SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Sri Venkateswara University

M.Tech

SCHEME AND SYBLLUS

About The Department

The Department of Computer Science and Engineering was established in 1986 offering B.Tech Program with initial intake of 20. Now the B.Tech (CSE) intake is increased to 40. The new programme 6 Year B.Tech & M.Tech Dual Degree course was introduced in 2015 . The Department offers the Self –Finance course B.Tech(CSE) and B.Tech (Artificial Intelligence) Programme was introduced in 2021.

The post graduate program i.e. M.Tech (CSE) was started in the year 2005 with initial intake of 18 and now it is increased to 25. The MTech students, qualified in GATE receive Rs 8000 fellowship per month from AICTE. The Ph.D admissions in CSE started in the year 2002 and there are nearly 34 scholars are working for their doctoral degree. The thrust areas of research of the department are Natural Language Processing, Distributed Systems, Grid Computing, Artificial Intelligence, Software Architecture, Data Mining, Wireless Networks and Speech Processing.

Department vision and mission

Vision

To become a centre of excellence in Computer Science and Engineering by imparting high quality teaching, training and research.

Mission

- The Department of Computer Science and Engineering is established to provide undergraduate and graduate education in the field of Computer Science and Engineering
- To Create Knowledge of advanced concepts, innovative technologies and develop research aptitude for contributing to the needs of industry and society.
- Develop professional and soft skills for improved knowledge and employability of students.
- Encourage students to engage in life-long learning to create awareness of the contemporary developments in Computer Science and Engineering to become outstanding professional.
- Develop attitude for ethical and social responsibilities in professional practice at regional, National and International levels.

Program Outcomes:

1. Gain advanced knowledge in theoretical computer science, algorithms, computer software, hardware and networking.
2. Analyze computer based software and hardware problems and identifying solutions.
3. Develop solutions to problems related to computer hardware and software systems to meet the needs of society and industry.
4. Develop skills for research, and innovation in the area of computer hardware and software
5. Ability to use modern software tools and technologies for designing simple to complex applications in real world.
6. Ability to work in multidisciplinary groups, for decision making and self-management
7. Apply knowledge of management principles to effectively contribute in project teams within social and economical constraints.
8. Develop effective professional and business communication.
9. Attitude for independent and continuous learning for improved knowledge and professional competence.
10. Follow ethical practices in professional career and societal contributions
11. Able to continuously self-reflect own actions for improvement.

PEOS

1. Graduates will undertake advanced research studies in the areas of Computer Networks, Database systems, Data Mining, software engineering and Multidisciplinary topics
2. Graduates will be proficient and successful in professional careers in academia, software development, and research organizations
3. Graduates will demonstrate effective communication and leadership skills in professional practice with ethical code, gain knowledge of contemporary and global issues and strive for continuous learning

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI
DEPARTMENT OF COMPUTER SCINCE ENGINEERING
Postgraduate Programme
Specilization;Artificial Intelligene
Scheme of Instruction for Choice Based Credit System
Total credits (2 year course): 68

SEMESTER I

Course Code	Course Title	L	T	P	Credits	Internal	End Semester	Total
Program Core-I		3			3	40	60	100
MAPC 01	Mathematical Foundation of Computer Science							
Program Core-II		3			3	40	60	100
AIPC 02	Artificial Intelligence	3			3	40	60	100
Program Elective – I(Any one of the following)		3			3	40	60	100
AIPE 11	Expert Systems							
AIPE 12	Introduction to Intelligent Systems							
Program Elective – II(Any one of the following)		3			3	40	60	100
AIPE 21	Machine Learning							
AIPE 22	Logic and Functional programming							
Audit Course – I		2	0	2	2	40	60	100
PGPC 01	Research Methodology and IPR							
AICP 01	Core-I Lab: Artificial Intelligence Lab			4	2	40	60	100
AIEP 01	Elective-I Lab (Based on Elective): Expert Systems/ Introduction to Intelligent Systems/ Machine Learning/ Logic And Functional Programming Lab			4	2	40	60	100
Audit Course – II(Any one of the following)		2			0	40	60	100
PGPA 11	English for Research Paper Writing							
PGPA 12	Disaster Management							
PGPA 13	Sanskrit for Technical Knowledge							

