VISION AND MISSION

VISION OF THE DEPARTMENT

The Department of Computer Science and Engineering strives to create computing professionals, researchers, and entrepreneurs, with high technical knowledge, communication skills, values and ethics. It collaborates with academia, industry and community to set high standards in academic excellence and in fulfilling societal responsibilities.

MISSION OF THE DEPARTMENT

The mission of the Department of Computer Science and Engineering is to

- Provide motivated faculty and state of the art facilities for education and research, both in foundational aspects and of relevance to emerging computing trends.
- Develop knowledgeable, industry-ready students with pertinent competencies.
- Inculcate responsibility through sharing of knowledge and innovative computing solutions that benefit the society-at-large.
- Engage in collaborative research with academia and industry for seamless transfer of knowledge resulting in patentable solutions.
- Generate adequate resources for research activities from sponsored projects and consultancy.
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.E. COMPUTER SCIENCE AND ENGINEERING
(SPECIALIZATION IN BIG DATA ANALYTICS)
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES:

1. Prepare students to understand the foundational concepts in Computer Science and Engineering.
2. Enable students to integrate theory and practice for problem solving.
3. Empower students to critically analyze current trends and future issues from a system perspective at multiple levels of detail and abstraction.
4. Prepare students to critically analyze existing literature, identify the gaps and propose innovative and research oriented solutions for Big Data.
5. Enable students to pursue lifelong multidisciplinary learning as professional engineers and scientists.
6. Enable students to effectively communicate technical information, function effectively on teams, and apply computer engineering solutions within a global, societal, and environmental context by following ethical practices.

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

<table>
<thead>
<tr>
<th>PO #</th>
<th>Graduate Attribute</th>
<th>Programme Outcomes</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Research Aptitude</td>
<td>An ability to independently carry out research / investigations, identify problems and develop solutions to solve practical problems.</td>
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<tr>
<td>2.</td>
<td>Technical documentation</td>
<td>An ability to write and present a substantial technical report/ document.</td>
</tr>
<tr>
<td>3.</td>
<td>Technical competence</td>
<td>Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.</td>
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<tr>
<td>4.</td>
<td>Handle complex problems</td>
<td>Use research based knowledge, methods, appropriate techniques, resources and tools to solve complex engineering issues with an understanding of the limitations.</td>
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<tr>
<td>5.</td>
<td>Environmental Sustainability and societal Ethics</td>
<td>Ensure development of socially relevant and eco friendly indigenous products by applying technical knowledge, ethical principles and, sound engineering practices.</td>
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<tr>
<td>6.</td>
<td>Life-long learning</td>
<td>Recognize the need for independent, life-long learning and engage in the broadest context of technological change.</td>
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PROGRAM SPECIFIC OUTCOMES:
1. In-depth understanding of the concepts and intricacies of Big Data Analytics
2. Perform Critical Analysis of Big Data Applications using Special purpose tools and software
3. Consolidate ideas, develop and apply innovative solutions through research to the real world problems involving Big Data
A broad relation between the programme educational objective and the outcomes is given in the following table.

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PO1</th>
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# ANNA UNIVERSITY, CHENNAI

**UNIVERSITY DEPARTMENTS**

**M.E. COMPUTER SCIENCE AND ENGINEERING**

(SPECIALIZATION IN BIG DATA ANALYTICS)

**REGULATIONS – 2019**

**CHOICE BASED CREDIT SYSTEM**

I - IV SEMESTER CURRICULA AND SYLLABI

## SEMESTER I

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| 7.     | CP5161      | Data Structures and Algorithms Laboratory         | PCC      | 0 0 4            | 4                     | 2       |
| 8.     | BD5111      | Big Data Computing Laboratory                     | PCC      | 0 0 4            | 4                     | 2       |

**TOTAL** 16 18 25 19

* Audit Course is optional

## SEMESTER II

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|        |             | **PRACTICALS**                                    |          |                  |                       |         |
| 7.     | BD5211      | Big Data Query Languages Laboratory               | PCC      | 0 0 4            | 4                     | 2       |
| 8.     | CP5261      | Machine Learning Techniques Laboratory            | PCC      | 0 0 4            | 4                     | 2       |
| 9.     | CP5262      | Professional Practices                            | EEC      | 0 0 2            | 2                     | 1       |

**TOTAL** 17 12 27 21

* Audit Course is optional
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**TOTAL NO. OF CREDITS: 71**
OPEN ELECTIVE COURSES (OEC)
*(out of 6 courses one course must be selected)*

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AUDIT COURSES (AC)
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**PROGRAM ELECTIVES COURSE (PEC)**

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**BIG DATA ANALYTICS ELECTIVES**

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**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

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MA5153 ADVANCED MATHEMATICS FOR SCIENTIFIC COMPUTING L T P C 3 1 0 4
OBJECTIVES:
- To apply mathematical linear programming techniques to solve constrained problems.
- To appreciate the use of simulation techniques.
- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives.
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions.
- To impart knowledge of handling random vectors which represent random variables in multi-dimensional space.

UNIT I  LINEAR PROGRAMMING  12

UNIT II  SIMULATION  12
Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to real time problems.

UNIT III  ESTIMATION THEORY  12

UNIT IV  TESTING OF HYPOTHESIS  12

UNIT V  MULTIVARIATE ANALYSIS  12

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students will be able to
- Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.
- Simulate appropriate application/distribution problems.
- Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
- Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.
- Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:

CP5151  DATA STRUCTURES AND ALGORITHMS  3 0 0 3

OBJECTIVES:
• To extend the students’ knowledge of algorithms and data structures.
• To enhance their expertise in algorithmic analysis and algorithm design techniques.
• To understand various types of search and heap structures.
• To study various types of geometric, randomized and approximation algorithms.
• To extrapolate from them in order to apply those algorithms and techniques to solve problems.

UNIT I FUNDAMENTALS

UNIT II SEARCH STRUCTURES

UNIT III HEAP STRUCTURES
Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps

UNIT IV GEOMETRIC ALGORITHMS
Segment Trees – 1-Dimensional Range Searching – k-d Trees – Line Segment Intersection – Computing the Overlay of Two Subdivisions – Range Trees – Voronoi Diagram

UNIT V ADDITIONAL TOPICS

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the Course, the Student will be able to
• Analyze algorithms.
• Determine algorithm correctness.
• Choose appropriate data structures for the problems to be solved.
• Design algorithms for problems from different domains.
• Identify various research strategies on algorithmic design.

REFERENCES:
OBJECTIVES:
- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To understand the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.
- To understand how the various forms of parallelism are exploited by the architecture.

UNIT I  FUNDAMENTALS OF COMPUTER DESIGN AND ILP

UNIT II  MEMORY HIERARCHY DESIGN

UNIT III  MULTIPROCESSOR ISSUES

UNIT IV  MULTICORE ARCHITECTURES

UNIT V  VECTOR, SIMD AND GPU ARCHITECTURES

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the Course, the Student will be able to
• Identify the limitations of ILP and the need for multicore architectures.
• Discuss the issues related to multiprocessing and suggest solutions.
• Point out the salient features of different multicore architectures and how they exploit parallelism.
• Point out the various optimizations that can be performed to improve the memory hierarchy design.
• Point out the salient features of vector, GPU and domain specific architectures.

