**SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI**  
**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**  
**Postgraduate Programme**  
**Scheme of Instruction for Choice Based Credit System**  
*(With effect from 2018 – 2019 admitted batch)*  
Total credits (2 year course): 68

**SEMESTER I**

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Instruction Hours/Week : 32(P)    Credits : 16
Sessional Marks : 50            End Semester Examinations Marks : 50
SEMESTER I

MAPC01  
Mathematical Foundation of Computer Science

Instruction Hours/Week : 3(L)  
Sessional Marks : 40  
End Semester Examinations Marks : 60  
Credits : 3

Unit I  
Probability mass, density, and cumulative distribution functions, Parametric families of  
distributions, Expected value, variance, conditional expectation, Applications of the univariate  
and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains

Unit II  
Random samples, sampling distributions of estimators, Methods of Moments and Maximum  
Likelihood,

Unit III  
Statistical inference, Introduction to multivariate statistical models: regression and classification  
problems, principal components analysis, The problem of overfitting model assessment.

Unit IV  
Graph Theory: Isomorphism, Planar graphs, graph colouring, hamilton circuits and euler cycles.

Unit V  
Permutations and Combinations with and without repetition. Specialized techniques to solve  
combinatorial enumeration problems

References:

2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science  
Applications. Wiley.
3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and  
Probabilistic Analysis.
4. Alan Tucker, Applied Combinatorics, Wiley

Course Outcomes

• To understand the basic notions of discrete and continuous probability.
To understand the methods of statistical inference, and the role that sampling distributions play in those methods.

To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

**COPC02**

**Advanced Data Structures**

Instruction Hours/Week: 3(L)  
Credits: 3  
Sessional Marks: 40  
End Semester Examinations Marks: 60

**Unit I**
- **Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
- **Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

**Unit II**
- **Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

**Unit III**
- **Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

**Unit IV**

**Unit V**
- **Computational Geometry:** One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

**References:**

Curse Outcomes

- Understand the implementation of symbol table using hashing techniques.
- Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
- Develop algorithms for text processing applications.
- Identify suitable data structures and develop algorithms for computational geometry problems.

COPE11

Machine learning

Instruction Hours/Week : 3(L)  
Credits : 3
Sessional Marks : 40  
End Semester Examinations Marks : 60

Unit I
Supervised Learning (Regression/Classification)
Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes
Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit II
Unsupervised Learning
Clustering: K-means/Kernel K-means
Dimensionality Reduction: PCA and kernel PCA
Matrix Factorization and Matrix Completion
Generative Models (mixture models and latent factor models)

Unit III
Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Unit IV
Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning Scalable Machine Learning (Online and Distributed Learning)
A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference
Unit IV
Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

References
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
   Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

Course Outcomes
- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- To mathematically analyse various machine learning approaches and paradigms

COPE12

Introduction to Intelligent Systems

Instruction Hours/Week : 3(L)
Credits : 3
Sessional Marks : 40
End Semester Examinations Marks : 60

Unit I

Unit II
Biological foundations to intelligent systems II: Fuzzy logic, knowledge representation and inference mechanism, genetic algorithm, and fuzzy neural networks.

Unit III

Unit IV
Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual
graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.

**Unit V**
Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning. Recent trends in Fuzzy logic, Knowledge Representation

**References:**


**Corse Outcomes**
- Able to Demonstrate knowledge of the fundamental principles of intelligent systems and would be able to analyse and compare the relative merits of a variety of AI problem solving techniques.

**COPE21**

**Distributed Database Systems**

Instruction Hours/Week : 3(L) Credits : 3  
Sessional Marks : 40 End Semester Examinations Marks : 60

**Unit I**
Introduction: Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts Distributed Database Systems Architecture: Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

**Unit II**
Distributed Database Design: Alternative design strategies; Distributed design issues; Fragmentation; Data allocation  
Semantics Data Control: View management; Data security; Semantic Integrity Control  
Query Processing Issues: Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data
Unit III
Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms
Transaction Management: The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models
Concurrency Control: Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management

Unit IV
Reliability: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols
Parallel Database Systems: Parallel architectures; parallel query processing and optimization; load balancing

Unit V
Advanced Topics;
Mobile Databases, Distributed Object Management, Multi-databases

References

Course Outcomes

• Design trends in distributed systems.