PGPA 14	Value Education							
Total					18			700

SEMESTER II

Course Code	Course Title	L	T	P	Credits	Internal	End Semester	Total
Program Core-III		3			3	40	60	100
AIPC 03	Advanced Algorithms							
Program Core-IV		3			3	40	60	100
AIPC 04	Soft Computing							
Program Elective – III(Any one of the following)		3			3	40	60	100
AIPE 31	Data Visualization							
AIPE 32	Computer Vision							
Program Elective – IV(Any one of the following)		3			3	40	60	100
AIPE 41	Recommender System							
AIPE 42	Knowledge Discovery							
AICP02	Core-II Lab (Based on Core)::Advanced Algorithms/ Soft Computing Lab			4	2	40	60	100
AIEP02	Elective-II Lab (Based on Elective): Image Processing/ Computer Vision/ Recommender System / Knowledge Discovery Lab			4	2	40	60	100
Audit Course – III(Any one of the following)		2	0	0	0	40	60	100
PGPA 21	Constitution of India							
PGPA 22	Pedagogy Studies							
PGPA 23	Stress Management by Yoga							
PGPA 24	Personality Development through Life Enlightenment Skills							
AIMP 01	Mini Project			4	2	40	60	100
					18			600

SEMESTER III

Course Code	Course Title	L	T	P	Credits	Internal	End Semester	Total
Program Elective – V(Any one of the following)		3			3	40	60	100
AIPE 51	High Performance Computing							
AIPE 52	Parallel Algorithms							
Open Elective – III(Any one of the following)		3	0	0	3	40	60	100
PGOE 11	Business Analytics							
PGOE 12	Industrial Safety							
PGOE 13	Operations Research							
PGOE 14	Cost Management of Engineering Projects							
PGOE 15	Composite Materials							
PGOE16	Waste to Energy							
AIPD01	Major Project : Phase – I Dissertation			20	10	100		100
Total					16			300

SEMESTER IV

		Lecture	Tutorial	Practical	Credits
AIPD 02	Major Project : Phase – II Dissertation			32	16
	Total				16

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) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

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:

1. John Vince, Foundation Mathematics for Computer Science, Springer.
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.

AIPC02

Artificial Intelligence

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

Unit I

The History of AI: Concept of intelligence, Search for Mechanical Intelligence, Evolution of Artificial Intelligence (AI), Systems Approach, Overview of topics.

General state space search, Trees, Graphs and Representation, General Search Paradigms - Depth-First Search, Depth-Limited Search, Iterative Deepening Search, Breadth-First Search, Bi-directional Search, Uniform-Cost Search.

Best-First Search, N-Queens problem, A* Search, Eight Puzzle problem, Hill Climbing Search, Simulated Annealing, Tabu Search, Constraint Satisfaction, Graph Coloring problem, Constraint Satisfaction algorithms - Generate and Test, Backtracking, Forward Checking and Look Ahead, Min-Conflicts Search.

Unit II

AI and Games: Two Player Games, The Minimax Algorithm, Tic-Tac-Toe problem, Minimax with Alpha-Beta Pruning, Classical Game AI, Checkers, Chess, Scrabble, Video Game AI, Movement and Path finding, Table Lookup with Offensive and Defensive Strategy, NPC Behavior, Team AI, Real-Time Strategy AI.

Unit III

Knowledge Representation (KR): Types and Role of Knowledge, Semantic Nets, Frames, Conceptual Dependency, Scripts,Propositional Logic, First Order Logic (Predicate Logic), Semantic Web, Computational Knowledge Discovery.

Non-monotonic Reasoning, TMS,MYCIN , EMYCIN.

Unit IV

Intelligent Agents: Anatomy of an Agent, Agent Properties and AI, Hybrid Agent, Agent Architectures, Types of Architectures, Agent Languages, Agent Communication.

Agent Languages: Knowledge Query and Manipulation Language, FIPA Agent Communication Language, Extensible Markup Language.

Unit V

Natural Language Processing:Understanding sibgle sentence, keword matching, semantic analysis,structure for understanding, scheme and scripts in understanding, dialogus understanding.

