Experiment on simple velocity control.
- Practical – Experiment on simple longitudinal motion control.

PRACTICAL EXERCISES:

1. Write a python program to read Lidar sensor data and write it in a text file.
2. Write an Arduino sketch to operate DC motors through motor driver.
3. Write a python program on Raspberry Pi board to control the movement of pan-tilt platform with 5v dc motors.
4. Write a python program to read the IMU sensor values through I2C bus in Raspberry Pi board.
5. Develop an Arduino application to drive a simple rover with four wheels in a random path.
6. Write a python program to send the location of a rover with GPS to Firebase realtime database.
7. Develop a Lidar sensor assisted application to implement 2D collision cone based obstacle avoidance for rovers.
8. Develop an application using python program to control the pan-tilt motion of a camera and to take pictures/videos in the field of view of the camera.
10. Develop a convolutional neural network model to detect road lanes in videos.
11. Mini Project.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Identify the requirements and design challenges of AGVs.
2. Select suitable sensors to sense the internal state and external world of AGVs.
3. Implement lane detection, road detection & vehicle detection algorithms.
4. Simulate/implement ground vehicle navigation algorithms.
5. Simulate/implement ground vehicle control systems.
6. Design communication protocols for connected vehicles.

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Suggested Activities:
- Survey the machines in the laboratory and identify the configuration of the GPUs in them.
- Download the CUDA toolkit and setup the CUDA environment.
- Write simple CUDA code and vary the parameters to understand the concept of threads, blocks and grids.

Suggested Evaluation Methods:
- Check the configuration.
- Demonstrate the CUDA setup by running simple and sample programs.

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

Suggested Activities:
- Code walkthrough of sample CUDA programs.
- Run sample CUDA programs with different memory options.

Suggested Evaluation Methods:
- Check the trace of the CUDA programs.
- Check the output corresponding to different memory options.

UNIT III  PROGRAMMING ISSUES

Suggested Activities:
- Code walkthrough of sample CUDA programs with synchronization within thread blocks and across thread blocks.
- Write CUDA programs with and without pitched memory and compare.

Suggested Evaluation Method:
- Quizzes on the understanding of synchronization options.

UNIT IV  OPENCL BASICS

Suggested Activities:
- Code walkthrough of sample OpenCL programs.
- Run sample OpenCL programs with different memory options.

Suggested Evaluation Methods:
- Check the trace of the OpenCL programs.
- Check the output corresponding to different memory options.

UNIT V  ALGORITHMS ON GPU
Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix – Matrix Multiplication – Programming Heterogeneous Cluster.

Suggested Activities:
- Analyse programs in CUDA/OpenCL to perform graph traversal, tree traversal.
- Study sample programs for matrix multiplication and analyse their performance.
Suggested Evaluation Methods:
- Check the output of the CUDA programs.
- Check Performance chart.

PRACTICAL EXERCISE:
1. Implement matrix multiplication using CUDA. Experiment with different matrix sizes and kernel launch options and compare the performance. (2 labs)
2. Implement vector reduction using CUDA, and check output with CUDA profiler.
3. Implement matrix multiplication with tiling and shared memory.
4. Implement various performance tuning techniques for matrix multiplication.
5. Implement matrix multiplication using OpenCL.
6. Implement vector reduction using OpenCL.
7. Implement graph traversal using CUDA.
8. Implement image processing algorithms using CUDA.
9. Experiment with advanced features such as dynamic parallelism.
10. Mini project: Choose an application and implement using GPU and do performance analysis.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Describe GPU Architecture.
2. Write programs using CUDA, identify issues and debug them.
3. Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication.
4. Write simple programs using OpenCL.
5. Given a problem, identify efficient parallel programming patterns to solve it.
6. Compare different GPU programming paradigms.

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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

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

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

OUTCOMES:
On completion of the course, the students will be able to:
- Discuss video processing fundamentals
- Analyze video features for segmentation purpose
- Derive numeric problems related to motion estimation
- Process video streams for analytics purpose
- Parse and index video segments
- Design applications for video analytics in current trend

REFERENCES:
OBJECTIVES:
- To enrich student learning in fundamentals of multimedia coding and standards.
- To train the students to acquire knowledge in text coding.
- To acquire knowledge behind theory of image and video coding & decoding with standards.
- To learn principles of audio coding and standards.
- To get comprehensive learning in multimedia standard content description and formats.

UNIT I  LOSSLESS AND LOSSY CODING  9

Suggested Activities:
- Flipped classroom on text coding concepts.
- Practical – Implement basic text coding and decoding algorithm using Python.
- Case study of WinZip, RAR.

Suggested Evaluation Methods:
- Estimate complexity and coding efficiency of a given algorithm.
- Assignment on numerical problem solving in coding theory.
- Assignment on numerical problems in coding theory.

UNIT II  IMAGE PROCESSING AND CODING  9
Suggested Activities:
- Flipped classroom on different image coding techniques.
- Practical – Demonstration of EXIF format for given camera.
- Practical – Implementing effects quantization, color change.
- Analyze effects of change in RGB components in a digital color image.
- Case study of Google's WebP image format.

Suggested Evaluation Methods:
- Evaluation of the practical implementations.
- Assignment on image file formats.
- Quizzes on colour models.