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BD5151 BIG DATA MINING AND ANALYTICS

OBJECTIVES:
• To understand the computational approaches to Modeling, Feature Extraction.
• To understand the need and application of Map Reduce.
• To understand the various search algorithms applicable to Big Data.
• To analyze and interpret streaming data.
• To learn how to handle large data sets in main memory.
• To learn the various clustering techniques applicable to Big Data.
UNIT I  DATA MINING AND LARGE SCALE FILES  9

UNIT II  SIMILAR ITEMS  9

UNIT III  MINING DATA STREAMS  9
Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows

UNIT IV  LINK ANALYSIS AND FREQUENT ITEMSETS  9

UNIT V  CLUSTERING  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the Course, the Student will be able to
- Design algorithms by employing Map Reduce technique for solving Big Data problems.
- Identify similarities using appropriate measures.
- Point out problems associated with streaming data and handle them.
- Discuss algorithms for link analysis and frequent itemset mining.
- Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

REFERENCES:
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  
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  
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III  
TECHNICALWRITING /PRESENTATION  
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)  

UNIT V  
INTELLECTUAL PROPERTY RIGHTS (IPR)  

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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CP5161 DATA STRUCTURES AND ALGORITHMS LABORATORY L T P C
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OBJECTIVES:
- To familiarize various data structure implementations.
- To implement heap and various tree structures like AVL, Red-black, B- Tree and segment trees.
- To understand efficient implementation of line segment intersection.
- To understand various search structures.
- To get understanding of problem to program mapping.

LIST OF EXPERIMENTS:
1. Binary Search Trees
2. Min/Max Heaps
3. Leftist Heaps
4. AVL Trees
5. Red-Black Trees
6. B-Trees
7. Segment Trees
8. Line segment intersection

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Achieve programming skill to convert a problem to a programming logic.
- Apply suitable data structure for the problem in hand.
- Implement heap and various tree structures like AVL, Red-black, B- Tree and segment trees.
- Understand the usage of data structures for geometric problems.
- Understand the importance of height balancing in search structures.
OBJECTIVES:
- To set up single and multi-node Hadoop Clusters.
- To solve Big Data problems using Map Reduce Technique.
- To design algorithms that uses Map Reduce Technique to apply on Unstructured and structured data.
- To learn NoSQL query.
- To learn Scalable machine learning using Mahout.

LIST OF EXERCISES:
1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. MapReduce application for word counting on Hadoop cluster
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce
5. Page Rank Computation
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Set up single and multi-node Hadoop Clusters.
- Apply Map Reduce technique for various algorithms.
- Design new algorithms that uses Map Reduce to apply on Unstructured and structured data.
- Develop Scalable machine learning algorithms for various Big data applications using Mahout.
- Represent NoSQL data.
CP5251 ADVANCED OPERATING SYSTEMS

OBJECTIVES:
- To understand the concepts of distributed systems.
- To get an insight into the various issues and solutions in distributed operating systems.
- To learn about real-time operating systems.
- To gain knowledge on the design concepts of mobile operating systems.
- To understand cloud operating systems.

UNIT I INTRODUCTION

UNIT II DISTRIBUTED OPERATING SYSTEMS

UNIT III DISTRIBUTED RESOURCE MANAGEMENT

UNIT IV REAL TIME OPERATING SYSTEMS
UNIT V MOBILE AND CLOUD OPERATING SYSTEMS


OUTCOMES:
Upon completion of the course, the students will be able to
- Identify the features of distributed operating systems.
- Demonstrate the various protocols of distributed operating systems.
- Identify the different features of real time operating systems.
- Discuss the features of mobile operating systems.
- Discuss the features of cloud operating systems.

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BD5201 BIG DATA QUERY LANGUAGES L T P C 3 0 0 3

OBJECTIVES:
- To familiarize with R Programming.
- To understand data analysis using R and HADOOP Integrated Programming Environment.
- To Understand Analytics for Big data ‘at Rest’ and Real-Time Analytical Processing for Big data ‘in Motion’.
- To understand the Pig Data model and Pig scripts.
- To learn way of Querying Big Data using Hive.
UNIT I  INTRODUCTION TO R PROGRAMMING

UNIT II DATA ANALYSIS USING R AND HADOOP

UNIT III ANALYTICS FOR BIG DATA STREAMS

UNIT IV PROGRAMMING WITH PIG

UNIT V PROGRAMMING WITH HIVE

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Design applications using R, HADOOP.
- Design applications using RHADOOP& RHIPE.
- Develop analytic applications for data Streams.
- Develop Pig scripts for Big data applications.
- Design Big data applications schema and use HIVE QL.

REFERENCES:
OBJECTIVES:

- To understand the concepts of Machine Learning.
- To appreciate supervised learning and their applications.
- To appreciate the concepts and algorithms of unsupervised learning.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of advanced learning.

UNIT I  INTRODUCTION

UNIT II  SUPERVISED LEARNING

UNIT III  UNSUPERVISED LEARNING
UNIT IV PROBABILISTIC GRAPHICAL MODELS

UNIT V ADVANCED LEARNING

TOTAL : 45+30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Design a learning model appropriate to the application.
- Design a Neural Network for an application of your choice.
- Implement Probabilistic Discriminative and Generative algorithms for an application of your choice and analyze the results.
- Use a tool to implement typical Clustering algorithms for different types of applications.
- Design and implement an HMM for a Sequence Model type of application.
- Identify applications suitable for different types of Machine Learning with suitable justification.

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OBJECTIVES:
- To understand the basic programming constructs of R and understand the use of R in Big Data analytics.
- To solve Big data problems using Map Reduce Technique in R, HADOOP.
- To develop Pig scripts for analyzing large un-structured and semi-structured data.
- To develop program for Query processing using Hive.
- To perform analytics on Big data streams using Hadoop Streaming API.
- To learn to work on Sqoop.

LIST OF EXPERIMENTS:
1. Perform descriptive and predictive analytics using “R programming”
2. MapReduce application for word counting on R HADOOP after successful installation of three R packages (rhdfs, rmr, and rhbase)
3. Understand data pipeline using Pig Interactive Shell Commands after successful “Pig” installation
4. Develop Pig Scripts and call UDF’s to accomplish functionalities to meet the problem objectives
5. Embedding PIG Latin in Python
6. Log analysis using “Pig” on semi structured data
7. Perform query processing on data warehousing after successful installation of “Hive”
8. Perform adhoc query on HDFS data using Hive Query Language (HQL)
9. Accomplish MapReduce Job by using Hadoop Streaming API
10. Perform various HDFS commands
11. Loading data into HDFS using Sqoop

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Set up R packages and develop a program using R Programming constructs.
- Solve Big Data problems using RHADOOP.
- Understand setting up of Pig and solve Big Data problems.
- Understand setting up of Hive and perform query processing.
- Apply Hadoop Streaming API for Big Data problems.
- Apply Sqoop for data loading into HDFS.