• Apply network virtualization.

• Apply remote method invocation and objects.
COPE22

Data Science

Instruction Hours/Week : 3(L)  Credits : 3
Sessional Marks : 40  End Semester Examinations Marks : 60

Unit-I
Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Unit-II
Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources

Unit-III
Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

Unit-IV
Data visualisation: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit-V
Applications of Data Science, Technologies for visualisation, Bokeh (Python)
Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

References:

Course Outcomes

- Explain how data is collected, managed and stored for data science;
- Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;
- Implement data collection and management scripts using MongoDB
PGPC 01

Research Methodology and IPR

Instruction Hours/week : 2(L)  
Credits : 2
Sessional Marks : 40  
Semester-end Examination : 60

UNIT I
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
Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT III
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

UNIT V
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

Course Outcomes:
• understand research problem formulation.
• analyze research related information
• follow research ethics
• understand that today’s world is controlled by Computer, Information Technology, but
tomorrow world will be ruled by ideas, concept, and creativity.
• understand that when IPR would take such important place in growth of individuals &
nation, it is needless to emphasis the need of information about Intellectual Property
Right
• to be promoted among students in general & engineering in particular.
• 6.understand that IPR protection provides an incentive to inventors for further research
work and
• investment in R & D, which leads to creation of new and better products, and in turn
brings about, economic growth and social benefits.

PGPA11

ENGLISH FOR RESEARCH PAPER WRITING

Instruction Hours/week : 2(L)                          Credits : 2
Sessional Marks : 100                                      Semester-end Examination : -

UNIT I
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs
and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing
and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT II
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT III
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

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

References :

12

Course outcomes

- understand how to improve writing skills and level of readability
- learn about what to write in each section
- understand the skills needed when writing a Title

PGPA12

DISASTER MANAGEMENT

Instruction Hours/week : 2(L) Credits : 2
Sessional Marks : 100 Semester-end Examination : -

UNIT I

Introduction
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; natural and Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II

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

UNIT III

Disaster Preparedness And Management Preparedness
Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT IV

Risk Assessment Disaster Risk

UNIT V
Disaster Mitigation Meaning
Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

References:
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.

Course outcomes

- demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop the standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

PGPA 13
SANSKRIT FOR TECHNICAL KNOWLEDGE

Instruction Hours/week : 2(L) Credits : 2
Sessional Marks : 100 Semester-end Examination : -

UNIT I
Alphabets in Sanskrit, Past/Present/Future Tense

UNIT II
Simple Sentences Order

UNIT III
Introduction of roots
UNIT IV
Technical information about Sanskrit Literature

UNIT V
Technical concepts of Engineering—Electrical, Mechanical, Architecture, Mathematics

References:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbhastri, Rashtriya Samskrit Sansthanam, New Delhi Publication

Course Outcomes:
At the end of the course, students will be able to
1. understand basic Sanskrit language
2. understand the Ancient Sanskrit literature about science & technology
3. help to develop logic, being a logical language

PGPA14
VALUE EDUCATION

Instruction Hours/week : 2(L)  Credits : 2
Sessional Marks : 100  Semester-end Examination : -

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

References:


Course outcomes:

At the end of the course, students will be able to
1. acquire the knowledge of self-development
2. learn the importance of Human values
3. develop the overall personality

COCP01

Core-I Lab

Advanced Dats Structures Lab

Instruction Hours/Week : 4(P) Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