UNIT III VIDEO PROCESSING AND CODING


Suggested Activities:
- Flipped classroom on concepts of video coding standards.
- Assignment on calculation of file size in different resolution and standards.
- Assignment on complexity estimation of different motion vector search methods.
- Assignment on measurement of video quality using tools.
- Practical – Implementation of effects quantization, Chroma sub-sampling etc.
- Case study of Google’s WebM video format.
- Mini project on processing of coded video.

Suggested Evaluation Methods:
- Evaluation of the practical implementation.
- Evaluation of the mini project.
- Quizzes on MPEG standards.

UNIT IV AUDIO PROCESSING AND CODING


Suggested Activities:
- Flipped classroom on audio coding standards.
- External learning – Dolby, DTS systems in Cinema theatres.
- Assignment on numerical problems on digital audio.
- Practical – Implementation of surround sound.
- Case study of a multi-channel home theatre system.

Suggested Evaluation Methods:
- Assignment on numerical problems on digital audio.
- Real-time demonstration of surround sound.
- Quizzes on Surround audio.
UNIT V MULTIMEDIA CONTENT DESCRIPTION AND FRAMEWORK


Suggested Activities:
- Designing the structure and user interface.
- Case study of media coding used by YouTube, Netflix.
- External learning – Media streaming for TV.

Suggested Evaluation Methods:
- Responsive web design using hypermedia.
- Demonstration of media streaming through internet.
- Quizzes on multimedia frameworks.

PRACTICAL EXERCISES:
1. Implement Shannon Fano, Huffman, and adaptive Huffman coding techniques.
2. Develop and implement Dictionary based coding and decoding methods.
3. Implement Arithmetic coding and decoding algorithms.
4. Develop and implement transform coding with DCT / Wavelet based algorithm.
5. Implement color balancing and Gamma correction methods.
6. Implement different modules of JPEG algorithms.
7. Implement color processing in video.
8. Implement different modules of MPEG–1 / H.261 standards.
9. Develop tool for editing MIDI musical files.
10. Implement different modules of MP–3, AAC standards.
11. Create multimedia contents with standard multimedia content description interface and frameworks.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Articulate the concepts and techniques used in multimedia basics and standard coding techniques.
2. Develop competence in implementing text coding.
3. Design and implement algorithms for image and video coding.
4. Choose and analyze suitable audio coding for a given multimedia application.
5. Design and develop multimedia projects with standard content formats and frameworks.

REFERENCES:
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.
PRACTICAL EXERCISES:

Implement the following exercises using OpenCV:

1. Develop a system to compute that representation for each of the images in a database and to change images between different colour spaces, transformations, about Contours (4 hr)
2. Develop a system to search for an object in an image using Template Matching and segment images and extractions of foreground (4 hr)
3. Implement to do the pre-processing for any document and construct a vector space model for the collection of text documents and also compute the similarity between them. (4 hr)
4. Develop a system to compute spatial-temporal motion trajectory for a video dataset. (4 hr)
5. Develop a system to compute any two Feature extraction techniques and dimension reduction procedure. (4 hr)

TOTAL: 75 PERIODS

OUTCOMES:

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

1. Learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval.
2. Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
3. Outline the structure of queries and media elements.
4. Implement the process by exploring the open source tool for Image retrieval and video retrieval.
5. Recognize the feasibility of applying machine learning for a particular problem.
6. Critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

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OBJECTIVES:
- To understand the fundamentals of Short film Making.
- To know the working principles camera.
- To acquire knowledge about the editing software.
- To train the student as a member or leader in diverse teams of short film development.
- To inculcate aesthetic sense involved in creativity and transform creative ideas into short film.

UNIT I INTRODUCTION TO SHORT FILM

Introduction – Different Types of Short Film – Documentary and Non Fiction Film – Animated Short Films – Challenges in Developing Short Films – Creative Approaches.

Suggested Activities:
- Flipped classroom on issues in short film production.
- External learning – Practical problems related to interacting with people related public issues.

Suggested Evaluation Methods:
- Assignment on different types of short film.
- Tutorial – Various issues related to short films production.
- Assignment on different interviews style.

UNIT II PREPRODUCTION


Suggested Activities:
- Blended learning – People interest towards short films.
- Flipped classroom on discussion on selection of crew members based on their talents.
- External learning – Survey on funding agencies and legal details regarding short films productions.

Suggested Evaluation Methods:
- Assignment on preparing survey question to known people interest towards short film.
- Tutorial – Crew and their responsibilities.
- Assignment on project proposal preparation.

UNIT III PRODUCTION

Suggested Activities:
- Blended learning – Research regarding the locations and pervious stories.
- Flipped classroom on different types of cameras.

Suggested Evaluation Methods:
- Quizzes on research and scheduling the locations.
- Assignment on the usage of cameras in shooting procedures.

UNIT IV POST PRODUCTION

Suggested Activities:
- Flipped classroom on various visual and color effects.
- External learning – Interaction with media peoples.

Suggested Evaluation Methods:
- Tutorial – Color theory.
- Assignment on recording and editing.

UNIT V SCREENING
Impact of Short Film on the Society – Various Media Techniques used in Short Film Production – Identifying Important Current Social Issues for Short Film – Exploring Background Research Current Social Issues – Making Short Film for Television and Theatrical Release – Non Fiction Presentation – Production of an individually or Group Authored Short Film Based on Historical – Corporate – Institutional – Current Social Issues.