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OBJECTIVES:
- To apply the concepts of Machine Learning to solve real-world problems
- To implement basic algorithms in clustering & classification applied to text & numeric data
- To implement algorithms emphasizing the importance of bagging & boosting in classification & regression
- To implement algorithms related to dimensionality reduction
- To apply machine learning algorithms for Natural Language Processing applications

EXERCISES RECOMMENDED
1. Solving Regression & Classification using Decision Trees
2. Root Node Attribute Selection for Decision Trees using Information Gain
3. Bayesian Inference in Gene Expression Analysis
4. Pattern Recognition Application using Bayesian Inference
5. Bagging in Classification
6. Bagging, Boosting applications using Regression Trees
7. Data & Text Classification using Neural Networks
8. Using Weka tool for SVM classification for chosen domain application
9. Data & Text Clustering using K-means algorithm
10. Data & Text Clustering using Gaussian Mixture Models
11. Dimensionality Reduction Algorithms in Image Processing applications
12. Application of CRFs in Natural Language Processing

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- To learn to use Weka tool for implementing machine learning algorithms related to numeric data
- To learn the application of machine learning algorithms for text data
- To use dimensionality reduction algorithms for image processing applications
- To apply CRFs in text processing applications
- To use fundamental and advanced neural network algorithms for solving real-world data
CP5262 PROFESSIONAL PRACTICES

OBJECTIVES:
- To facilitate analysis, design and problem solving skills.
- To have a thorough domain knowledge.
- To understand the best Industry practices by reading case studies.
- To kindle innovative and professional thinking.
- To explore possible alternative solutions.
- To estimate feasibility, cost, risk and ROI.

SESSIONS BASED ON:
Identify an Application/Projects (may be of social relevance) – Understand Customer Requirements – Analyze and Understand Customers and Stakeholders – Value Additions – Innovations and Research Component – Preparing Plan / SRS Document Indicating Feasibility, Cost, Risk, ROI and Related Design – Suggest Implementation Methodology – Perform Risk Assessment and Management

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify and formulate the problem
- Describe the background of the problem.
- Assess the needs of stakeholders.
- Make estimates like cost, risk, ROI etc., to justify the business opportunity.
- Describe the industry standards and procedures.
- Predict the business opportunity.
- Suggest system implications.

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Attested
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
OBJECTIVES:
- To comprehend the underlying principles of Relational Database Management System.
- To develop database models using parallel and distributed databases.
- To understand the concepts of XML and Web databases.
- To appprehend the design and implementation of active temporal and deductive databases.
- To develop applications based on NoSQL database.

UNIT I  RELATIONAL MODEL  9+6

UNIT II PARALLEL AND DISTRIBUTED DATABASES  9+6

UNIT III XML AND WEB DATABASES  9+6

UNIT IV ACTIVE TEMPORAL AND DEDUCTIVE DATABASES  9+6

UNIT V NoSQL DATABASES  9+6
NoSQL database vs traditional RDBMS database – Migrating from RDBMS to NoSQL– CRUD operations – Querying NoSQL stores – Indexing and Ordering Datasets –MongoDB-Database creation and Querying– Web Application development using MongoDB

TOTAL : 45+30:75 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Design and implement relational databases.
- Design and implement parallel and distributed databases.
- Design and implement XML databases, Active, Temporal and Deductive databases.
- Implement the concept of database connectivity with the applications.
- Design and implement No SQL database.

REFERENCES:
2. Han, Jiawei, Jian Pei, and MichelineKamber. Data mining: Concepts and Techniques. 2011.
OBJECTIVES:
- To understand the concept of cloud and utility computing.
- To understand the various issues in cloud computing.
- To familiarize themselves with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To be able to set up a private cloud.

UNIT I  INTRODUCTION  9+6

UNIT II  VIRTUALIZATION  9+6
Data Center Technology – Virtualization – Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing – Pros and Cons of Virtualization – Implementation Levels of Virtualization – Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V, KVM, Virtual Box

UNIT III  CLOUD COMPUTING MECHANISM  9+6
UNIT IV  HADOOP AND MAP REDUCE  9+6
Apache Hadoop – HadoopMap Reduce –Hadoop Distributed File System- Hadoop I/O-
Developing a MapReduce Application – MapReduce Types and Formats – MapReduce Features– Hadoop Cluster Setup –Administering Hadoop.

UNIT V  SECURITY IN THE CLOUD  9+6

TOTAL: 45 +30 : 75 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Identify the architecture, infrastructure and delivery models of cloud computing.
- Explain the core issues of cloud computing such as security, privacy and interoperability.
- Choose the appropriate technologies, algorithms and approaches for the related issues.
- Facilitate Service Level Agreements (SLA).

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OBJECTIVES:
- To learn about the importance of information security.
- To learn different scanning and enumeration methodologies and tools.
- To understand various hacking techniques and attacks.
- To be exposed to programming languages for security professionals.
- To understand the different phases in penetration testing.

UNIT I INTRODUCTION TO HACKING

UNIT II SCANNING AND ENUMERATION

UNIT III SYSTEM HACKING

UNIT IV PROGRAMMING FOR SECURITY PROFESSIONALS

UNIT V PENETRATION TESTING

TOTAL: 45+30:75 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify threats to computers.
- Defend hacking attacks.
- Protect data assets.
- Defend a computer against a variety of security attacks using various tools.
- Practice and use safe techniques on the World Wide Web.

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CP5079 DIGITAL IMAGE AND VIDEO PROCESSING L T P C 3 0 2 4

OBJECTIVES:
- To understand broad range of image processing techniques and their applications.
- To learn about video processing techniques and understand the video content.
- To appreciate various techniques used for acquisition, preprocessing, enhancement and analysis of Image and Video data.
- To appreciate the use of image & video processing in current technologies.
- To expose the students to real-world applications and case studies of the image & video processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9+6

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9+6

UNIT III IMAGE SEGMENTATION AND MORPHOLOGY 9+6

UNIT IV BASICS OF VIDEO PROCESSING 9+6
Introduction – Video Sampling and Interpolation- Motion Detection and Estimation – Video Enhancement and Restoration
UNIT V 
VIDEO SEGMENTATION, TRACKING & APPLICATIONS  
9+6


TOTAL: 45+30:75 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.
- Critically analyze the role of video in modern technologies.
- Implement basic image and video processing algorithms.
- Design and develop various applications that incorporates different techniques of Image and Video processing.
- Apply and explore new techniques in the areas of Image and video Processing.

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OBJECTIVES:
- To understand the mathematical foundations of security principles.
- To appreciate the different aspects of encryption techniques.
- To understand various attacks present over encryption and authentications techniques.
- To understand the role played by authentication in security.
- To appreciate the current trends of security practices.

UNIT I  CLASSICAL ENCRYPTION AND BLOCKCIPHERS  9+6

UNIT II  PSEUDO-RANDOM FUNCTIONS AND SYMMETRIC ENCRYPTION  9+6

UNIT III  HASH FUNCTIONS AND MESSAGE AUTHENTICATION  9+6

UNIT IV  NUMBER THEORY AND ASYMMETRIC ENCRYPTION  9+6

UNIT V  SECURITY PRACTICES AND ADVANCED TOPICS  9+6

OUTCOMES:
Upon completion of the course, the students will be able to
- Demonstrate the various classical encryption techniques and the adversary capabilities.
- Apply computational secrecy and semantic security to find out the probability of how strong are the security schemes.
- Illustrate the various MAC and HASH functions and apply the Birthday attack over Hash.
- Apply number theory in public key encryption techniques.
- Analyze the application of cryptography for secure E-Commerce and other secret transactions.