The concepts of Core courses should be practiced using Java/Python
Hashing functions
Boyer-Moore Algorithm
Knuth-Morris-Pratt Algorithm
Huffman Coding Algorithm
One Dimensional Range Searching
Two Dimensional Range Searching
Lab Outcomes
Hashing functions
Boyer-Moore Algorithm
Knuth-Morris-Pratt Algorithm
Huffman Coding Algorithm
One Dimensional Range Searching
Two Dimensional Range Searching

COEP01

Elective-I Lab (Based on Elective):

Instruction Hours/Week : 4(P) Credits : 2
The concepts of Elective courses should be practiced using Java/Python

**Machine Learning Lab**
1. Implement Nearest-Neighbours
2. Implement Naive Bayes Linear models
3. Implement K-means/Kernel K-means
4. Implement Bayesian Learning
5. Implement IOT applications

**Lab Outcomes**
On successful completion of this course the students will be able to learn
- Nearest-Neighbours
- Naive Bayes Linear models
- K-means/Kernel K-means
- Bayesian Learning
- IOT applications

**Intelligent Systems Lab**
1. Implement Neural network
2. Implement genetic algorithm
3. Implement fuzzy neural networks
4. Implement frames
5. Implement scripts,
6. Implement statistical learning

**Course Outcomes**
On successful completion of this course the students will be able to learn
1. genetic algorithm
2. fuzzy neural networks
3. frames
4. scripts,
5. statistical learning

**Distributed Database Systems Lab**
1. Implement View management
2. Implement Data security
3. Implement Semantic Integrity
4. Implement Distributed query optimization algorithms
5. Implement Operations transaction management
6. Implement Distributed query processing
7. Implement parallel query processing

**Course Outcomes**
On successful completion of this course the students will be able to learn
- View management
- Data security
- Semantic Integrity
- Distributed query optimization algorithms
- Operations transaction management
- Distributed query processing
- parallel query processing

**Data Science Lab**
1. Implement Data storage in Oracle/XML
2. Implement data visualization
3. Implement Basic machine learning algorithms
4. Implement various data collection and analysis techniques
5. Implement visualization techniques

**Course Outcomes**
On successful completion of this course the students will be able to learn
- Data storage in Oracle/XML
- data visualization
- Basic machine learning algorithms
- in various data collection and analysis techniques
- visualization techniques
SEMESTER II

COPC03

Advanced Algorithms

Instruction Hours/Week : 3(L)                               Credits : 3
Sessional Marks : 40                                      End Semester Examinations Marks : 60

Unit I
Sorting: Review of various sorting algorithms, topological sorting
Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's),
depth-first search and computation of strongly connected components, emphasis on correctness
proof of the algorithm and time/space analysis, example of amortized analysis.

Unit II
Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal
independent set. Application to MST.
Graph Matching: Algorithm to compute maximum matching. Characterization of maximum
matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Unit III
Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum
flow, Edmond-Karp maximum-flow algorithm.
Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm,
inverse of a triangular matrix, relation between the time complexities of basic matrix
operations, LUP-decomposition

Unit IV
Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming
paradigm. More examples of dynamic programming.
Modulo Representation of integers/polynomials: Chinese Theorem, Conversion between
base-representation and modulo-representation Extension to polynomials. Application: Interpolation problem

Unit V
Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier
Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm
Linear Programming: Geometry of the feasibility region and Simplex algorithm NP-
completeness: Examples, proof of NP-hardness and NP-completeness.

References
1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft,
   Ullman."Algorithm Design" by Kleinberg and Tardos
Course Outcomes

- Analyze the complexity/performance of different algorithms.
- Determine the appropriate data structure for solving a particular set of problems.
- Categorize the different problems in various classes according to their complexity.