Suggested Activities:
- External learning – Survey on current public issue.
- Flipped classroom on discussion on innovative short film production.

Suggested Evaluation Methods:
- Quizzes on public issues.
- Tutorial – Various new techniques in short film production.

PRACTICAL EXERCISES:
1. Power point 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 animation using Unity.
7. Creating Lighting effects using Adobe Light Room.
8. Working on color correction and color exposure using Photoshop.
10. Develop a short film based on current public issues as mini project.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Apply the knowledge of concepts and techniques used in short film development.
2. Understand the social issues and projecting them effectively through short film.
3. Conduct various experiments for effective short film.
4. Design and implement various techniques in to short film that brings impact on the society.
5. Apply various tools and software for lighting and sound to uphold the professional and social obligation.
6. Manage and Develop a short film as a life-long activity as a team.

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MM5004 ANIMATION TECHNIQUES L T P C
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OBJECTIVES:
- To understand the fundamentals of animation.
- To know the working principles of animation tools.
- To acquire knowledge about the issues in 2D and 3D animation.
- To train the student as a member or leader in diverse teams of animation.
- To gain skill in designing real time animation movie.

UNIT I INTRODUCTION TO ANIMATION
Suggested Activities:
- Flipped classroom on properties of multimedia systems design elements
- External learning – Graphics display devices and input devices

Suggested Evaluation Methods:
- Quizzes based on designing elements.
- Assignment on latest input and output devices.

UNIT II PERSPECTIVE IN ANIMATION
Perspective Blocks and Boxes – Vanishing Point in Horizon – Outside Horizon and Indoors – Scale Diagrams in Perspective – Different View Points – Importance of Eye Level – Curves and Cylinders in Perspective – Perspective in 1 point, 2 point, 3 point, Multiple Points – Shapes in Perspective with Light and Shade – Foreshortening.

Suggested Activities:
- Flipped classroom on discussion on projection.
- External learning – Camera mechanism.

Suggested Evaluation Methods:
- Tutorials – Viewing port and camera positing.
- Assignment on camera working and principles.

UNIT III ANIMATION PRINCIPLE

Suggested Activities:
- Flipped classroom on drawing gestures, facial expressions and pose to pose sketching.
- External learning – Sketching from acting, sketching from live models.

Suggested Evaluation Methods:
- Tutorial – Drawing body movements and facial expression.
- Assignments on sketching various animal movements.

UNIT IV ANIMATION PRESENTATION

Suggested Activities:
- Flipped classroom on different special effects
- Discussion on slow and fast actions and movements of the objects

Suggested Evaluation Methods:
- Tutorial – Environmental and surrounding Effects
- Assignments on physical nature of the objects
UNIT V ADVANCES IN ANIMATION


Suggested Activities:
- Flipped classroom on designing web pages.
- External learning – Sound editing tools.

Suggested Evaluation Methods
- Tutorial – Creating web pages.
- Assignment on different sound effects and background music.

PRACTICAL EXERCISES:
1. Simple 2D text animation using Flash.
2. Implementing morphing, Tweening using Flash.
3. Implementation Animation with control buttons using Flash.
5. Adding back ground music and voice over to animation sequence using Adobe Audition.
6. Editing the animation sequence and adding transitions using Adobe Premier Pro.
7. Story Board writing.
8. Animation calibration using Adobe after Effects.
10. Creating a simple animation movie using Maya as mini project.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Apply the knowledge of concepts and techniques used in Animation.
2. Understood the physics and basic movements of character.
3. Conduct various experiment for effective modern interactive Animation.
4. Design and implement algorithms and techniques applied to Animation.
5. Apply various tools and software like OpenGL, Unity, 3D Maya efficiently to uphold the professional and social obligation.
6. Manage and develop a cost effective animation movie and Gaming as a life-long activity individually or as a team.

REFERENCES:
OBJECTIVES:
- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of game engine.
- To survey the gaming development environment and toolkits.
- To learn and develop simple games using Pygame environment.

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING

Suggested Activities:
- Discussion about computer and video games origin and history.
- Discussion of graphics objects, open source language for game development like Pygame and Processing.py – a Language for creative arts.
- External learning – Algorithms in translation, scaling, zooming and rotation of 3D objects.
- Practical – Installation of Pygame and Pygame Zero and Implementation of colour models and shading models in Python.

Suggested Evaluation Methods:
- Tutorial – 2D and 3D transformations.
- Practical – Programming exercises in animations.
- Assignments on image projections and colour models.
- Quizzes on 2D and 3D Game Object transforms.

UNITII GAMEDESIGNPRINCIPLES

Suggested Activities:
- Flipped classroom on animation.
- Practical – Creation of game script.
- External learning – Problems on game level design.
- Assignment on preparation of game level design document, detailed document.

Suggested Evaluation Methods:
- Tutorial – Script writing.
- Assignments on game proposal writing.
- Quizzes on game design document.

UNIT III GAME ENGINE DESIGN

Suggested Activities:
- Flipped classroom on rendering.
- External learning – Problems on rendering and animation.
- Practical – Implementation of simple animations in Pygame and Processing.py

Suggested Evaluation Methods:
- Tutorial – Collision detection.
- Assignments on game AI and path finding.
- Quizzes on rendering.

UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS
Pygame Game development – Unity – Unity Scripts – Mobile Gaming, Game Studio, Unity – Single player and Multi-Player games.

Suggested Activities:
- Flipped classroom on gaming environments.
- External learning – Problems on Installation of Unity and scripts.
- Practical – Pygame routines for character rendering, transformations and sound processing.

Suggested Evaluation Methods:
- Tutorial – Mobile gaming.
- Assignment on game logic.
- Quizzes of all topics related to Unity and Pygame.

UNITY GAME DEVELOPMENT USING PYGAME

Suggested Activities:
- External learning – Writing Unity scripts and assets.
- Practical – Implementation of simple games.
Suggested Evaluation Methods:
- Tutorial problems in 2D and 3D graphics Programming.
- Practical – Programming problems like asset creation.
- Quizzes on game development in Pygame.

PRACTICAL EXERCISES:
1. Implement a small avatar in Pygame/Unity.
2. Implement a canvas and colour models in Pygame/Unity.
3. Implement a Lighting and Shade model in Pygame/Unity.
4. Write a Proposal document for a Game.
5. Write a Game Level design document and detailed document.
7. Implement Pygame routines for Character rendering and transformations.
8. Implement routines for creation and playing of Sounds in Pygame.
9. Implement a simple game logic.
10. Implement a simple Tile game using Pygame/Unity.
11. Mini Project.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Have knowledge on the concepts of 2D and 3D graphics.
2. Know about Games and its genres with its origin and history.
3. Design game design documents.
4. Understand the implementation of gaming engines.
5. Survey gaming environments and frameworks.
6. Implement a simple game in Pygame.

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OBJECTIVES:
- To impart the fundamental aspects and principles of mixed reality technologies.
- To know the internals of the hardware and software components involved in the development of mixed reality enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about mixed reality application development.
- To know the technologies involved in the development of mixed reality based applications.

UNIT I
INTRODUCTION
9

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
MR COMPUTING ARCHITECTURE
9

Suggested Activities:
- Flipped classroom on basic graphics pipeline.
- External learning – Different types of Graphics architectures and workstations.
- Practical – GPU programming.

Suggested Evaluation Methods:
- Tutorial – Graphics pipelines.
- Brainstorming session on GPU architecture.
- Quizzes on graphical architectures.
- Demonstration on GPU related simple modeling and rendering programs.

UNIT III
MR MODELING
9
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 IV PROGRAMMING AND APPLICATIONS

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 V MIXED REALITY TECHNOLOGIES

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.

PRACTICAL EXERCISES:
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 camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modelling 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: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the basic concepts of Mixed reality
2. Understand the tools and technologies related to Mixed Reality
3. Know the working principle of Mixed reality related Sensor devices
4. Develop the Virtual Reality applications in different domains
5. Design of various models using modeling techniques

REFERENCES:
1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018

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OBJECTIVES:
- To understand the fundamentals of data visualization.
- To know the working principles of various information visualization tools.
- To acquire knowledge about the issues in data representation.
- To visualize the complex engineering design.
- To gain skill in designing real time interactive information visualization system.
UNIT I  INTRODUCTION

Suggested Activities:
- Blended Learning - Displaying Different types visualization images.
- Flipped classroom on task of representing information.
- External learning - Problems related to acquiring data.

Suggested Evaluation Methods:
- Tutorial - Different data visualizing images.
- Assignment on different data acquiring methods.
- Quizzes on issues and solutions in different visualization applications.

UNIT II  DATA REPRESENTATION

Suggested Activities:
- Flipped classroom on color formats.
- External learning - Survey on different human computer interaction and types of user interface.

Suggested Evaluation Methods:
- Assignment on human visual and auditory system.
- Quizzes on various color format.
- Assignment on human computer interaction user interface.

UNIT III  DATA PRESENTATION

Suggested Activities:
- Blended learning - Drawing Charts for display.
- Flipped classroom on various presentation techniques.
- External learning - Different font and font styles, symbols and Gesture representation.

Suggested Evaluation Methods:
- Assignment on chart preparation.
- Tutorial - Various presentation techniques.
- Assignment on gesture presentation.

UNIT IV  INTERACTION AND DESIGN
Suggested Activities:
- Flipped classroom on various interacting Techniques.
- External learning - Interaction facilities and high level support for animation design.

Suggested Evaluation Methods:
- Tutorial - Interaction models.
- Assignment on animation design.

UNIT V CURRENT TRENDS

Suggested Activities:
- Flipped classroom on implementation of virtual reality environment.
- Mini project for designing and implementing a innovative interfaces.

Suggested Evaluation Methods:
- Demonstration of the mini project.
- Tutorial - Virtual reality application.

PRACTICAL EXERCISES:
1. Creating Interoperable Web Visualization Components using Candela tool.
2. Implementing Line and Stacked charts with Labels and Notes using Data wrapper tool.
4. Use Myheatmap tool to View Geographic Data Interactively.
5. Visualizing TSV, CSV, DSV data using Rawgraph.
8. Visualizing Complex Historical Data using Palladio tool.
10. Implementing a Real Time Application using VTK tool as mini project.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Apply mathematics and basic science knowledge for designing information visualizing System.
2. Collect data ethically and solve engineering problem in visualizing the information.
3. Implement algorithms and techniques for interactive information visualization.
4. Conduct experiments by applying various modern visualization tool and solve the space layout problem.
5. Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams.
6. Develop a cost effective and a scale able information visualization system.