REFERENCES:
OBJECTIVES:
- To understand the different architectures for IoT.
- To learn various protocols at the different layers for IoT.
- To develop prototype systems using Arduino / Raspberry Pi.
- To apply the use of data analytics in IoT.
- To develop applications of IoT in Industrial contexts.

UNIT I  ARCHITECTURES AND MODELS  9+6

UNIT II  CONNECTIVITY  9+6

UNIT III  SYSTEM DEVELOPMENT  9+6
Design Methodology – Case study – Basic blocks of IoT device – Raspberry Pi – Board, Interfaces, Linux, Setting up, Programming – Arduino – Other IoT Devices.

UNIT IV  DATA ANALYTICS AND IoT SECURITY  9+6

UNIT V  IoT IN INDUSTRY  9+6

TOTAL : 45+30:75 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to
- Explain the underlying architectures and models in IoT.
- Analyse different connectivity technologies for IoT.
- Develop simple applications using Arduino / Raspberry Pi.
- Apply data analytics techniques to IoT.
- Study the needs and suggest appropriate solutions for Industrial applications.

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IF5076 DEEP LEARNING L T P C
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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  
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  

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  
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

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.

REFERENCES:
OBJECTIVES:

- Understand the design principles and interaction.
- To explore the detailed design practices, standards.
- To gain an insight into Content Management System for content design.
- To use any Content Management System tool for better content management.
- To get familiarized with Web Analytics for better management.

UNIT I  PRINCIPLES OF WEB DESIGN  9+6

UNIT II  ELEMENTS OF PAGE DESIGN  9+6

UNIT III  WEB CONTENT DESIGN  9+6

UNIT IV  WEB CONTENT MANAGEMENT  9+6
UNIT V  WEB ANALYTICS

OUTCOMES:
Upon completion of the course, the student will be able to
• Design web pages that follow standards and are usable.
• Design web sites that are appealing.
• To be able to appreciate the usage of Content management System for designing web Content.
• To take advantage of Content Management System tools for managing content for large web sites.
• To be able to use analytics tools for better management.

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OBJECTIVES:
- To learn the fundamentals of semantic web and to conceptualize and depict Ontology for semantic web.
- To understand the languages for semantic web.
- To learn about the ontology learning algorithms and to utilize in the development of an application.
- To know the fundamental concepts of ontology management.
- To learn the applications related to semantic web.

UNIT I  THE QUEST FOR SEMANTICS 9

Suggested Activities:
- Flipped classroom on semantic web background and tutorial activity in class.
- Brainstorming session on various knowledge representation formats in class.

Suggested Evaluation Methods:
- Tutorial – Semantic web basics.
- Quizzes on knowledge representation formats.

UNIT II  LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 9

Suggested Activities:
- Flipped classroom on comparison of various semantic web related languages and tutorial activity in class.

Suggested Evaluation Methods:
- Quizzes on various ontology related languages.

UNIT III  ONTOLOGY LEARNING FOR SEMANTIC WEB 9

Suggested Activities:
- Flipped classroom on natural language processing techniques like statistical text analysis, term extraction, Word sense disambiguation, concept extraction and tutorial activity in class.
- External reading – https://nlp.stanford.edu/fsnlp/

Suggested Evaluation Methods
- Tutorials – Language processing techniques.
UNIT IV  ONTOLOGY MANAGEMENT AND TOOLS

Suggested Activities:
• Flipped classroom on study of various ontology related tools.

Suggested Evaluation Methods
• Tutorials – Ontology related tools like Protege, Ontolingua, Webonto.

UNIT V  APPLICATIONS

Suggested Activities:
• Flipped classroom on other applications of semantic web.

Suggested Evaluation Methods
• Quizzes on semantic web applications.

PRACTICAL EXERCISES:
1. Design of simple ontology on their domain of interest using Protege like tool.
2. Create RDF document using PHP library EasyRdf.
3. Use OWL language to represent relationships, properties and to provide inferences from created ontology.
4. Term extraction and Term disambiguation from corpus using Alchemy like API.
5. Use of any tool to apply SAPRQL queries and implement reasoning for avoiding inconsistencies.
7. Development of Simple application like chat bot, semantic search engine creation using Topic map data models extracted from Ontopia/Mappa.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Create ontology for a given domain.
2. Develop an application using ontology languages and tools.
3. Understand the concepts of semantic Web.
4. Use ontology related tools and technologies for application creation.
5. Design and develop applications using semantic web.
6. Understand the standards related to semantic web.

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IF5088 MOBILE APPLICATION DEVELOPMENT L T P C 3 0 2 4

OBJECTIVES:
- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile application.
- To understand the design issues in the development of mobile applications.
- To understand the development procedures for mobile application.
- To develop mobile applications using various tools and platforms.


Suggested Activities:
- Flipped classroom on survey on mobile application models.
- External learning – mobile application design using frameworks and tools.

Suggested Evaluation Methods:
- Quiz – questionnaire related to mobile application models.
- Assignment – evaluate using learning content management system like Moodle.

UNIT II USER INTERFACE Generic UI development – Designing the right UI – Multimodal and Multichannel UI – Gesture based UI – Screen Elements and Layouts – Voice XML.
Suggested Activities:
- Flipped classroom on discussion on UI for mobile application like voice and gestures.
- External learning – survey on different view elements for mobile application.

Suggested Evaluation Methods:
- Quiz – questionnaire related to user interface design for mobile applications.
- Assignment – evaluate using learning content management system like Moodle.

UNIT III APPLICATION DESIGN
9

Suggested Activities:
- Flipped classroom on discussion on memory constraints for mobile application design.
- External learning – survey on resource management and concurrent operations.

Suggested Evaluation Methods:
- Quiz – questionnaire related to memory constraints in design for mobile applications.
- Assignment – evaluate using learning content management system like Moodle.

UNIT IV APPLICATION DEVELOPMENT I
9

Suggested Activities:
- Simple Android application development like user account creation.
- Android application accessing the mobile database to view user data.

Suggested Evaluation Methods:
- Evaluation based on the demonstrated application functionality using emulators.

UNIT V APPLICATION DEVELOPMENT II
9

Suggested Activities:
- Application accessing Internet for communication like web application.
- Android application accessing GPS for location based service.

Suggested Evaluation Methods:
- Evaluation based on the demonstrated application functionality using emulators.

PRACTICAL EXERCISES: 30
1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Write an application that makes use of internet for communication (mobile web app).
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock.

TOTAL: 75 PERIODS
OUTCOMES:
On completion of the course, the students will be able to:
1. Design the right user interface for mobile application.
2. Implement mobile application using UI toolkits and frameworks.
3. Design a mobile application that is aware of the resource constraints of mobile devices.
4. Develop web based mobile application that accesses internet and location data.
5. Implement android application to use telephony for SMS communication.
6. Implement android application with multimedia support.