COPC04

Soft Computing

Instruction Hours/Week : 3(L)  
Credits : 3
Sessional Marks : 40  
End Semester Examinations Marks : 60

Unit I

Unit II

Unit II
NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural Networks

Unit IV
GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition

Unit V
Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

References


3. MATLAB Toolkit Manual

Course Outcomes

- Identify and describe soft computing techniques and their roles in building intelligent machines
- Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
- Apply genetic algorithms to combinatorial optimization problems.
- Evaluate and compare solutions by various soft computing approaches for a given problem

COPE31

Data Preparation and Analysis/Big Data Analysis

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I
Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues

Unit II
Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Unit III
Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit IV
Visualization: Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity

Unit V
Regression and correlation analysis
Course Outcomes

- Able to extract the data for performing the Analysis.

COPE32

**Computer Vision**

Instruction Hours/Week: 3(L)  
Credits: 3

Sessional Marks: 40  
End Semester Examinations Marks: 60

**Unit I**
Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis

**Unit II**
Edge detection, Edge detection performance, Hough transform, corner detection

**Unit III**
Segmentation, Morphological filtering, Fourier transform

**Unit IV**
Feature extraction, shape, histogram, color, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data pre-Processing

**Unit V**
Pattern Analysis:
Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

References:

Course Outcomes

- Developed the practical skills necessary to build computer vision applications.
- To have gained exposure to object and scene recognition and categorization from images.

COPE41

GPU Computing

<table>
<thead>
<tr>
<th>Instruction Hours/Week</th>
<th>Credits</th>
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Sessional Marks: 40
End Semester Examinations Marks: 60

Unit I
Introduction: History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL / OpenACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wavefronts, Thread blocks / Workgroups, Streaming multiprocessors, 1D / 2D / 3D thread mapping, Device properties, Simple Programs

Unit II
Memory: Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories

Unit III
Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU Functions: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.

Unit IV
Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects

Unit V
Case Studies: Image Processing, Graph algorithms, Simulations, Deep Learning
Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU
processing, Peer access, Heterogeneous processing

References:

2. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN: 978-0124159334)

Course Outcomes
- Students would learn concepts in parallel programming, implementation of programs on GPUs, debugging and profiling parallel programs.

COPE42

Digital Forensics

Instruction Hours/Week : 3(L) Credit: 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Unit II
Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seize electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Unit III
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Unit IV
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Unit V

References:


Course Outcomes

- Computer forensics and digital detective and various processes, policies and procedures
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics

PGPA 21

CONSTITUTION OF INDIA

Instruction Hours/week : 2(L)                                                                                    Credits : 2
Sessional Marks : 100                                                                                    Semester-end Examination : -

UNIT I

History and philosophy of the Indian Constitution
History -Drafting Committee, (Composition & Working) - Preamble - Salient Features

UNIT II


UNIT III

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 IV
Local Administration:

UNIT V

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

References:
1. The Constitution of India, 1950 (Bare Act), Government Publication.

Course Outcomes:
- the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 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.

PGPA 22

PEDAGOGY STUDIES

Instruction Hours/week : 2(L) Credits : 2
Sessional Marks : 100 Semester-end Examination : -

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: 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.

References:


Course Outcomes:
• the pedagogical practices being used by teachers in formal and informal classrooms in developing countries.
• the evidence on the effectiveness of these pedagogical practices
• learns how teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

PGPA 23

STRESS MANAGEMENT BY YOGA

Instruction Hours/week : 2(L) Credits : 2
Sessional Marks : 100 Semester-end Examination : -

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

UNIT II
Yam - Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT III
Niyam - Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT IV
Asan - Various yog poses and their benefits for mind & body

UNIT V
Pranayam - Regularization of breathing techniques and its effects-Types of pranayam

References:
1. ‘Yogic Asanas for Group Tarining-Part-I’ :Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Course Outcomes:
• develop healthy mind in a healthy body thus improving social health also
• improve efficiency
PGPA 24

PERSONALITY DEVELOPMENT THROUGH LIFE  ENLIGHTENMENT SKILLS

Instruction Hours/week : 2(L)  
Sessional Marks : 100  
Credits : 2  
Semester-end Examination : -

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)

UNIT II
Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT III
Approach to day to day work and duties.
Shrimad BhagwadGeeta : 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 IV
Statements of basic knowledge.
Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 - Chapter 12- Verses 13, 14, 15, 16,17, 18

UNIT V
Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17 - Chapter 3-Verses
36,37,42 Chapter 4 - Verses 18, 38,39 - Chapter18 – Verses 37,38,63.