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MM5071  ADVANCED COMPUTER GRAPHICS AND ANIMATIONS  L T P C
3 0 2 4

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

UNIT I  FUNDAMENTALS

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

Suggested Evaluation Methods:
- Quiz to check the understanding of the graphics concepts (like graphics hardware, displays and standards).
- Assessing the understanding of various basic graphics algorithms through programming assessment by using vectors and matrices.
UNIT II  TRANSFORMATIONS

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

Suggested Evaluation Methods:
- Quizzes on rasterization schemes.
- Assessing the understanding of the basic elements available in the OpenGL environment through the programming structs.
- Demonstration on transformations hierarchies using matrix stack.

UNIT III  FRACTALS

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

Suggested Evaluation Methods:
- Quiz on Fractals.
- Demonstration the generation of fractals using Python and Numpy.
- 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:
- Flipped classroom on Texture Synthesis and photo realistic rendering
- Run the shader application and add the texture and shadow.
- Analyze few more shaders - Toon/Cell, Cook-Torrance, Oren-Nayar, Gradient.

Suggested Evaluation Methods:
- Quiz on advanced graphics techniques (like texture synthesis and photo realistic rendering).
- Demonstration of shader application exploring texture and shadow features.
- Discussion on bi-directional reflectance distribution function after analyzing the various shader models.
UNIT V ANIMATION

Overview of Animation Techniques – Key framing, 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:
- Exploration of various animation techniques and tools (Self Study).
- Carry out small projects like Design of small animation movies using any tools with good aesthetic sense.

Suggested Evaluation Methods:
- Discussion on various animation techniques and tools.
- Projects may be evaluated based on the theme, design, creativity, tools and aesthetic sense.

PRACTICAL EXERCISE:

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

OUTCOMES:
On completion of the course, the students will be able to:
1. Prepare for the emerging field of digital modelling and fabrication based on the competence gained.
2. Understand and apply 3d graphics algorithms related to transformations, illumination, texturing, etc. With the aid of software libraries.
3. Develop interactive applications using 3d graphics
4. Investigate and apply software libraries for 3d graphics and related software needs.
5. Understand the issues relevant to computer animation.
6. Describe and synthesise character animation techniques, including motion, changing their facial expressions and crowd behaviour.
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MM5006 MULTIMEDIA BASED E-LEARNING L T P C
3 0 2 4

OBJECTIVES:
- To learn the various multimedia E-learning approaches and Components.
- To understand the key elements of Design Thinking.
- To explore the models for multimedia E-learning E-learning courseware development.
- To learn about Multimedia E-learning Authoring tools.
- To know about Evaluation and management of Multimedia E-learning solutions.

UNIT I INTRODUCTION

Suggested Activities:
- External learning - E-learning approaches and components.
- Discussion on design thinking.

Suggested Evaluation Methods:
- Assignment on E-learning approaches and components.
- Quiz on design thinking.
UNIT II DESIGNING MULTIMEDIA E-LEARNING CONTENT/COURSE

Suggested Activities:
- Discussion forum - design models.
- External learning - E-learning instructional methods.

Suggested Evaluation Methods:
- Assignment on design models of multimedia E-learning.
- Quiz on E-Learning instructional methods.

UNIT III CREATING INTERACTIVE CONTENT

Suggested Activities:
- Discussion forum on creation of multimedia story boards.
- External learning on types of authoring tools.

Suggested Evaluation Methods:
- Assignment on multimedia story boards creation.
- Quiz on authoring tools.

UNIT IV LEARNING PLATFORMS

Suggested Activities:
- Discussion on LMS categories for multimedia E-learning.
- External learning - Functional areas E-learning.

Suggested Evaluation Methods:
- Assignment on proprietary and open source LMS.
- Quiz on LMS solutions.

UNIT V COURSE DELIVERY AND EVALUATION

Suggested Activities:
- Discussion on planning and documentation.
- External learning - Evaluation and delivery methods.

Suggested Evaluation Methods:
- Assignment on planning and documentation.
- Quiz on evaluation and delivery methods.
PRACTICAL EXERCISES:
1. Creation of Users and Schedule users Vs Courses in Moodle.
2. Preparation and Organization of Multimedia Course Contents in Moodle.
3. Aligning the course objectives, Assessments and evaluation methods of Courseware inMoodle.
4. Courseware Content generation with various Multimedia instructional formats.
5. Adding communication tools in Moodle for effective collaboration.
6. Creation of instructor led courses in Moodle.
7. Creation of self-Learning courses in Moodle.
8. Implementation of various Evaluation strategies of Courseware in Moodle.
9. Implementation of various delivery strategies in Moodle.
10. Assessing the Quality of Multimedia Courseware in Moodle.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of course, the students will be able to:
1. Distinguish the phases of activities in models of Multimedia E-learning
2. Identify appropriate Multimedia instructional methods and delivery strategies
3. Choose appropriate Multimedia E-learning Authoring tools
4. Create interactive Multimedia E-Learning courseware
5. Evaluate the Multimedia E-learning courseware
6. Manage the E-learning courseware

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OBJECTIVES:
- To make students aware of the basic principles of sound.
- To learn about sound production and hearing.
- To learn about designing sound techniques.
- To know about Studio environment.
- To know about Surround Sound.