REFERENCES:

CP5075 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES L T P C 3 0 0 3

OBJECTIVES:
• To study the basic concepts of cryptocurrencies and blockchains.
• To explain the details of Bitcoin and its different components.
• To study the basics Hyperledger and Web3.
• To analyse the position of Web 3 and Hyperledger with different aspects of blockchain technologies.
• To differentiate between alternate blockchains and their advantages in application areas.
• To understand the Ethereum development environment and the application development process.

UNIT I INTRODUCTION 9

UNIT II BITCOIN 9

UNIT III WEB3 AND HYPERLEDGER 9

UNIT IV ALTERNATIVE BLOCKCHAINS AND APPLICATIONS 9

UNIT V ETHEREUM 9
Setting up Ethereum development tools – Solidity language. – Ethereum accounts, key pairs, working with Externally Owned Accounts (EOA), contract accounts – Smart contracts, structure, setting up and interaction, examples – Decentralised applications, implementation, case studies – Whisper protocol – Swarm architecture and concepts.

TOTAL : 45 PERIODS
OUTCOMES:
On completion of the course, the students should be able to:
- Explain cryptocurrencies and their relationship with blockchain technology.
- Explain the different steps in the use of Bitcoins.
- Relate Web 3 and Hyperledger to concepts in blockchain technologies.
- Apply blockchains to different real-life problems.
- Implement a simple application using Ethereum.

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SE5071 MULTIMEDIA SYSTEMS AND APPLICATIONS L T P C 3 0 2 4

OBJECTIVES:
- To enrich student learning in multimedia systems basics.
- To train the students to acquire knowledge in multimedia tools and authoring.
- To acquire knowledge about multimedia data compression techniques.
- To acquire knowledge in the area of multimedia communication systems.
- To know about popular multimedia application areas.

UNIT I MULTIMEDIA ELEMENTS 9+6
UNIT II MULTIMEDIA TOOLS and AUTHORING 9+6

UNIT III MULTIMEDIA COMPRESSION 9+6

UNIT IV MULTIMEDIA COMMUNICATION SYSTEMS 9+6

UNIT V MULTIMEDIA APPLICATIONS 9+6
Applications for WWW.Multimedia databases – Indexing and Retrieval, Visualization, Virtual, Augmented and Mixed Reality, Interactive E-learning, HCI and UX design, Games and Animation, Real-Time video conferencing.

TOTAL: 75 PERIODS

PRACTICAL EXERCISES:
1. Editing various images (Image restoration, Changing colour image to Grey scale and vice versa) and adding special effects to images using tools like Photoshop, Gimp and flash
2. Creating and Editing various video clippings and adding special effects using tools like Adobe Premier Pro
3. Creating and Editing various audio files and adding special effects using tools like Sound Forge and Audacity
4. Creating three dimensional models and animations using tools like Blender, 3DS Max, Unity
5. Working on Text compression algorithms like Run length and Huffman
6. Implementation of transformations like DCT and FFT
7. Designing User Interfaces and developing simple games using multimedia tools
8. Creating simple multimedia applications using any popular Authoring tools
9. Mini Project (4 Periods)

OUTCOMES:
On Completion of the course, the students should be able to:
• Handle the multimedia elements effectively
• Use Multimedia Hardware and Software for Editing and Authoring
• Use Compression algorithms for various multimedia applications
• Develop effective strategies to deliver Quality-of-Experience in networked Multimedia applications
• Design and develop multimedia applications in various domains

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SE5076 SOFTWARE TESTING AND QUALITY ASSURANCE  

OBJECTIVES:
The student should be able to
- Know what is software and the usage of different types of softwares.
- Know the Quality Metrics of various Softwares.
- Know the methodologies used in developing software.
- Test the product finally to check the product Quality.

UNIT I INTRODUCTION  

UNIT II TESTING METHODOLOGIES  

UNIT III TEST STRATEGIES  

UNIT IV TEST AUTOMATION AND MANAGEMENT  

[Signature]
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
UNIT V  SQA IN PROJECT MANAGEMENT  9+6

TOTAL: 45+30:75 PERIODS

OUTCOMES
Upon completion of the course, the student will be able to
- Develop Quality plans and use SQA components in project life cycle.
- Analyze the product Quality.
- Judge the use of infrastructure components and use configuration items for Quality control.
- Use various testing methods and verify.
- Assess Quality standards of various software products.

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CP5082  INFORMATION RETRIEVAL TECHNIQUES  L T P C
3 0 0 3

OBJECTIVES:
- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search.
- To learn measuring effectiveness and efficiency of information retrieval techniques.
- To get used to performing Parallel Information Retrieval.
- To understand the concepts of digital libraries.
UNIT I INTRODUCTION

UNIT II RETRIEVAL MODELING

UNIT III INDEXING

UNIT IV EVALUATION AND PARALLEL INFORMATION RETRIEVAL

UNIT V SEARCHING THE WEB

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Build an Information Retrieval system using the available tools
- Identify and design the various components of an Information Retrieval system
- Measure effectiveness and efficiency of information retrieval techniques
- Use parallel Information Retrieval approaches in real world problems
- Design an efficient search engine and analyze the Web content structure

REFERENCES:
OBJECTIVES:
- To gain knowledge about the current web development and emergence of social web.
- To study about the modeling, aggregating and knowledge representation of semantic web.
- To appreciate the use of machine learning approaches for web content mining.
- To learn about the extraction and mining tools for social networks.
- To gain knowledge on web personalization and web visualization of social networks.

UNIT I  CLUSTERING AND CLASSIFICATION  9+6

UNIT II  SOCIAL MEDIA MINING  9+6

UNIT III  EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS  9+6
UNIT IV  HUMAN BEHAVIOR ANALYSIS AND PRIVACY ISSUES  9+6

UNIT V  VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS  9+6

TOTAL : 45+30 : 75 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Apply knowledge of current web development in the era of social web.
- Model, aggregate and represent knowledge for semantic web.
- Use machine learning approaches for web content mining.
- Design extraction and mining tools for social networks.
- Develop personalized web sites and visualization for social networks.

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OBJECTIVES:
- To learn parallel algorithms development techniques for shared memory and DCM models.
- To study the main classes of fundamental parallel algorithms.
- Learn to design efficient parallel algorithms.
- To study the complexity and correctness models for parallel algorithms.
- To understand parallel solutions for bitwise computation.

UNIT I INTRODUCTION

UNIT II SORTING & SEARCHING
Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW – Searching a sorted sequence – Searching a random sequence – Bitonic Sort

UNIT III ALGEBRAIC PROBLEMS
Permutations and Combinations – Matrix Transpositions – Matrix by Matrix multiplications – Matrix by vector multiplication.

UNIT IV GRAPH & GEOMETRY
Connectivity Matrix – Connected Components – All Pair Shortest Paths – Minimum Spanning Trees – Point Inclusion – Intersection, Proximity and Construction Problems

UNIT V OPTIMIZATION & BIT COMPUTATIONS
Prefix Sums – Job Sequencing – Knapsack - Adding two integers – Adding n integers – Multiplying two integers – Selection

OUTCOMES:
Upon completion of the course, the students will be able to
- Understand the difference between sequential and parallel algorithms.
- Design parallel algorithms in various models of parallel computation.
- Apply a suitable model for developing a parallel algorithm.
- Know the basic issues associated with implementing parallel algorithms.
- Understand the differences among several algorithms used for solving the same problem and recognize which one is better under different conditions.