AI languages: LISP, PROLOG, KRL

References:

1. Russel S, Norvig P, *Artificial Intelligence: A Modern Approach*, 3rd edition, Pearson Education, 2010.
2. Rich E, Knight K, Nair S B, *Artificial Intelligence*, 3rd edition, Tata McGraw-Hill, 2009.
3. Luger G F, *Artificial Intelligence*, 6th edition, Pearson Education, 2009.
4. Carter M, *Minds and Computers: An Introduction to the Philosophy of Artificial Intelligence*, Edinburgh University Press, 2007.
5. Coppin B, *Artificial Intelligence Illuminated*, Jones & Bartlett, 2004.
6. Ertel W, *Introduction to Artificial Intelligence*, Springer, 2011.
7. M. Tim Jones, Artificial Intelligence: A Systems Approach, Infinity Science Press, New Delhi, 2008

Curse Outcomes

- Understand AI and AI problem solving tecniqies
- Understand knowledge representation
- Understand intelligent agents
- Understand natural language processing.

AIPE11

Introduction To Expert Systems

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

What Are Expert Systems? Knowledge Representation. Symbolic Computation. 5. Rule-Based Systems. Structured Objects.

Unit II

Object-Oriented Programming. Logic Programming. Representing Uncertainty. Knowledge Acquisition.

Unit III

Heuristic Classification. Heuristic Classification. Hierarchical Hypothesise and Test. Constructive Problem Solving. Constructive Problem Solving .

Unit IV

Designing for Explanation. Tools for Building Expert Systems. Blackboard Systems.

architectures.

Unit V

Truth Maintenance Systems. Machine Learning. Belief Networks. Case Based Reasoning. Hybrid Systems.

References:

1. Jackson, Peter (1998), *Introduction To Expert Systems* (3 ed.), Addison Wesley
2. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI
3. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

Corse Outcomes

- Designing for Explanation. Tools for Building Expert Systems. Blackboard Systems.
- Machine Learning. Belief Networks. Case Based Reasoning. Hybrid Systems.

AIPE12

Introduction to Intelligent Systems

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

Unit I

Biological foundations to intelligent systems I: Artificial neural networks, Back-propagation networks, Radial basis function networks, and recurrent networks.

Unit II

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

Unit III

Search Methods Basic concepts of graph and tree search. Three simple searchmethods: breadth-first search, depth-first search, iterative deepening search.Heuristic search methods: best-first search, admissible evaluation functions, hill-climbing search. Optimisation and search such as stochastic annealing and
genetic algorithm.

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:

4. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.

5. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

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.

AIPE21

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

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

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

AIPE22

Logic And Functional Programming

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Proposition Logic: Introduction of logic and Functional Paradigm, Propositional Concepts, Semantic Table , Problem Solving with Semantic Table.

Unit-II

Natural Deduction and Axiomatic Propositional Logic: Rules of Natural Deduction, Sequent Calculus, Axiomatic Systems, Meta theorems, Important Properties of AL, Resolution, Resolving Arguments

Unit-III

Introduction to Predicate Logic Objects, Predicates and Quantifiers, Functions, First Order Language, Quantifiers, Scopeand Binding, Substitution, An Axiomatic System for First Order Predicate Logic, Soundness and Completeness, Axiomatic Semantic and Programming

Unit-IV

Semantic Tableaux & Resolution in Predicate Logic: Semantic Tableaux, Instantiation Rules, Problem-solving in Predicate Logic, Normal forms, Herbrand Universes and H-interpretation, Resolution, Unification, Resolution as a computing Tool, Nondeterministic Programming, Incomplete Data Structure, Second Order Programming in Prolog, Logic Grammars: Definite Clause Grammar, A Grammar Interpreter.

Unit-V

Lazy and Eager Evaluation strategies: Evaluation Strategies, Lazy Evaluation: Evaluation Order and strictness of function,Programming with lazy evaluation, Interactive functional program, Delay of unnecessary Computation, Infinite Data Structure, Eager Evaluation and Reasoning

References:

1. John Kelly, "The Essence of Logic", Prentice-Hall India.
2. Saroj Kaushik, "Logic and Prolog Programming", New Age International ltd

Corse Outcomes

Understanding of the theory and practice of functional and logic programming

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

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

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:

1. 1.Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science
2. & engineering students'"
3. 2.Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
4. 3.Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
5. 4.Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
6. 5.Mayall , "Industrial Design", McGraw Hill, 1992.
7. 6.Niebel , "Product Design", McGraw Hill, 1974.
8. 7.Asimov , "Introduction to Design", Prentice Hall, 1962.
9. 8.Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New
10. Technological Age", 2016.
11. 9.T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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 :

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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
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.

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:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., 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

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-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

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
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature ,Discipline

UNIT III

Personality - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness, Avoid fault Thinking. Free from anger, Dignity of labour.

UNIT IV

Behavior Development, Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT V

Character and Competence, Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

References:

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

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

AICP01

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

AIEP01

Elective-I Lab(Based on Elective):

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

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

AIPC03

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 III9
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.

AIPC04

Soft Computing

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

Unit I
INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit II
FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making

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

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing , Prentice:Hall of India, 2003.

2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications , Prentice Hall, 1995.

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

AIPE31

Data Visualization

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

Unit II

Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit III

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

Unit IV

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit V

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

References:

1. WARD, GRINSTEIN, KEIM,.Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.

2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

Course Outcomes

- familiar with the design process to develop visualization methods and visualization systems, and methods for their evaluation.
- preparation and processing of data, visual mapping and the visualization

AIPE32

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:
Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised
Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

References:

1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Goodfellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisher et al.

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

AIPE41

Recommender System

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

Introduction: Overview of Information Retrieval, Retrieval Models, Search and Filtering Techniques: Relevance Feedback, User Profiles, Recommender system functions, Matrix operations, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

Unit II

Content-based Filtering: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, pre-processing and feature extraction, Obtaining item features from tags, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Unit III

Filtering: User-based recommendation, Item-based recommendation, Model based approaches, Matrix factorization, Attacks on collaborative recommender systems.

Unit IV

Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies

Unit V

Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations.

Types of Recommender Systems: Recommender systems in personalized web search, knowledge-based recommender system, Social tagging recommender systems, Trust-centric recommendations, Group recommender systems.

References:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
2. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st ed.
3. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.
4. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

Course Outcomes

- Design recommendation system for a particular application domain.
- Evaluate recommender systems on the basis of metrics such as accuracy, rank accuracy, diversity, product coverage, and serendipity

AIPE42

Knowledge Discovery

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search,Data Mining and Ethics

Unit II

Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters

Unit III

Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm

Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation

Unit IV

Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency

Unit V

Numeric Predictions - Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions

Artificial Neural Networks – Perceptrons, Multilayer Networks, The Backpropagation Algorithm

Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm

References:

1. Data mining and knowledge discovery handbook by Maimon, oded(et al.)
2. Data Cleansing : A Prelude to knowledge Discovery

Course Outcomes

- Able to have knowledge of various knowledge representation methods.

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

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT 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:
District's Administration Head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

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.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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.
- the passage of the Hindu Code Bill of 1956.

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:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign. 7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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 8

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) Credits : 2
Sessional Marks : 100 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 :

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

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.

AICP02

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

AIEP02

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 stroring
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 stroring
- 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

AIMP 01

Mini Project

nstruction 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

AIPE51

High Performance Computing

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

Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.Scalar Analysis with Factored Use-Def Chains: Constructing Factored Use- Def Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains, Constant Propagation with FUD Chains, Data Dependence for Scalars. Data
Dependence Analysis for Arrays.

Unit-III

Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis. Loop Restructuring: Simple Transformations, Loop Fusion, Loop Fission, Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations. Optimizing for Locality: Single Reference to Each Array, Multiple References,Genera l Tiling, Fission and Fusion for Locality.

Unit-IV

Concurrency Analysis: Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers. **Vector Analysis:** Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers.

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.

AIPE52

Parallel Algorithms

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

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit II

Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.

Unit II

Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC/,
Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit IV

Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel
Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix
Multiplication, Solution of Linear Equation, Root finding.

Unit V

Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derangements.

References

1. Designing Efficient Algorithms for Parallel Computer by M.J. Quinn, McGraw Hill.
2. Design and Analysis of Parallel Algorithms by S.G. Akl
3. Parallel Sorting Algorithm" by S.G. Akl, Academic Press

Course Outcomes

- at the end of this course the student will know about parallel computing model PRAM, LMCC etc., efficiency of parallel algorithms, parallel sorting network, parallel search algorithm, Permutation, graph algorithm, combinations.

PGOE 11

Business Analytics

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

Sessional Marks : 40 Semester-end Examination : 60

UNIT I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics technology.

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

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

References:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
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

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity
lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

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:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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

Introduction and Overview of the Strategic Cost Management Process, Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

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

Project contracts. Types and contents. 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. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning,

UNIT IV

Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible

Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation
problems, Assignment problems, Simulation, Learning Curve Theory.

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
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
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

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: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of

Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

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:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

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) Credits : 3
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

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

UNIT IV Biomass Combustion: 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:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley &Sons, 1996.

Course outcomes :

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

AIMP 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

AIPD 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.