UNIT I  PRINCIPLES OF SOUND  9

Suggested Activities:
- Flipped classroom on human speech production and voice box of human.
- External learning - Physical & psychological properties of sound, microphones and its types.
- Assignment on numerical problems in computing sound parameters.

Suggested Evaluation Methods:
- Tutorial - Sound characteristics.
- Assignments on computation of phase, amplitude and loudness of sound.
- Quizzes on sound properties.

UNIT II  LISTENING SOUND  9

Suggested Activities:
- Flipped classroom on human auditory mechanisms, stereo sound.
- External learning - Binaural and stereo recording techniques, sound effects.
- Assignment on numerical problems in stereo signals.

Suggested Evaluation Methods:
- Tutorial - Sound acoustics.
- Assignments on mono and stereo sound.
- Quizzes on human auditory mechanisms.

UNIT III  DESIGNING SOUND  9

Suggested Activities:
- Flipped classroom on perception of sound.
- External learning - MIDI formats, music synthesis.
- Assignment on numerical problems in music signals processing.
Suggested Evaluation Methods:
- Tutorial - Audio perception.
- Assignments on sound design.
- Quizzes on music processing.

UNIT IV STUDIO MANAGEMENT
9

Suggested Activities:
- Flipped classroom on sound mixing
- External learning - Studio instruments, studio layout and design

Suggested Evaluation Methods:
- Quizzes on studio equipment.
- Quizzes on studio management.

UNIT V SURROUND SOUND
9
Principles of Loudspeaker – Types of Loudspeakers – Stereo, Two–Channel Signal Formats and Microphone techniques, Binaural Recording and Dummy Head Techniques, Surround Sound – Three Channel Stereo, Four Channel Surround, 5.1 Channel Surround, and Other Multichannel Configurations. Surround Sound Systems, Matrix Surround Sound Systems, Dolby Digital, DTS, and Ambisonics.

Suggested Activities:
- Flipped classroom on loudspeakers and its types.
- External learning - Survey of cinematic sound systems, layout and design of home theater.

Suggested Evaluation Methods
- Quizzes on types of loudspeakers and microphones.
- Quizzes on surround sound.

PRACTICAL EXERCISES: 30
1. Installation of Audacity and Matlab Audio Toolbox.
2. Record Live audio with Audacity/Matlab.
3. Extract sound features using Matlab.
4. Implement programs for computer playback of audio using Audacity.
5. Convert tapes and records into digital recordings or CDs using Audacity/Matlab.
7. Use Files of AC3, M4A/M4R (AAC), WMA and other formats supported using optional libraries of Audacity/Matlab.
8. Implement Cut, copy, splice operations using Audacity.
10. Implement sound effects including change the speed or pitch of a recording in Audacity.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Have knowledge about basics of sound.
2. Know about the auditory mechanisms.
3. Know about studio management.
4. Compose a music using tools.
5. Know about studio equipments and design.
6. Know about surround sound.

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MM5008 MEDIA SECURITY L T P C
3 0 2 4

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

UNIT I CRYPTANALYSIS AND DIGITAL RIGHTS MANAGEMENT 9

Suggested Activities:
• External learning - cryptanalysis for algorithms such as AES, RSA.
• Analysis for DRM products.

Suggested Evaluation Methods:
• Group discussion on linear and differential cryptanalysis of cryptographic algorithms.
• Tutorial on DRM products.
UNIT II DIGITAL WATERMARKING BASICS


Suggested Activities:
- Problems on Error Correction Coding.
- Designing a good watermark.

Suggested Evaluation Methods:
- Assignment on ECC.
- Tutorial on DRM products.

UNIT III DIGITAL WATERMARKING SCHEMES AND PROTOCOLS


Suggested Activities:
- Implementation of buyer seller watermarking protocol.
- Analyzing the performance of different media specific WM and WM for CG models.

Suggested Evaluation Methods:
- Tutorial - Media specific watermarking techniques.
- Group discussion on the performance evaluation of watermarking techniques.

UNIT IV STEGANOGRAPHY AND STEGANALYSIS


Suggested Activities:
- An application development using Steganography.

Suggested Evaluation Methods:
- Project.

UNIT V MULTIMEDIA ENCRYPTION


Suggested Activities:
- Case study on forensic data.
- Case study on forgery detection.

Suggested Evaluation Methods:
- Group discussion on case studies.
PRACTICAL EXERCISE:
1. Implementation of Error Correction Coding.
2. Developing a cryptanalytic tool for simple ciphers
3. Implementation of Image Watermarking
4. Implementation of Video Watermarking
5. Implementation of Audio Watermarking
6. Implementation of Watermarking for Binary Images
7. Implementation of Watermarking for Binary Images
8. Implementation of Watermarking for 3D contents
9. Implementation of Steganographic Image and retrieving the hidden image from the input image.
10. Install any steganographic tool and forensic tool and explore the same. Make use of the tools to develop an application of your choice.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
1. Analyze the security algorithms required by any computing system.
2. Identify the security challenges and issues that may arise in any system.
3. Implement the concepts of steganography, digital watermarking techniques, etc.
4. Design secure applications using steganography and water marking schemes
5. Apply concepts on digital rights management while developing secure systems
6. Design any secure system by preserving the privacy.

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

Suggested Evaluation Methods
- Assignments on hashing mechanisms
- Tutorials - Indexing and access methods.
- Demonstration of the application development.

UNIT II TEXT DATABASES

Suggested Activities
- Flipped classroom on text databases.
- External learning - Comparison of other retrieval techniques for text databases and its usage.
- Practical - Application development in text databases.

Suggested Evaluation Methods
- Assignments on information retrieval techniques.
- Demonstration of the practical implementation.

UNIT III IMAGE RETRIEVAL MECHANISMS

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

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

UNIT IV AUDIO/VIDEO DATABASES

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

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

UNIT V MULTIMEDIA DATABASE DESIGN

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

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

PRACTICAL EXERCISE:
1. Design and implement insertion and deletion in B-Trees.
2. Design and implement insertion and deletion in R –Trees.
3. Design and implement insertion and deletion in TV-Trees.
4. Design and implement access methods for text.
5. Design and implement similarity based retrieval with image databases.
6. Design and implement image processing algorithms.
7. Design and implement capturing, indexing of audio content.
8. Design and implement querying content of video libraries.
9. Design and implement querying in multimedia data.
10. Real time multimedia application development.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Demonstrate the multidimensional data structures for multimedia applications
2. Apply database indexing methods for efficient storage and retrieval of multimedia content.
3. Work with Text databases, its storage and retrieval.
4. Formulate and generalize the use of audio and video databases for real time multimedia applications.
5. Demonstrate about Image database, its storage and retrieval.
6. Apply multimedia database design for multimedia architecture.

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OE5091 BUSINESS DATA ANALYTICS

OBJECTIVES:
- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.
UNIT I  OVERVIEW OF BUSINESS ANALYTICS

Suggested Activities:
- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:
- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II  ESSENTIALS OF BUSINESS ANALYTICS

Suggested Activities:
- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.

Suggested Evaluation Methods:
- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III  MODELING UNCERTAINTY AND STATISTICAL INFERENCE

Suggested Activities:
- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:
- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
- Quizzes on topics like sampling and probability.

UNIT IV  ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK
**Suggested Activities:**
- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

**Suggested Evaluation Methods:**
- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

**UNIT V OTHER DATA ANALYTICAL FRAMEWORKS**
Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

**Suggested Activities:**
- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

**Suggested Evaluation Methods:**
- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

**TOTAL: 45 PERIODS**

**OUTCOMES:**
On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

**REFERENCES:**
OBJECTIVES:
- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION

UNIT IV FAULT TRACING
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment’s like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.
UNIT V PERIODIC AND PREVENTIVE MAINTENANCE

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: Ability to summarize basics of industrial safety
CO2: Ability to describe fundamentals of maintenance engineering
CO3: Ability to explain wear and corrosion
CO4: Ability to illustrate fault tracing
CO5: Ability to identify preventive and periodic maintenance

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REFERENCES:

OE5093 OPERATIONS RESEARCH

OBJECTIVES:
- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- Solve project management problems
- Solve scheduling problems
UNIT I     LINEAR PROGRAMMING  9
Introduction to Operations Research – assumptions of linear programming Formulations of linear programming problem – Graphical method problems –

UNIT II     ADVANCES IN LINEAR PROGRAMMING  9
Solutions to LPP using simplex algorithm- Revised simplex method – primal dual relationships – Dual simplex algorithm – Sensitivity analysis

UNIT III     NETWORK ANALYSIS – I  9
Transportation problems –Northwest corner rule, least cost method, Voges’s approximation method – Assignment problem –Hungarian algorithm

UNIT IV     NETWORK ANALYSIS – II  9
Shortest path problem: Dijkstra’s algorithms, Floyds algorithm, systematic method – CPM/PERT

UNIT V     NETWORK ANALYSIS – III  9
Scheduling and sequencing – single server and multiple server models – deterministic inventory models – Probabilistic inventory control models

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: To formulate linear programming problem and solve using graphical method.
CO2: To solve LPP using simplex method
CO3: To formulate and solve transportation, assignment problems
CO4: To solve project management problems
CO5: To solve scheduling problems

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REFERENCES:
OBJECTIVES:
- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution
- Develop knowledge of costing techniques in service sector and various budgetary control techniques
- Illustrate with quantitative techniques in cost management

UNIT I  INTRODUCTION TO COSTING CONCEPTS  9
Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II  INTRODUCTION TO PROJECT MANAGEMENT  9
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III  PROJECT EXECUTION AND COSTING CONCEPTS  9
Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV  COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL  9
Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V  QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT  9
Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1 – Understand the costing concepts and their role in decision making
CO2– Understand the project management concepts and their various aspects in selection
CO3– Interpret costing concepts with project execution
CO4– Gain knowledge of costing techniques in service sector and various budgetary control techniques
CO5 – Become familiar with quantitative techniques in cost management
OBJECTIVES:

- Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I: INTRODUCTION
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II: REINFORCEMENTS
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III: MANUFACTURING OF METAL MATRIX COMPOSITES
UNIT IV MANUFACTURING OF POLYMER MATRIX COMPOSITES

UNIT V STRENGTH
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: Know the characteristics of composite materials and effect of reinforcement in composite materials.
CO2: Know the various reinforcements used in composite materials.
CO3: Understand the manufacturing processes of metal matrix composites.
CO4: Understand the manufacturing processes of polymer matrix composites.
CO5: Analyze the strength of composite materials.