REFERENCES:
### OBJECTIVES:
- To understand the nature of threats and cyber security management goals and technology
- To understand the landscape of hacking and perimeter defense mechanisms
- To develop strategies for cyber security and protecting critical infrastructure
- To understand policies to mitigate cyber risks
- To understand the IT Act, scheme, amendments and emerging cyber law and desired cyber ecosystem capabilities

### UNIT I  OVERVIEW OF CYBER SECURITY

### UNIT II  ATTACKS AND COUNTERMEASURES

### UNIT III  STRATEGIES FOR CYBER SECURITY
UNIT IV  POLICIES TO MITIGATE CYBER RISK

UNIT V  CRITICAL INFORMATION INFRASTRUCTURE PROTECTION

TOTAL: 45 PERIODS

OUTCOMES:
- Gain knowledge on the nature of threats and cyber security management goals and framework
- Knowledge on the landscape of hacking and perimeter defense mechanisms
- Ability to differentiate and integrate strategies for cyber security and protecting critical infrastructure
- Able to understand policies to mitigate cyber risks
- Knowledge on IT Act, and amendments, copy rights, IPR and cyber law to deal with offenses.

REFERENCES:
9. CGI, ―Cyber security in Modern Critical Infrastructure Environments, 2014.
OBJECTIVES:
- To learn the key aspects of Soft computing and Neural networks.
- To study the fuzzy logic components.
- To gain insight onto neuro fuzzy modeling and control.
- To know about the components and building block hypothesis of genetic algorithm.
- To gain knowledge in machine learning through neural networks.

UNIT I INTRODUCTION TO SOFT COMPUTING
Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS

UNIT III NEURAL NETWORKS

UNIT IV FUZZY LOGIC

UNIT V NEURO-FUZZY MODELING

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to
- Differentiate Conventional AI and Computational Intelligence.
- Discuss on machine learning through neural networks.
- Apply knowledge in developing a Fuzzy expert system.
- Model Neuro Fuzzy system for clustering and classification.
- Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.

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CP5088 USER INTERFACE DESIGN

OBJECTIVES:
- To determine the necessity of user interaction by understanding usability engineering and user modeling.
- To learn the methodologies for designing interactive systems.
- To investigate the core and complex design issues for interaction.
- To examine the evaluation methodologies of design.
- To understand design issues for web and mobile platforms.
UNIT I  INTRODUCTION  
Context of Interaction – Ergonomics - Designing Interactive systems – Understanding Users-cognition and cognitive frame works, User Centred approaches - Usability, Universal Usability, Understanding and conceptualizing interaction, Guidelines, Principles and Theories

UNIT II  INTERACTION DESIGN  

UNIT III  DESIGN AND EVALUATION  

UNIT IV  MODELS AND THEORIES  
Cognitive Models, Socio-Organizational Issues And Stake Holder Requirements, Communication And Collaboration Modelstask Analysis, Dialog Notations and Design, Models of the System, Modeling Rich Interaction, Ubiquitous Computing

UNIT V  DESIGNING INTERACTIONS FOR WEB AND MOBILE PLATFORMS  

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Understand the basics of human computer interactions via usability engineering and cognitive modeling.
- Understand the basic design paradigms, complex interaction styles.
- Understand the fundamental design issues.
- Examine the evaluation of interaction designs and implementations.
- Use models and theories for user interaction.
- Use above concepts for above concepts for web and mobile applications.

REFERENCES:
OBJECTIVES:
- Learn different definitions of software quality.
- Know different notions of defects and classify them.
- Understand the basic techniques of data collection and how to apply them.
- Learn software metrics that define relevant metrics in a rigorous way.
- Gain confidence in ultra-high reliability.

UNIT I  INTRODUCTION
Automated Testing – Background on software testing – Automated test life cycle methodology (ATLM) – Test Maturity Model – Test Automation Development – Overcoming false expectations of automated testing – benefits – Test tool proposal

UNIT II  TEST FRAMEWORK AND AUTOMATION
Automated Test Tool Evaluation and Selection – Organisation’s system engineering environment – tools that support the testing life cycle – Test Tool Research – Hands-on Tool evaluation - Test process analysis – Test tool consideration – Selecting the test automation approach - Test team management – Organization Structure of a Test Team – Test Program Tasks – Test Effort Sizing

UNIT III  TEST PLANNING AND DESIGN

UNIT IV  TESTING THE APPLICATIONS
UNIT V  CASE STUDIES
Test automation and agile project management – database automation – test automation in cloud
– Mainframe and Framework automation – Model based test case generation – Model based
testing of Android applications

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Perform some simple statistical analysis relevant to software measurement data.
- Classify defects on identification and work on them.
- Use data collection techniques aptly.
- Use software metrics for relevant measures in a rigorous way.
- Use from practical examples both the benefits and limitations of software metrics for quality
control and assurance.

REFERENCES:
1. Elfriede Dustin, Jeff Rashka, "Automated software testing: Introduction, Management and
2. C. Titus Brown, Gheorghe Gheorghiu, Jason Huggins, "An Introduction to Testing Web
3. Dorothy Graham, Mark Fewster, "Experiences of Test Automation: Case Studies of
5. Kanglin Li, Mengqi Wu, "Effective Software Test Automation: Developing an Automated

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OBJECTIVES:

- To understand the representation and processing of Morphology and Part-of-Speech Taggers.
- To appreciate various techniques used for speech synthesis and recognition.
- To understand different aspects of natural language syntax and the various methods used for processing syntax and disambiguating word senses.
- To appreciate the various representations of semantics and discourse.
- To know about various applications of natural language processing.

UNIT I  MORPHOLOGY AND PART-OF SPEECH PROCESSING  9+6  

UNIT II  SPEECH PROCESSING  9+6  

UNIT III  SYNTAX ANALYSIS  9+6  

UNIT IV  SEMANTIC AND PRAGMATIC INTERPRETATION  9+6  

UNIT V  APPLICATIONS  9+6  

TOTAL: 45+30=75 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to
• Identify the different linguistic components of given sentences.
• Design a morphological analyser for a language of your choice using finite state automata concepts.
• Implement the Earley algorithm for a language of your choice by providing suitable grammar and words.
• Use a machine learning algorithm for word sense disambiguation.
• Build a tagger to semantically tag words using WordNet.
• Design a business application that uses different aspects of language processing.