References :

Course Outcomes :
- develop personality and achieve the highest goal in life
- lead the nation and mankind to peace and prosperity
- help in developing versatile personality.
COCP02

**Core-II Lab** (Based on Core)
: Advanced Algorithms/ Soft Computing Lab

Instruction Hours/Week : 4(P)  
Credits : 2

Sessional Marks : 40  
End Semester Examinations Marks : 60

The concepts of Core courses should be practiced using Java/Python

1. BFS travel salesman problem
2. DFS travel salesman problem
3. Ford-Fulkerson Method
4. Strassen's algorithm
5. Dijkasra's
6. Floyd-Warshall algorithm
7. NP-Complete problems

**Lab Outcomes**

On successful completion of this course the students will be able to learn

- BFS travel salesman problem
- DFS travel salesman problem
- Ford-Fulkerson Method
- Strassen's algorithm
- Dijkasra's
- Floyd-Warshall algorithm
- NP-Complete problems

COEP02

**Elective-II Lab** (Based on Elective)

Instruction Hours/Week : 4(L)  
Credits : 2

Sessional Marks : 40  
End Semester Examinations Marks : 60

The concepts of Elective courses should be practiced using Java/Python

**Data Preparation and Analysis Lab**

1. Implement Data Gathering and storing
2. Implement Data formats, parsing using Python
3. Implement Heterogeneous and missing data
4. Implement Regression analysis
5. Implement correlation analysis
6. Implement Visualization
Lab Outcomes
On successful completion of this course the students will be able to learn
- Data Gathering and storing
- Data formats, parsing using Python
- Heterogeneous and missing data
- Regression analysis
- Correlation analysis
- Visualization

Computer Vision Lab
1. Implement Image formation and sensing
2. Implement Image analysis
3. Implement Edge detection
4. Implement Corner detection
5. Implement Segmentation
6. Implement Feature extraction
7. Implement Feature analysis

Lab Outcomes
On successful completion of this course the students will be able to learn
- Image formation and sensing
- Image analysis
- Edge detection
- Corner detection
- Segmentation
- Feature extraction
- Feature analysis

GPU Computing Lab
1. Implement Threads
2. Implement Simulation of dynamic allocation
3. Implement Synchronization
4. Implement Asynchronization
5. Implement Graph algorithms

Lab Outcomes
On successful completion of this course the students will be able to learn
- Threads
- Simulation of dynamic allocation
- Syncronization
- Asyncrinization
- Graph algorithms

Digital Forensics Lab
1. Implement methods to search
2. Implement investigative process, analysis
3. Implement criminal investigation.
4. Implement forensic analysis
5. Use open-source security tools
6. Use mobile forensics tools

**Lab Outcomes**
On successful completion of this course the students will be able to learn

- methods to search
- investigative process, analysis
- criminal investigation.
- forensic analysis
- open-source security tools
- mobile forensics tools

**COMP 01**

**Mini Project**

Instruction Hours/Week : 6(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

The object of mini Project is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.
SEMESTER III

COPE51 Compilers for HPC

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I
High Performance Systems, Structure of a Compiler, Programming Language Features, Languages for High Performance.

Unit-II

Unit-III

Unit-IV

Unit-V
Message-Passing Machines: SIMD Machines, MIMD Machines, Data Layout, Parallel Code for Array Assignment, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics.

Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.

References:
1. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson

Course Outcomes
• Familiar with the structure of compiler.
● Parallel loops, data dependency and exception handling and debugging in compiler.

COPE52

Optimization Techniques

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I
Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

Unit II
General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Unit II

Unit IV
Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.