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OE5096 WASTE TO ENERGY L T P C
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OBJECTIVES:
- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations
- Invent knowledge on biomass combustors and its applications on generating energy
- Summarize the principles of bio-energy systems and their features
UNIT I  INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE  9
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW –
Conversion devices – Incinerators, gasifiers, digestors

UNIT II  BIOMASS PYROLYSIS  9
Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application –
Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III  BIOMASS GASIFICATION  9
Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers –
Design, construction and operation – Gasifier burner arrangement for thermal heating –
Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in
gasifier operation.

UNIT IV  BIOMASS COMBUSTION  9
Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors,
Types, inclined grate combustors, Fluidized bed combustors, Design, construction and
operation - Operation of all the above biomass combustors.

UNIT V  BIO ENERGY  9
Properties of biogas (Calorific value and composition), Biogas plant technology and status -
Bio energy system - Design and constructional features - Biomass resources and their
classification - Biomass conversion processes - Thermo chemical conversion - Direct
combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion -
aerobic digestion - Types of biogas Plants – Applications - Alcohol production from
biomass - Bio diesel production -Urban waste to energy conversion - Biomass energy
programme in India.

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1 – Understand the various types of wastes from which energy can be generated
CO2 – Gain knowledge on biomass pyrolysis process and its applications
CO3 – Develop knowledge on various types of biomass gasifiers and their operations
CO4 – Gain knowledge on biomass combustors and its applications on generating energy
CO5 – Understand the principles of bio-energy systems and their features

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   & Sons, 1996.
AUDIT COURSES (AC)

AX5091 ENGLISH FOR RESEARCH PAPER WRITING L T P C 2 0 0 0

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

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

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REFERENCES
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

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

TOTAL : 30 PERIODS

OUTCOMES

CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches
REFERENCES
1. Goel S. L., Disaster Administration And Management Text And Case Studies”, Deep &
2. NishithaRai, Singh AK, “Disaster Management in India: Perspectives, issues and
3. Sahni, PardeepEt.Al. ”, Disaster Mitigation Experiences And Reflections”, Prentice Hall
OfIndia, New Delhi, 2001.

AX5093  Sanskrit for Technical Knowledge  L T P C
124

OBJECTIVES
• Illustrate the basic sanskrit language.
• Recognize sanskrit, the scientific language in the world.
• Appraise learning of sanskrit to improve brain functioning.
• Relate sanskrit to develop the logic in mathematics, science & other subjects
  enhancing the memory power.
• Extract huge knowledge from ancient literature.

UNIT I  ALPHABETS
Alphabets in Sanskrit

UNIT II  TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences

UNIT III  ORDER AND ROOTS
Order - Introduction of roots

UNIT IV  SANSKRIT LITERATURE
Technical information about Sanskrit Literature

UNIT V  TECHNICAL CONCEPTS OF ENGINEERING
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

OUTCOMES
CO1: Understanding basic Sanskrit language.
CO2: Write sentences.
CO3: Know the order and roots of Sanskrit.
CO4: Know about technical information about Sanskrit literature.
CO5: Understand the technical concepts of Engineering.
REFERENCES
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

AX5094 VALUE EDUCATION

OBJECTIVES
Students will be able to
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I

UNIT II

UNIT III

UNIT IV

TOTAL: 30 PERIODS
OUTCOMES
Students will be able to
- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the overall personality.

SUGGESTED READING

AX5095 CONSTITUTION OF INDIA L T P C
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OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION:
History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION:
Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES:

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.

TOTAL: 30 PERIODS
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.

AX5096 PEDAGOGY STUDIES

OBJECTIVES
Students will be able to:
- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes.
UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

OUTCOMES
Students will be able to understand:
- What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SUGGESTED READING

AX5097 STRESS MANAGEMENT BY YOGA

OBJECTIVES
- To achieve overall health of body and mind
- To overcome stress

UNIT I
Definitions of Eight parts of yoga.(Ashtanga)

UNIT II
Yam and Niyam - Do’s and Don’t’s in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 30 PERIODS
OUTCOMES
Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

SUGGESTED READING
1. “Yogic Asanas for Group Tarining-Part-I”:Janardan Swami Yoga bhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama
   (Publication Department), Kolkata

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<tr>
<th>AX5098</th>
<th>PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS</th>
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<td>L T P C</td>
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<td>OBJECTIVES</td>
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<tr>
<td>- To learn to achieve the highest goal happily</td>
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<tr>
<td>- To become a person with stable mind, pleasing personality and determination</td>
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<tr>
<td>- To awaken wisdom in students</td>
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UNIT I
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (don't's) - Verses- 71,73,75,78 (do's)

UNIT II
Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

OUTCOMES
Students will be able to
- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neet is hatakam will help in developing versatile personality of students.

SUGGESTED READING
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010