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BD5002 LINKED OPEN DATA AND ITS APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:
• To understand the computational aspects of creation, storage & retrieval of Linked Open Data (LOD).
• To understand the need of RDF & SPARQL in querying LOD.
• To understand the publishing & consumption of LOD in WWW.
• To design recommendation systems applicable to LOD.
• To learn how to handle large scale machine learning for LOD.
UNIT I  INTRODUCTION

UNIT II  RDF & SPARQL
RDF database systems–RDF and Semantic Web – Encoding, storage, indexing – Query processing – reasoning– SPARQL– Improving Linked Data quality

UNIT III  PUBLISHING & CONSUMING LINKED OPEN DATA

UNIT IV  RECOMMENDATION SYSTEMS
Recommendation systems: A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction

UNIT V  LARGE SCALE MACHINE LEARNING
Mining social network graphs – Social Networks as Graphs, Clustering of Social-Network Graphs, Discovery of Communities, Partitioning of Graphs, Overlapping Communities, Simrank, Counting Triangles, Large scale machine learning– Machine-Learning Model, Perceptrons, SVM, Learning from Nearest Neighbours

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
• Create, Store & Retrieve LOD.
• Design methodologies for publishing & consuming LOD.
• Use RDF & SPARQL to query LOD.
• Design recommendation algorithms based on LOD.
• Design algorithms for handling LOD using large scale machine learning.

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OBJECTIVES:
- To understand the basics of the various database systems including databases for Big data.
- To learn about the architecture of data intensive computing.
- To learn about parallel processing for data intensive computing.
- To learn about Security in Data Intensive Computing Systems.
- To learn about the applications that involve Data intensive computing.

UNIT I INTRODUCTION
Introduction to Distributed systems – Databases Vs. File Systems - Distributed file systems (HDFS) – Distributed Machine-Learning System - Data Parallelism – Characteristics - Hadoop – Execution Engines - Map Reduce - Distributed Storage System for Structured Data – NoSQL databases - Casandra, Mongo DB - Developing a Distributed Application

UNIT II ARCHITECTURES AND SYSTEMS

UNIT III TECHNOLOGIES AND TECHNIQUES

UNIT IV SECURITY
Security in Data Intensive Computing Systems - Data Security and Privacy in Data-Intensive Supercomputing Clusters - Information Security in Large Scale Distributed Systems - Privacy and Security Requirements of Data Intensive Applications in Clouds

UNIT V APPLICATIONS AND FUTURE TRENDS

OUTCOMES:
Upon completion of the course, the students will be able to
- Design applications that involve data intensive computing.
- Suggest appropriate architecture for data intensive computing systems.
- Decide on the appropriate techniques of Map Reduce, Mongo DB, for the different Applications.
- Identify parallel processing techniques for data intensive computing.
- Decide on the various security techniques that are necessary for data intensive applications.

REFERENCES:
OBJECTIVES:
- To learn the basics of Cognitive Science with focus on acquisition, representation and use of knowledge by individual minds, brains, and machines.
- To study the mind and intelligence, embracing psychology, artificial intelligence, neuroscience and linguistics.
- To understand the role of neuro-science in the cognitive field.
- To learn about computational models for semantic processing.
- To appreciate the role of reasoning in cognitive processing.

UNIT I  INTRODUCTION TO COGNITIVE SCIENCE

UNIT II  COGNITIVE PSYCHOLOGY

UNIT III  COGNITIVE NEUROSCIENCE
Brain and Cognition Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology- Computational Neuroscience - The Organization of the mind - Organization of Cognitive systems - Strategies for Brain mapping – A Case study: Exploring mindreading

UNIT IV  LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODELS
OUTCOMES:
Upon completion of the course, the students will be able to
- Explain and analyse the methods of knowledge representation in cognitive processing.
- Be proficient in designing cognitive architectures.
- Understand the connection between brain and cognition.
- Apply neural network models to cognition.
- Apply reasoning & decision making to design dynamic systems.

REFERENCES:
OBJECTIVES:

- To understand how to accurately represent voluminous complex data set in web and from other data sources.
- To understand the methodologies used to visualize large data sets.
- To understand the various process involved in data visualization.
- To get used to with using interactive data visualization.
- To understand the different security aspects involved in data visualization.

UNIT I INTRODUCTION

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools.

UNIT II VISUALIZING DATA METHODS

Mapping - Time series - Connections and correlations – Indicator-Area chart-Pivot table- Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods-Hierarchies and Recursion - Networks and Graphs-Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs- Info graphics

UNIT III VISUALIZING DATA PROCESS

Acquiring data, - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder ,Asynchronous Image Downloads, Advanced Web Techniques, Using a Database, Dealing with a Large Number of Files. Parsing data - Levels of Effort, Tools for Gathering Clues, Text Is Best, Text Markup Languages, Regular Expressions (regexps), Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.

UNIT IV INTERACTIVE DATA VISUALIZATION


UNIT V SECURITY DATA VISUALIZATION

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization - Attacking and defending visualization systems – Creating security visualization system.

OUTCOMES:

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

- Understand the representation of complex and voluminous data.
- Design and use various methodologies present in data visualization.
- Understand the various process and tools used for data visualization.
- Use interactive data visualization to make inferences.
- Discuss the process involved and security issues present in data visualization.

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**OBJECTIVES:**
- Introduce the students with data stream models and to present the use cases of stream processing.
- Present algorithmic techniques for stream processing including random sampling, graph sketches, and merge-and-reduce.
- Present current techniques on monitoring distributed data streams.
- Provide practical perspective on analysing data stream systems.
- Show their application to problems such as subgraph counting, graph connectivity, random sampling from graphs, graph matchings, etc.

**UNIT I**

**INTRODUCTION TO DATA STREAMS**

Data stream models - basic streaming methods - applications. Change detection - maintaining histograms from data streams

**UNIT II**

**STREAM MINING ALGORITHMS**

Evaluating streaming algorithms - learning from data streams - evaluation issues - open issues. Clustering from data streams - clustering examples - clustering variables. Frequent pattern mining - frequent Itemset mining - heavy hitters - mining frequent item set from data streams - sequence pattern mining.

**UNIT III**

**CLASSIFICATION METHODS IN DATA STREAMS**

Decision trees from data streams - very fast decision tree algorithm (VFDT) - extensions - OLIN: info-fuzzy algorithms. Novelty detection in data streams - learning and novelty - novelty detection as a one-class classification problem - learning new concepts - the online novelty and drift detection algorithms

**UNIT IV**

**ANALYSIS OF STREAM DATA**

Multi-dimensional analysis of data - architecture for on-line analysis of data streams - stream data cube computation. Load shedding in data stream systems - load shedding for aggregation queries - load shedding in aurora - load shedding for sliding window joins - load shedding for classification queries
Synopsis construction in data streams - sampling methods - wavelets – sketches – histograms. Join processing in data streams - indexing and querying data streams - dimensionality reduction and forecasting on streams - distributed mining of data streams

OUTCOMES:
Upon completion of the course, the students will be able to
- Understand the applicability and utility of different machine learning algorithms.
- Describe and apply current research trends in data-stream processing.
- Analyze the suitability of stream mining algorithms for data stream systems.
- Program and build stream processing systems, services and applications.
- Solve problems in real-world applications that process data streams.

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BD5006 BIG DATA ACQUISITION L T P C 3 0 0 3

OBJECTIVES:
- To understand the complexity and volume of Big Data and their challenges.
- To analyse the various methods of data collection.
- To comprehend the necessity for pre-processing Big Data and their issues.
- To understand predictive analytics and descriptive analytics.
- To understand and implement Big Data Analytics with data convergence and Business Maturity Model.
UNIT I  INTRODUCTION TO BIG DATA ACQUISITION  6
Big Data framework - fundamental concepts of Big Data management and analytics - Current challenges and trends in Big Data Acquisition.

UNIT II  DATA COLLECTION AND TRANSMISSION  9

UNIT III  DATA PRE-PROCESSING  9
Data pre-processing overview-Sampling - Missing Values - Outlier Detection and Treatment - Standardizing Data - Categorization - Weights of Evidence Coding - Variable Selection and Segmentation.

UNIT IV  DATA ANALYTICS  12

UNIT V  BIG DATA PRIVACY AND APPLICATIONS  9
Data Masking – Privately Identified Information (PII) -Privacy preservation in Big Data- Popular Big Data Techniques and tools- Map Reduce paradigm and the Hadoop system – Applications- Social Media Analytics- Recommender Systems- Fraud Detection.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Identify the various sources of Big Data.
- Apply several key big data technologies used for storage, analysis and manipulation of data.
- Design new algorithms for collecting Big Data from various sources.
- Design algorithms for pre-processing Big Data other than the traditional approaches.
- Design methodologies to extract data from structured and un-structured data for analytics.

REFERENCES:
OBJECTIVES:
- To understand the basic issues and types of text mining.
- To appreciate the different aspects of text categorization and clustering.
- To understand the role played by text mining in Information retrieval and extraction.
- To appreciate the use of probabilistic models for text mining.
- To appreciate the current trends in text mining.

UNIT I INTRODUCTION
Overview of text mining - definition - general architecture - algorithms - core operations - Pre-processing - types of problems - basics of document classification - information retrieval - clustering and organizing documents - information extraction - prediction and evaluation-textual information to numerical vectors -collecting documents - document standardization - tokenization-lemmatization-vector generation for prediction - sentence boundary determination - evaluation performance

UNIT II TEXT CATEGORIZATION AND CLUSTERING

UNIT III TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION EXTRACTION
Information retrieval and text mining - keyword search - nearest-neighbor methods - similarity - web-based document search - matching - inverted lists - evaluation. information extraction - architecture - co-reference - named entity and relation extraction - template filling and database construction - applications. inductive - unsupervised algorithms for information extraction - text summarization techniques - topic representation - influence of context - indicator representations - pattern extraction - Apriori algorithm - FP tree algorithm

UNIT IV PROBABILISTIC MODELS

UNIT V RECENT TRENDS
Visualization approaches - architectural considerations - visualization techniques in link analysis - example - mining text streams - text mining in multimedia - text analytics in social media - opinion mining and sentiment analysis - document sentiment classification - opinion lexicon expansion - aspect-based sentiment analysis - opinion spam detection – text mining applications and case studies

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify the different features that can be mined from text and web documents.
- Use available open source classification and clustering tools on some standard text data sets.
- Modify existing classification/clustering algorithms in terms of functionality or features used.
Design a system that uses text mining to improve the functions of an existing open source search engine.

Implement a text mining system that can be used for an application of your choice.

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BD5008 BIG DATA SECURITY LT P C 3 0 0 3

OBJECTIVES:
- To understand the mathematical foundations of security principles.
- To appreciate the different aspects of encryption techniques.
- To understand the role played by authentication in security.
- To understand the security concerns of big data.
- To appreciate applications of security analytics.

UNIT I SYMMETRIC TECHNIQUES
UNIT II  ASYMMETRIC TECHNIQUES

UNIT III  MESSAGE AUTHENTICATION

UNIT IV  INTRODUCTION TO SECURITY ANALYTICS

UNIT V  APPLICATIONS OF SECURITY ANALYTICS

OUTCOMES:
Upon completion of the course, the students will be able to
• To use cryptographic security algorithms to secure big data in transmissions and storage
• To design algorithms in a secure manner for Big data applications
• To use available security practices in big-data computation.
• To use big-data analytics principles to build security applications.
• To detect security threats and vulnerabilities using security analytics

TOTAL: 45 PERIODS

REFERENCES:
SE5073

SENTIMENT ANALYSIS

OBJECTIVES:
- To understand the need for sentiment analysis.
- To explore the various methodologies involved in text sentiment classification.
- To learn the fusion of Natural Language processing with sentiment analysis.
- To explore available sentiment summarization methods.
- To learn the various tools used for sentiment analysis.

UNIT I

INTRODUCTION
Need for Sentiment Analysis - Problem of Sentiment Analysis - Subjectivity – Stance – Words to Discourse – Pragmatics – Natural Language Processing issues – Opinion Definition – Sentiment analysis Tasks – Opinion Summarization – Types of opinion – Subjectivity and emotion – Author and Reader Standpoint

UNIT II

DOCUMENT SENTIMENT CLASSIFICATION
Sentiment Classification Using Supervised Learning – Unsupervised Learning – Rating Prediction – Cross-Domain Sentiment Classification – Cross-Language Sentiment Classification – Sentence Subjectivity and Classification – Subjectivity Classification – Sentence Sentiment Classification – Conditional Sentences - Sarcastic Sentences – Cross-Language Subjectivity and Sentiment Classification – Discourse Information for Sentiment Classification

UNIT III

ASPECT BASED SENTIMENT ANALYSIS

Attested

DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
UNIT IV
OPINION SUMMARIZATION

UNIT V
TOOLS FOR SENTIMENT ANALYSIS

OUTCOMES:
Upon completion of the course, the students will be able to
- Apply the various algorithms to perform opinion mining and classification.
- Learn various supervised and unsupervised machine learning methods for sentiment analysis.
- Generate sentiment lexicons by applying NLP techniques.
- Solve problems on opinion summarization.
- Learn to use tools for sentiment analysis.

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TOTAL : 45 PERIODS
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
9

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
9
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.
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OE5092 INDUSTRIAL SAFETY

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 9
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 9
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 9

UNIT IV FAULT TRACING 9
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 9
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

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

TOTAL: 45 PERIODS

REFERENCES:
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 problems - Formulations of linear programming problem – Graphical method

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

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

TOTAL: 45 PERIODS

REFERENCES:
OE5094  COST MANAGEMENT OF ENGINEERING PROJECTS          L T P C
                                     3 0 0 3

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

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2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988

OE5095 COMPOSITE MATERIALS L T P C 3 0 0 3

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

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
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

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

UNIT III BIOMASS GASIFICATION
UNIT IV   BIOMASS COMBUSTION

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

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 - anaerobic 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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AUDIT COURSES (AC)

AX5091   ENGLISH FOR RESEARCH PAPER WRITING

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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AX5092 DISASTER MANAGEMENT

OBJECTIVES
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches
UNIT I INTRODUCTION 6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

UNIT III DISASTER PRONE AREAS IN INDIA 6
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

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

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REFERENCES
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 6
Alphabets in Sanskrit

UNIT II TENSES AND SENTENCES 6
Past/Present/Future Tense - Simple Sentences

UNIT III ORDER AND ROOTS 6
Order - Introduction of roots

UNIT IV SANSKRIT LITERATURE 6
Technical information about Sanskrit Literature

UNIT V TECHNICAL CONCEPTS OF ENGINEERING 6
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.

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1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Pratham Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
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
2 0 0 0

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.

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 L T P C 2 0 0 0

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

AX5098
PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

OBJECTIVES
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

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 (dont’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

TOTAL: 30 PERIODS

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