Unit V
Real life Problems and their mathematical formulation as standard programming problems.

References

2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.
3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.


Course Outcomes

- Formulate optimization problems.
- Understand and apply the concept of optimality criteria for various types of optimization problems.
- Solve various constrained and unconstrained problems in single variable as well as multivariable.
- Apply the methods of optimization in real life situation

PGOE 11  
Business Analytics

Instruction Hours/week : 3(L)  
Sessional Marks : 40  
Credits : 3  
Semester-end Examination : 60

UNIT I  

UNIT II  

UNIT III  
Organization Structures of Business analytics, Team management, Management Issues, designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear optimization.
UNIT IV

UNIT V

References:
2. Business Analytics by James Evans, persons Education.

Course outcomes:

- the knowledge of data analytics.
- the ability of think critically in making decisions based on data and deep analytics.
- the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- the ability to translate data into clear, actionable insights.

PGOE 12
Industrial Safety
Instruction Hours/week : 3(L) Credits : 3
Sessional Marks : 40 Semester-end Examination : 60

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

UNIT II
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.
Unit-III

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

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

References:

Course outcomes:

- understand the preventive steps for industrial safety
- apply the corrosion prevention methods
- find the causes and tracking of faults in machine tools and equipment
- understand the periodic and preventive maintenance of mechanical and electrical equipment

PGOE 13
 Operations Research

Instruction Hours/week : 3(L) Credits : 3
Sessional Marks : 40 Semester-end Examination : 60
UNIT I
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT II
Formulation of a LPP - Graphical solution revised simplex method- duality theory - dual Simplex method - sensitivity analysis - parametric programming

UNIT III
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT IV
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V
Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:


Course Outcomes:

- apply the dynamic programming to solve problems of discreet and continuous variables.
- apply the concept of non-linear programming
- carry out sensitivity analysis
- model the real world problem and simulate it.

PGOE 14
Cost Management of Engineering Projects

Instruction Hours/week : 3(L)                          Credits : 3
Sessional Marks : 40                                        Semester-end Examination : 60

UNIT I

UNIT II
Project: meaning, Different types, why to manage, cost overruns centers, 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.

UNIT III

UNIT IV

UNIT V

References:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Course outcomes:

- understand the cost concepts in decision - making
- commission, execute and manage Engineering projects
- apply the quality management techniques in the execution of projects
- apply the quantitative techniques for cost management of projects
PGOE 15

Composite Materials

Instruction Hours/week : 3(L)  Credits : 3
Sessional Marks : 40  Semester-end Examination : 60

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

UNIT – III

UNIT – IV

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.

References:


Course outcomes:

- demonstrate the characteristics of composite materials and composite performance
- understand the use of fibres as reinforcement
- understand the manufacturing process of metal and polymer matrix composites
- demonstrate the failure criteria

PGOE 16

Energy Generation from Wastes

Instruction Hours/week : 3(L)  
Sessional Marks : 40  
Semester-end Examination : 60

UNIT I
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II

UNIT III

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
Biogas: 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.

References:


Course outcomes:

- demonstrate the energy generation from wastes
- understand the biomass pyrolysis and gasification
- design, construct and operate biomass combustors
- develop bio-energy system

COMP 01

Major Project: Phase – I Dissertation

Instruction Hours/Week: 20(P) Credits: 10
Marks: 100

The object of Major Project Phase I Dissertation Work & Dissertation is to enable the student to extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student in R&D work and technical leadership. The assignment to normally include:

- In depth study of the topic assigned in the light of the Report prepared;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee.
SEMESTER IV

COPD 02

Major Project : Phase –II Dissertation

Instruction Hours/Week : 32(P)          Credits : 16
Marks : 100

The object of Major Project Work Phase II & Dissertation is to enable the student to extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student in R&D work and technical leadership. The assignment to normally include:

- In-depth study of the topic assigned in the light of the Report prepared;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee.