



Faculty of Engineering & Technology

Syllabus

For

Master of Technology (M. Tech.)

Computer Science & Engineering

(Program Code: ET0151CS)

(2019-20)

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1. Program Educational Objectives (PEOs):

1. To provide students with a foundation in engineering areas required to formulate, solve and analyse engineering problems. **(Fundamental Knowledge)**
2. To analyse real life problems; apply the knowledge gained from modern design methodologies to address issues in a manner i.e., technically sound, economically feasible and socially acceptable. **(Professional Skill & Society).**
3. To inculcate ethical attitude, effective communication skills, teamwork in their profession and adapt to current trends by engaging in lifelong learning needed for a successful professional career. **(Ethics & Lifelong Learning)**

2. Post Graduate Attributes (PGAs)

The post graduate attributes in M. Tech. are the summation of the expected course learning outcomes mentioned in the end of each course. Some of them are stated below:

PGA1: Discipline-specific Knowledge:

Capability of demonstrating comprehensive knowledge of MCA program and understanding of core branch so that it forms a foundation for a Post Graduate program of study.

PGA2: Research-related skills:

To develop a sense of inquiry and capability for asking relevant and intelligent questions, problem identification, synthesizing and articulating; ability to recognize and establish cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

PGA3: Critical Thinking & Analytical Reasoning:

Ability to employ critical thinking in understanding the concepts relevant to the various branches of technical courses. Analytical reasoning refers to the ability to look at information, be it qualitative or quantitative in nature, and discern patterns within the information.

PGA4: Problem Solving:

Capability to solve problems by using research-based knowledge and research methods including innovative thinking, design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PGA5: Usage of Modern Tools (Information/digital literacy)& Self-directed learning:

To create, select, and apply appropriate techniques, resources, and modern science and IT tools including prediction and modeling to complex science activities with an understanding of the limitations. Self – directed learning is to provide ability to work independently and do in-depth study of various problems and requirements of society.

PGA6: Communication skills:

- i. Ability to communicate various concepts of technical education effectively using practical approach and their geometrical visualizations.
- ii. Ability to use courses as a precise language of communication in other branches of human knowledge.
- iii. Ability to resolve unsolved problems and requirements of industries and societies.
- iv. Ability to show the importance of their technical knowledge as precursor to various scientific developments since the beginning of the civilization.

PGA7. Leadership Readiness/Qualities and Employability Options:

Capability for mapping out the tasks in a team or an organization, self-motivating and inspiring team members to engage with the team objectives/vision and using management skills to follow the mapped path to the destination in a smooth and efficient way. This program will also help students to enhance their employability through self employment (Entrepreneur) or by opting jobs in various sectors like industries, Government offices, PSUs, corporate etc.

PGA8. Multicultural Competence:

Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PGA9: Moral and ethical awareness/reasoning:

Ability to identify unethical behavior such as falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects of their program.

PGA10: Lifelong learning:

Life-long learning provides the ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

3. Programme Outcomes (POs)

Students post graduating with the M. Tech degree should be able to acquire with following **POs**

- PO1.** Apply knowledge, skills, and current tools, recent computing technologies of Engineering innovatively to different applications
- PO2.** Enhance thinking skills to design and conduct experiments, as well as to analyze and interpret data and address the research gaps to produce solutions with the help of tools, technology and products.
- PO3.** Understand the contemporary research, security issues in the different areas of engineering.

- PO4.** An ability to identify, analyze, design, develop, implement and integrate based systems.
- PO5.** Enhance critical thinking by acquiring the skills in modern techniques, methodologies and tools to be innovative and creative.
- PO6.** An ability to communicate effectively, express /present ideas in an impressive and professional manner, both in written and verbal forms.
- PO7.** An ability to work in multidisciplinary and multicultural environment, become entrepreneur.
- PO8.** An ability to understand leadership and entrepreneurship qualities.
- PO9.** An ability to understand health, ethical, legal, financial, and professional responsibilities.
- PO10.** To recognizes the need for self-motivation and ability to engage in lifelong learning through continuing education, research and professional development.

Mapping of Graduate Attributes (PGAs) and Programme Outcomes (POs):

PO/PGA	PGA1	PGA2	PGA3	PGA4	PGA5	PGA6	PGA7	PGA8	PGA9	PGA10
PO1										
PO2										
PO3										
PO4										
PO5										
PO6										
PO7										
PO8										
PO9										
PO10										

4. Program Specific Outcomes (PSOs) :

- PSO1: Engage in sustainable development and to demonstrate engineering skills for effective interpretation and decision to solve real world problems.
- PSO2: To make a strong combination of technical and leadership qualities for successful professional career in industry or in entrepreneurship.

5. Course-Wise Learning Objectives, Structures and Outcomes (CLOSOs)

MASTER OF TECHNOLOGY

SEMESTER – I

Code	Title of Subject	L	T	P	IA	EA	Total	Credits
MTCSCS 101	Mathematical foundations of Computer Science	3	0	0	50	100	150	3
MTCSCS 102	Advanced Data Structures	3	0	0	50	100	150	3
Elective -1 (Any One)								
MTCSCS 103A	Machine Learning	3	0	0	50	100	150	3
MTCSCS 103B	Wireless Sensor Networks	3	0	0	50	100	150	3
MTCSCS 103C	Introduction to Intelligent Systems	3	0	0	50	100	150	3
Elective -2 (Any One)								
MTCSCS 104A	Data Science	3	0	0	50	100	150	3
MTCSCS 104B	Distributed Systems	3	0	0	50	100	150	3
MTCSCS 104C	Advanced Wireless and Mobile Networks	3	0	0	50	100	150	3
MTCSCS 105	Research Methodology and IPR	2	0	0	50	100	150	2
MTCSCS 106	Audit Course – 1 AUDIT 1 and 2 : English for Research Paper Writing AUDIT 1 and 2: Disaster Management AUDIT 1 and 2 : Sanskrit For Technical Knowledge AUDIT 1 and 2 : Value Education AUDIT 1 and 2 : Constitution Of India AUDIT 1 and 2 : Pedagogy Studies AUDIT 1 and 2: Stress Management by Yoga AUDIT 1 and 2: Personality Development through Life Enlightenment Skills	2	0	0	0	0	0	0
Practical/Viva Voce								
MTCSCS 107	Advanced Data Structures Lab	0	0	4	60	40	100	2
MTCSCS 108	Distributed Systems Lab	0	0	4	60	40	100	2
Total		16	0	8	370	580	950	18

SEMESTER – II

Course Number	Subject	L	T	P	IA	EA	Total	Credits
MTCS201	Information Security System	3	0	0	50	100	150	3
MTCS202	Soft Computing	3	0	0	50	100	150	3
Elective -1 (Any One)								
MTCS203A	Data Preparation and Analysis	3	0	0	50	100	150	3
MTCS203B	Secure Software Design & Enterprise Computing	3	0	0	50	100	150	3
MTCS203C	Computer Vision	3	0	0	50	100	150	3
Elective -2 (Any One)								
MTCS204A	Advanced Communication Network	3	0	0	50	100	150	3
MTCS204B	GPU Computing	3	0	0	50	100	150	3
MTCS204C	Digital Forensics	3	0	0	50	100	150	3
MTCS205	Audit Course – 2 AUDIT 1 and 2 : English for Research Paper Writing AUDIT 1 and 2: Disaster Management AUDIT 1 and 2 : Sanskrit For Technical Knowledge AUDIT 1 and 2 : Value Education AUDIT 1 and 2 : Constitution Of India AUDIT 1 and 2 : Pedagogy Studies AUDIT 1 and 2: Stress Management by Yoga AUDIT 1 and 2: Personality Development through Life Enlightenment Skills	2	0	0	0	0	0	0
Practical/Viva Voce								
MTCS206	Information Security System Lab	0	0	4	60	40	100	2
MTCS207	Advanced Communication Network Lab	0	0	4	60	40	100	2
MTCS208	Mini Project with Seminar	2	0	0	60	40	100	2
Total		14	0	8	380	520	900	18

SEMESTER – III

Course Number	Subject	L	T	P	IA	EA	Total	Credits
Elective -1 (Any One)								
MTCSCS 301A	Mobile Applications and Services	3	0	0	50	100	150	3
MTCSCS 301B	Compiler for HPC	3	0	0	50	100	150	3
MTCSCS 301C	Optimization Techniques	3	0	0	50	100	150	3
Elective -2 (Any One)								
MTCSCS 302A	Business Analytics	3	0	0	50	100	150	3
MTCSCS 302B	Industrial Safety	3	0	0	50	100	150	3
MTCSCS 302C	Operations Research	3	0	0	50	100	150	3
MTCSCS 302D	Cost Management of Engineering Projects	3	0	0	50	100	150	3
MTCSCS 302E	Composite Materials	3	0	0	50	100	150	3
MTCSCS 302F	Waste to Energy	3	0	0	50	100	150	3
Practical/Viva Voce								
MTCSCS 303	Dissertation-I /Industrial Project	0	0	20	60	40	100	10
Total		6	0	20	160	240	400	16

SEMESTER - IV

Course Number	Subject	L	T	P	IA	EA	Total	Credits
MTCSCS 401	Dissertation II	0	0	32	300	400	700	16
Total		0	0	32	300	400	700	16

SEMESTER –I

Mathematical Foundation of Computer Science (MTCSCS101)

COURSE OBJECTIVE

- To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
- To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.
- To study various sampling and classification problems.

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Unit 1: 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 2: Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood

Unit 3: Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, and The problem of over fitting model assessment.

Unit 4: Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

Unit 5: Computer science and engineering applications Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.

Unit 6: Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.

TEXT BOOKS:

- John Vince, Foundation Mathematics for Computer Science, Springer.
- K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.

REFERENCES:

- M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
- Alan Tucker, Applied Combinatory, Wiley

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Apply the concepts learned in fundamental courses such as Discrete Mathematics, in a theoretical setting; in particular, the application of proof techniques.

CO2: Demonstrate abstract models of computing, including deterministic (DFA), non-deterministic (NFA) and their power to recognize the languages.

CO3: Construct pushdown automata and the equivalent context free grammars.

CO4: Understand the concept of different types of graphs and their uses.

CO5: Compute probabilities of interesting events and other vital characteristics, and make appropriate conclusions and forecasts

CO6: Apply linear algebra concepts in two-dimensional graphics transformations in various applications

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	H	H	H	H	H	M	L	L	L	-	L	M
CO2	L3	H	H	H	H	H	L	L	L	L	L	L	L
CO3	L6	H	H	H	H	H	M	L	M	-	L	M	M
CO4	L2	H	H	H	H	H	M	M	M	-	M	L	L
CO5	L3	H	H	H	H	H	L	L	L	L	-	M	M
CO6	L3	H	H	H	H	H	L	L	-	L	-	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Advanced Data Structures (MTCSCS102)

COURSE OBJECTIVE

- To choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- To understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems
- To come up with analysis of efficiency and proofs of correctness.

Syllabus

Unit 1: 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 2: 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 3: Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

Unit 4: Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Unit 5: Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.

Unit 6: Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

TEXT BOOKS :

- Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
- M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Understand the implementation of symbol table using hashing techniques.

CO 2: Develop and analyze algorithms for red-black trees, B-trees and Splay trees, algorithms for text processing applications.

CO 3: Apply the algorithms and design techniques to solve problems; analyze the complexities of various problems in different domains.

CO 4: Study and Solve Problem using Dynamic Programming and Greedy Method Algorithms.

CO 5: Study and Summarize concept of Lower Bound, NP Hard and NP Complete Problems

CO 6: Identify suitable data structures and develop algorithms for computational geometry problems.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	M	L	L	L	-	H	M
CO2	L6	H	H	H	H	H	L	L	L	L	L	L	L
CO3	L3	H	H	H	H	H	M	-	M	-	L	M	M
CO4	L2	H	H	M	H	H	M	-	M	-	M	H	M
CO5	L2	H	H	H	H	H	L	L	L	L	-	M	M
CO6	L2	H	H	H	H	H	L	L	-	L	-	M	M

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Machine Learning (MTCSCS103A)

COURSE OBJECTIVE

- To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
- To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- To explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Syllabus

Unit 1:

Supervised Learning (Regression/Classification)

Basic methods: Distance-based methods, Nearest- Neighbours, Decision Trees, Naïve 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 2:

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 3

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

Unit 4

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit 5

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 6:

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications

References:

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

At the end of the course, students will be able to:

CO 1: Solve complicated problems using biological neuron system & calculate equation of terminal network.

CO 2: Recognize the characteristics of machine learning that make it useful to real-world problems. Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.

CO 3: Understand algorithms for learning Bayesian networks. Understand reinforcement learning algorithms.

CO 4: Design and implement neural network systems.

CO 5: Describe the relation between real brains and simple artificial neural network models.

CO 6: Explain and contrast the most common architectures and learning algorithms for Multi-Layer Perceptrons, Radial-Basis Function Networks and Kohonen Self-Organising Maps.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L4	H	H	H	H	H	M	L	L	L	-	H	M
CO2	L2	H	H	H	H	H	L	L	L	L	L	M	M
CO3	L2	H	H	M	H	H	-	-	M	-	L	M	M
CO4	L6	H	H	M	H	H	M	-	M	-	M	H	M
CO5	L2	H	H	H	M	H	L	L	-	L	-	M	M
CO6	L2	H	H	H	H	H	L	L	-	L	-	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Wireless Sensor Networks (MTCSCS103B)

COURSE OBJECTIVE

- To understand the architect of sensor networks for various application setups.
- To devise appropriate data dissemination protocols and model links cost.
- To understand the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
- To evaluate the performance of sensor networks and identify bottlenecks.

Syllabus

Unit 1:

Introduction to Wireless Sensor Networks: Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors

Network Architecture: Traditional layered stack, Cross-layer designs, Sensor Network Architecture

Hardware Platforms: Motes, Hardware parameters

Unit 2:

Introduction to ns-3: Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.

Unit 3:

Medium Access Control Protocol design: Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled

Introduction to Markov Chain: Discrete time Markov Chain definition, properties, classification and analysis

MAC Protocol Analysis: Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)

Unit 4:

Security: Possible attacks, countermeasures, SPINS, Static and dynamic key distribution

Unit 5:

Routing protocols: Introduction, MANET protocols, **Routing protocols for WSN:** Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast,

Opportunistic Routing Analysis: Analysis of opportunistic routing (Markov Chain), Advanced topics in wireless sensor networks.

Unit 6:

ADVANCED TOPICS

Recent development in WSN standards, software applications.

References:

- W. Dargie and C. Poellabauer, “Fundamentals of Wireless Sensor Networks – Theory and Practice”, Wiley2010
- KazemSohraby, Daniel Minoli and TaiebZnati, “wireless sensor networks - Technology, Protocols, and Applications”, Wiley Interscience2007
- Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, “Wireless Sensor Network Technologies for the Information Explosion Era”, springer2010

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Understand and demonstrate the principles of Sensor Design, Sensors with its applications

CO 2: Learn the architecture and placement strategies of Sensors, wireless sensor networks

CO 3: Select and apply appropriate principles for data collection and aggregation methods for problem solving, routing and congestion algorithms

CO 4: Design, develop , and carry out performance analysis of sensors on specific applications

CO 5: Explore and implement solutions to real world problems using sensor devices, enumerating its principles of working

CO 6: Apply the advance engineering principles for the critical analysis of sensor design

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	M	L	L	L	-	L	L
CO2	L4	H	H	H	H	H	L	L	L	L	L	M	M
CO3	L3	H	H	M	H	H	-	-	M	-	L	M	M
CO4	L3	H	H	M	H	H	M	-	M	-	M	H	H
CO5	L4	H	H	H	M	H	L	L	-	L	-	M	M
CO6	L1	H	H	H	H	H	L	L	-	L	-	M	M

H- High, M- Moderate, L- Low, ‘-’ for No correlation

Introduction to Intelligent Systems (MTCSCS103C)

COURSE OBJECTIVE

- To introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach.
- To explore the essential theory behind methodologies for developing systems that demonstrate intelligent behaviour including dealing with uncertainty learning from experience and following problem solving strategies found in nature.

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Unit 1:

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

Unit 2:

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

Unit 3:

Search Methods Basic concepts of graph and tree search. Three simple search methods: 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 4:

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 5:

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.

Unit 6:

Recent trends in Fuzzy logic, Knowledge Representation

References:

- Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.
- Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Analyze and compare the relative merits of a variety of AI problem and solving techniques

CO 2: Formulate problems so that exploratory search can be applied, Able to Demonstrate knowledge of the fundamental principles of intelligent systems.

CO 3: Implement optimal, heuristic and memory bounded search techniques.

CO 4: Represent knowledge using formal logic and design algorithms to work in a semi-observable environment using logical reasoning.

CO 5: Design and develop practical algorithms for solving real-life planning problems.

CO 6: Implement probabilistic reasoning techniques to work in uncertain environments.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L4	H	L	M	L	L	-	-	-	L	L	M	M
CO2	L3	H	L	L	M	-	-	-	-	L	-	M	M
CO3	L3	L	M	M	-	M	-	-	-	-	L	L	M
CO4	L6	M	-	L	-	-	-	-	-	-	L	H	H
CO5	L6	H	H	M	L	M	-	-	-	-	M	M	M
CO6	L3	H	M	L	M	H	-	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To attain the knowledge and expertise to become a proficient data scientist.
- To demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- To produce Python code to statistically analyse a dataset;
- To critically evaluate data visualisations based on their design and use for communicating stories from data;

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Unit 1:

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

Unit 2: 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 3:

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 4:

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

Unit 5:

Applications of Data Science, Technologies for visualization, Bokeh (Python)

Unit 6:

Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

References:

- Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly.
- Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Apply knowledge of data science process and its tool kit.

CO 2: Explain how data is collected, managed and stored for data science;

CO 3: Understand the concept of statistics and distribution.

CO 4: Understand the Data visualization, their types and encoding decoding.

CO 5: Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists

CO 6: Implement data collection and management scripts using Python on Spyder (Anaconda3).

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	H	L	M	L	M	-	-	-	-	-	M	M
CO2	L3	H	H	L	-	M	-	-	-	-	-	M	M
CO3	L2	H	-	M	L	-	-	-	-	-	-	L	M
CO4	L2	M	L	H	H	H	-	-	-	-	L	L	M
CO5	L2	H	H	H	H	H	-	-	-	-	M	L	M
CO6	L6	L	H	M	M	L	-	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.

Syllabus

Unit 1:

INTRODUCTION

Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts

DISTRIBUTED DATABASE MANAGEMENT SYSTEM

ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

Unit 2:

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 3:

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 4:

RELIABILITY

Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

Unit 5:

PARALLEL DATABASE SYSTEMS

Parallel architectures; parallel query processing and optimization; load balancing

Unit 6: ADVANCED TOPICS

Mobile Databases, Distributed Object Management, Multi-databases

References:

- Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall,1991.
- Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley,1992.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.

CO 2: Examine the fundamental principles of distributed systems

CO 3: Design and develop distributed programs using sockets and RPC/RMI.

CO 4: Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.

CO 5: Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints.

CO 6: Abe to understand relational database management systems, normalization to make efficient retrieval from database and query.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L4	H	L	M	L	L	-	-	-	L	L	M	M
CO2	L3	H	L	L	M	-	-	-	-	L	-	M	M
CO3	L3	L	M	M	-	M	-	-	-	-	L	M	M
CO4	L6	M	-	L	-	-	-	-	-	-	L	H	H
CO5	L6	H	H	M	L	M	-	-	-	-	M	H	M
CO6	L3	H	M	L	M	H	-	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
- To learn how to design and analyse various medium access
- To learn how to evaluate MAC and network protocols using network simulation software tools.
- The students should get familiar with the wireless/mobile market and the future needs and challenges.

Syllabus

Unit 1:

INTRODUCTION:

Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

WIRELESS LOCAL AREA NETWORKS:

IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

Unit 2:

WIRELESS CELLULAR NETWORKS:

1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

Unit 3:

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22

Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

WIRELESS SENSOR NETWORKS

Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

Unit 4:

WIRELESS PANs

Bluetooth AND Zigbee, Introduction to Wireless Sensors.

Unit 5:

SECURITY

Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.

Unit 6:

ADVANCED TOPICS

IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

References:

- Schiller J., Mobile Communications, Addison Wesley 2000
- Stallings W., Wireless Communications and Networks, Pearson Education 2005
- Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
- Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
- Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 2000

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO 1: Demonstrate advanced knowledge of networking and wireless networking

CO 2: Understand various types of wireless networks, standards, operations and use cases.

CO 3: Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.

CO 4: Demonstrate knowledge of protocols used in wireless networks and

CO 5: Learn simulating wireless networks.

CO 6: Design wireless networks exploring trade-offs between wire line and wireless links. Develop mobile applications to solve some of the real world problems.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CO1	L3	H	L	M	L	M	-	-	-	-	-	M	M
CO2	L3	H	H	L	-	M	-	-	-	-	-	M	M
CO3	L2	H	-	M	L	-	-	-	-	-	-	L	L
CO4	L2	M	L	H	H	H	-	-	-	-	L	L	L
CO5	L2	H	H	H	H	H	-	-	-	-	M	L	L
CO6	L6	L	H	M	M	L	-	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To understand research problem formulation.
- To analyze research related information
- To follow research ethics
- To understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- To understanding 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.
- To 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.

Syllabus

Unit 1: 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 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit 3: 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 4: 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.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: 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:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

- Ranjit Kumar, 2 nd Edition , “Research Methodology: A Step by Step Guide for beginners”
- Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
- Mayall , “Industrial Design”, McGraw Hill,1992.
- Niebel , “Product Design”, McGraw Hill,1974.
- Asimov , “Introduction to Design”, Prentice Hall,1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”,2016.
- T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand,2008

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Understand research problem formulation. Analyze research related information & Follow research ethics.

CO2: Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO3: Understanding 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.

CO4: 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.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome S	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	M	M	H	M	L	L	M	L	M	L	M	M
CO2	L3	M	M	M	L	M	-	L	M	M	M	M	M
CO3	L2	H	H	L	M	M	M	L	-	M	-	L	L
CO4	L3,L4	M	M	L	L	M	-	-	-	M	L	M	M

H- High, M- Moderate, L- Low, ‘-’ for No correlation

COURSE OBJECTIVE

- To choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- To understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems
- To come up with analysis of efficiency and proofs of correctness.
- To perform various operations such as insertion, deletion, display on single linked lists.
- To perform different types of searching techniques on a given list
- To perform different types of sorting on a given list
- To convert the given infix expression to postfix expression
- To perform various operations on graphs
- To implement dictionaries using hashing technique
- To perform various operations on binary heap.
- To perform various operations on Binary search tree.
- To perform operations on AVL trees.
- To perform various operations on B-tree.

Program List:-

1- C programs to implement the following using an array.

- a) Stack ADT b) Queue ADT

2- Write C programs to implement the following using a singly linked list.

- a) Stack ADT b) Queue ADT

3- Write C programs to implement the deque (double ended queue) ADT using

a doubly linked list and an array.

4- Write a C program to perform the following operations:

- a) Insert an element into a binary search tree.
- b) Delete an element from a binary search tree.
- c) Search for a key element in a binary search tree.

5-Write C programs that use non-recursive functions to traverse the given

binary tree in

a) Preorder b) inorder and c) postorder.

6-Write C programs for the implementation of bfs and dfs for a given graph.

7- Write C programs for implementing the following sorting methods:

a) Merge sort b) Heap sort

8-Write a C program to perform the following operations

a) Insertion into a B-tree b) Deletion from a B-tree

9-Write a C program to perform the following operations

a) Insertion into an AVL-tree b) Deletion from an AVL-tree

10-Write a C program to implement Kruskal's algorithm to generate a minimum cost spanning tree.

11-Write a C program to implement Prim's algorithm to generate a minimum cost spanning tree.

COURSE OUTCOMES OF ADVANCED DATA STRUCTURES LAB (MTCSCS107)

At the end of the course, students will be able to:

CO1: Understand the implementation of symbol table using hashing techniques.

CO2: Develop and analyze algorithms for red-black trees, B-trees and Splay trees, algorithms for text processing applications.

CO3: Apply the algorithms and design techniques to solve problems; analyze the complexities of various problems in different domains.

CO4: Study and Solve Problem using Dynamic Programming and Greedy Method Algorithms.

CO5: Study and Summarize concept of Lower Bound, NP Hard and NP Complete Problems

CO6: Identify suitable data structures and develop algorithms for computational geometry problem.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	M	L	L	L	-	M	M
CO2	L6	H	H	H	H	H	L	L	L	L	L	M	M
CO3	L3	H	H	H	H	H	M	-	M	-	L	L	L
CO4	L2	H	H	M	H	H	M	-	M	-	M	M	M
CO5	L2	H	H	H	H	H	L	L	L	L	-	L	L
CO6	L2	H	H	H	H	H	L	L	-	L	-	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.

Syllabus

- Accessing the Database: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)
- Basic SQL: This lab covers simple SQL queries. (Inbuilt functions in RDBMS.)
- Intermediate SQL: This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)
- Advanced SQL: This lab covers even more complex SQL queries. (Procedures and Functions, PL/SQL, Cursors and Triggers)
- Database Access from a Programming Language: This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, ODBC or ADO.NET APIs.
- Building Web Applications: This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.
- Project: Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.
- The logical design performs the following tasks:
 - Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
 - Identify the functional dependencies in each relation
 - Normalize to the highest normal form possible B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/Postgre SQL on Linux platform.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.

CO2: Examine the fundamental principles of distributed systems

CO3: Design and develop distributed programs using sockets and RPC/RMI.

CO4: Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.

CO5: Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints.

CO6: Able to understand relational database management systems, normalization to make efficient retrieval from database and query.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	L	L	L	L	L	M
CO2	L6	H	H	H	H	H	M	L	L	L	L	M	M
CO3	L3	H	H	H	H	H	M	L	M	M	L	M	M
CO4	L2	H	H	H	H	H	-	M	M	L	L	M	M
CO5	L2	H	H	H	H	H	-	L	L	L	L	L	L
CO6	L2	H	H	H	H	H	-	L	M	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

SEMESTER – II

Course Number	Subject	L	T	P	IA	EA	Total	Credits
MTCS201	Information Security System	3	0	0	50	100	150	3
MTCS202	Soft Computing	3	0	0	50	100	150	3
Elective -1 (Any One)								
MTCS203A	Data Preparation and Analysis	3	0	0	50	100	150	3
MTCS203B	Secure Software Design & Enterprise Computing	3	0	0	50	100	150	3
MTCS203C	Computer Vision	3	0	0	50	100	150	3
Elective -2 (Any One)								
MTCS204A	Advanced Communication Network	3	0	0	50	100	150	3
MTCS204B	GPU Computing	3	0	0	50	100	150	3
MTCS204C	Digital Forensics	3	0	0	50	100	150	3
MTCS205	Audit Course – 2 AUDIT 1 and 2 : English for Research Paper Writing AUDIT 1 and 2: Disaster Management AUDIT 1 and 2 : Sanskrit For Technical Knowledge AUDIT 1 and 2 : Value Education AUDIT 1 and 2 : Constitution Of India AUDIT 1 and 2 : Pedagogy Studies AUDIT 1 and 2: Stress Management by Yoga AUDIT 1 and 2: Personality Development through Life Enlightenment Skills	2	0	0	0	0	0	0
Practical/Viva Voce								
MTCS206	Information Security System Lab	0	0	4	60	40	100	2
MTCS207	Advanced Communication Network Lab	0	0	4	60	40	100	2
MTCS208	Mini Project with Seminar	2	0	0	60	40	100	2
Total		14	0	8	380	520	900	18

COURSE OBJECTIVE

- This course will cover the concept of security , types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

Syllabus

Unit I: Multi level model of security, Cryptography, Secret Key Cryptography, Modes of Operation, Hashes and Message Digest, Public Key Algorithm, Security Handshake Pitfall, Strong Password Protocol; Case study of real time communication security;

Unit II: Introduction to the Concepts of Security, Security Approaches, Principles of security, Types of attacks; Cryptographic Techniques: Plain text and Cipher text, Substitution Techniques, Transposition Techniques Encryption and Decryption, Symmetric and Asymmetric Key Cryptography. Computer-based symmetric Key Cryptographic;

Unit III: Algorithms: Algorithm Types and Modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), Advanced Encryption Standard (AES);

Computer-based Asymmetric Key Cryptographic Algorithms; Cryptography, An Overview of Asymmetric Key Cryptography, The RSA algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm;

Unit IV: Public Key Infrastructure (PKI) Digital Certificates, Private Key Management , The PKI Model, Public Key Cryptography Standards (PKCS); Internet Security Protocols Secure Socket Layer (SSL) , Secure Hyper Text Transfer Protocol (SHTTP) , Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol , Electronic Money , Email Security;

Unit V: User Authentication Mechanisms : Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication; Practical Implementations of Cryptography/Security: Cryptographic Solutions Using Java, Cryptographic Solutions Using Microsoft, Cryptographic Toolkits, Security and Operating Systems; Network Security: Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN); Case Studies on Cryptography and Security:

Reference Books:

1. Atul Kahate "Cryptography and Network Security" Tata McGraw-Hill
2. Charlie Kaufman,Radia Perlman, Mike Speciner" Network Securities" Pearson,
3. J. A. Coopeer "Computer Communication Securities"TMH,
4. D.W. Davies W. L. Price "securities For computer Networks"
5. John Wiley Sons, L.Stein "Web Securities A step by step Guide " Addison Wesley.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: apply knowledge of plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution to various Network Models

CO 2: Apply Communication Model in Computer Engineering Domain

CO 3: Study Various models for data compression

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	H	H	H	H	H	M	M	L	L	L	M	M
CO2	L3	H	H	H	H	M	M	M	L	L	L	M	M
CO3	L2	H	H	H	H	M	L	-	L	M	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student a hand-on experience on MATLAB to implement various strategies.

Syllabus

Unit 1

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

Unit 2

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 3

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 4

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

Unit 5

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

Unit 6

Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm.

References:

- Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing®, Prentice:Hall of India,2003.
- George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications®, Prentice Hall, 1995.
- MATLAB ToolkitManual

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Identify and describe soft computing techniques and their roles in building intelligent machines

CO 2: Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

CO 3: Apply genetic algorithms to combinatorial optimization problems.

CO 4: Evaluate and compare solutions by various soft computing approaches for a given problem.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	-	L	M	L	-	L	M	M
CO2	L3	H	H	H	H	L	L	L	L	-	L	M	M
CO3	L3	H	H	H	H	-	M	L	L	-	L	L	L
CO4	L5	H	H	H	H	L	M	M	L	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

DATA PREPARATION AND ANALYSIS (MTCSCS203A)

COURSE OBJECTIVE

- To prepare the data for analysis and develop meaningful Data Visualizations

Syllabus

Unit1:

Data Gathering and Preparation:

Data formats, parsing and transformation, Scalability and real-time issues

Unit2:

Data Cleaning:

Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Unit3:

Exploratory Analysis:

Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit4:

Visualization:

Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity

References:

1. Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining, by Glenn

J. Myatt

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Extract the data for performing the Analysis.

CO 2: Work with Big Data platforms and explore the techniques

CO 3: Designing the efficient algorithms for mining the data from large volumes.

CO 4: Understand the basics of various big data analytics techniques.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	M	-	L	L	L	L
CO2	L2	H	H	H	H	H	-	L	-	L	L	L	L
CO3	L3	H	H	H	H	M	M	L	-	M	L	M	M
CO4	L2	H	H	H	H	H	-	M	-	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

SECURE SOFTWARE DESIGN & ENTERPRISE COMPUTING (MTCSCS203B)

COURSE OBJECTIVE

- To fix software flaws and bugs in various software.
- To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
- Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
- To understand the methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Syllabus

Unit 1:

Secure Software Design

Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

Unit 2:

Enterprise Application Development

Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprisesystem, Present software solution.

Unit 3:

Enterprise Systems Administration

Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services(DNS/DHCP/Terminal Services/Clustering/Web/Email).

Unit 4:

Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to goabout managing them.

Unit 5:

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities andflaws.

Unit 6:

Case study of DNS server, DHCP configuration and SQL injection attack.

References:

- Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
- Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Differentiate between various software vulnerabilities.

CO 2: Software process vulnerabilities for an organization.

CO 3: Monitor resources consumption in a software.

CO 4: Inter-relate security and software development process.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	M	-	-	L	L	L	L
CO2	L2	H	H	H	H	H	L	-	-	L	L	L	L
CO3	L2	H	H	H	H	M	M	-	-	M	L	M	M
CO4	L3	H	H	H	H	H	M	L	-	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

COMPUTER VISION (MTCSCS203C)

COURSE OBJECTIVE

- Be familiar with both the theoretical and practical aspects of computing with images.
- Have described the foundation of image formation, measurement, and analysis.
- Understand the geometric relationships between 2D images and the 3D world.
- Grasp the principles of state-of-the-art deep neural networks.

Unit 1:

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

Unit 2:

Edge detection, Edge detection performance, Hough transform, corner detection

Unit 3:

Segmentation, Morphological filtering, Fourier transform

Unit 4:

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

Unit 5:

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.

Unit 6:

Recent trends in Activity Recognition, computational photography, Biometrics.

References:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.

CO 2: Evaluate the techniques for Image enhancement used in digital image processing

CO 3: Developed the practical skills necessary to build computer vision applications.

CO 4: have exposure to object and scene recognition and categorization from images.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	M	-	L	L	L	L
CO2	L5	H	H	H	H	H	M	L	-	L	L	M	M
CO3	L3	H	H	H	H	M	M	L	-	M	L	M	M
CO4	L2	H	H	H	H	H	-	M	-	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

ADVANCED COMMUNICATION NETWORK (MTCSCS204A)

COURSE OBJECTIVE

- To have complete knowledge of networking concepts and functioning of all networking layers and have knowledge of various protocols associated with them.

Syllabus

UNIT 1:

Introduction: Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

UNIT 2:

Network layer:ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

UNIT 3:

Transport layer:Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

UNIT 4 :

Application layer:WWW, DNS, e-mail, SNMP, RMON

UNIT 5:

Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

Case study

Study of various network simulators, Network performance analysis using NS2

TEXT BOOKS:

- Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
- Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

REFERENCES:

- Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
- Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
- Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
- Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

COURSE OUTCOMES

At the end of the course, students will be able to:

- CO 1: Understand advanced concepts in Communication Networking
- CO 2: Design and develop protocols for Communication Networks.
- CO 3: Understand the mechanisms in Quality of Service in networking.
- CO 4: Optimize the Network Design.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	M	-	L	L	L	L
CO2	L6	H	H	H	H	H	M	L	-	L	L	M	M
CO3	L2	H	H	H	H	M	-	L	-	M	L	L	L
CO4	L3	H	H	H	H	H	L	M	-	L	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To learn parallel programming with Graphics Processing Units (GPUs).

Syllabus

Unit 1:

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, SimplePrograms

Unit 2:

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 3:

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 4:

Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects
Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based-Synchronization - Overlapping data transfer and kernel execution, pitfalls.

Unit 5:

Case Studies: Image Processing, Graph algorithms, Simulations, Deep Learning

Unit 6:

Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing

References:

- Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-meiHwu; Morgan Kaufman; 2010 (ISBN:978-0123814722)
- CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN:978-0124159334)

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Learn concepts in parallel programming

CO 2: Implementation of programs on GPUs,

CO 3: Debug of the programs

CO 4: Apply parallel programs.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	L	M	-	L	L	L	L
CO2	L5	H	H	H	H	H	L	L	-	L	L	M	M
CO3	L2	H	H	H	H	M	-	L	-	M	L	L	L
CO4	L3	H	H	H	H	M	M	L	-	M	L	M	L

COURSE OBJECTIVE

- To provide an in-depth study of the rapidly changing and fascinating field of computer forensics.
- To combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- To have knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- To have e-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Syllabus

Unit 1:

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 2:

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

Unit 3:

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 4:

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 5:

Mobile Forensics: mobile forensics techniques, mobile forensics tools **Legal Aspects of**

Digital Forensics: IT Act 2000, amendment of IT Act 2008.

Unit 6:

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

References:

- John Sammons, The Basics of Digital Forensics, Elsevier
- John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Understand relevant legislation and codes of ethics

CO 2: Understand Computer forensics and digital detective and various processes, policies and procedures

CO 3: Apply process of E-discovery, guidelines and standards, E-evidence, tools and environment.

CO 4: Understand Email and web forensics and network forensics.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	L	-	L	L	L	L
CO2	L2	H	H	H	H	H	-	L	-	L	L	L	L
CO3	L3	H	H	H	H	M	M	L	-	M	L	M	M
CO4	L2	H	H	H	H	M	-	L	-	M	L	L	L

COURSE OBJECTIVE

- To cover the concept of security , types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

Note: The following programs can be executed on Turbo C++ IDE (TurboC3), Borland Turbo C++

1. Study of Network Security fundamentals - Ethical Hacking, Social Engineering practices.
2. Study of System threat attacks - Denial of Services.
3. Study of Sniffing and Spoofing attacks
4. Study of Techniques uses for Web Based Password Capturing.
5. Study of Different attacks causes by Virus and Trojans.
6. Study of Anti-Intrusion Technique –Honey pot.
7. Study of Symmetric Encryption Scheme –RC4.
8. Implementation of S-DES algorithm for data encryption
9. Implementation of Asymmetric Encryption Scheme –RSA.
10. Study of IPbased Authentication.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: apply knowledge of plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution to various Network Models

CO2: Apply Communication Model in Computer Engineering Domain

CO3: Understand Various models for data compression

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	H	H	H	H	H	M	M	L	L	L	M	M
CO2	L3	H	H	H	H	M	M	M	L	L	L	M	M
CO3	L2	H	H	H	H	M	M	L	L	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

Advanced Communication Network LAB (MTCSCS207)

COURSE OBJECTIVE

- To have complete knowledge of networking concepts and functioning of all networking layers and have knowledge of various protocols associated with them.

Syllabus

1. Write two programs in C: hello_client and hello_server
 - The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
 - The client connects to the server, sends the string "Hello, world!", then closes the Connection
2. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
3. Repeat Exercises 1 & 2 for UDP.
4. Repeat Exercise 2 with multiplexed I/O operations
5. Simulate Bellman-Ford Routing algorithm in NS2
6. Write client/server applications involving unix sockets involving TCP or UDP involving iterative or concurrent server.
7. Understand IPV4 & IPV6 interoperability issues

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Understand advanced concepts in Communication Networking

CO2: Design and develop protocols for Communication Networks.

CO3: Understand the mechanisms in Quality of Service in networking.

CO4: Optimize the Network Design.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	M	L	L	L	L	L
CO2	L6	H	H	H	H	H	L	L	L	L	L	M	M
CO3	L2	H	H	H	H	M	-	L	L	M	L	L	M
CO4	L3	H	H	H	H	H	M	M	L	L	L	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mini Project and Seminar (MTCSCS208)

COURSE OBJECTIVE

- To identification of the problem
- To use modern research tools/methods.
- To design and conduct experiments and identify the solution of the problem/s.

COURSE OUTCOMES

By the end of this course every student is expected to be able to

CO1: handle research problems and use modern research tools/methods.

CO2: analyze and review the existing literature on a research problem.

CO3: design and conduct experiments.

CO4: write dissertation and technical reports.

CO5: publish research papers.

Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom's Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	M	H	H	L	M	-	-	-	-	-	M	H
CO2	L4	M	M	H	L	M	M	-	-	-	L	H	H
CO3	L6	H	L	M	M	H	L	-	-	-	M	H	H
CO4	L3	H	-	M	H	H	H	-	-	-	L	M	M
CO5	L3	H	-	M	H	M	H	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

SEMESTER – III

Course Number	Subject	L	T	P	IA	EA	Total	Credits
Elective -1 (Any One)								
MTCSCS 301A	Mobile Applications and Services	3	0	0	50	100	150	3
MTCSCS 301B	Compiler for HPC	3	0	0	50	100	150	3
MTCSCS 301C	Optimization Techniques	3	0	0	50	100	150	3
Elective -2 (Any One)								
MTCSCS 302A	Business Analytics	3	0	0	50	100	150	3
MTCSCS 302B	Industrial Safety	3	0	0	50	100	150	3
MTCSCS 302C	Operations Research	3	0	0	50	100	150	3
MTCSCS 302D	Cost Management of Engineering Projects	3	0	0	50	100	150	3
MTCSCS 302E	Composite Materials	3	0	0	50	100	150	3
MTCSCS 302F	Waste to Energy	3	0	0	50	100	150	3
Practical/Viva Voce								
MTCSCS 303	Dissertation-I /Industrial Project	0	0	20	60	40	100	10
Total		6	0	20	160	240	400	16

III Semester

MOBILE APPLICATIONS AND SERVICES (MTCSCS301A)

COURSE OBJECTIVE

- To presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.
- To explore emerging technologies and tools used to design and implement feature-rich mobile applications for smartphones and tablets
- To understand both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile

Syllabus

Unit 1: Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development

Android User

Unit 2: More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the

Model Right, Android Storing and Retrieving Data, Working with a Content Provider

Unit 3: Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony

Notifications and Alarms: Performance, Performance and Memory Management,

Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics

Unit 4: Putting It All Together: Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

Unit 5: Platforms and Additional Issues: Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android

Unit 6: Recent trends in Communication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT

References:

- Wei- Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Identify the target platform and users and be able to define and sketch a mobile application

CO 2: Understand the fundamentals, frameworks of mobile Application Platforms

CO 3: Development lifecycle of mobile application platforms including iOS, Android, and Phone Gap

CO 4: Design and develop a mobile application prototype in one of the platform (challenge project)

Mapping of Course Outcomes onto Program Outcomes

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	H	H	H	H	-	M	-	L	L	L	L
CO2	L2	H	H	H	H	H	-	L	-	L	L	L	L
CO3	L3	H	H	H	H	M	M	L	-	L	L	M	M
CO4	L6	H	H	H	H	M	M	L	-	L	L	M	M

COURSE OBJECTIVE

- To introduce structure of compilers and high performance compiler design for students. Concepts of cache coherence and parallel loops in compilers are included.

Syllabus

Unit1:

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

Unit2:

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.**

Unit3:

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, General Tiling, Fission and Fusion for Locality.

Unit4:

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.

Unit5:

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.

Unit 6:

Recent trends in compiler design for high performance computing and message passing machines and scalable shared memory machine.

References:

- Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Familiar with the structure of compiler.

CO 2: Understand Parallel loops

CO 3: Identify Data dependency

CO 4: Understand Exception handling and debugging in compiler.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	M	L	-	-	L	-	-	L	L	L	L
CO2	L2	H	M	M	-	-	M	-	-	M	-	L	L
CO3	L3	M	H	L	-	--	L	-	-	L	L	M	M
CO4	L2	H	-	M	-	-	M	-	-	M	L	L	L

COURSE OBJECTIVE

- To provide insight to the mathematical formulation of real world problems.
-
- To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems.

Syllabus

Unit 1:

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

Unit 2:

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

Unit 3:

Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

Unit 4:

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

Unit 5:

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

Unit 6:

Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.

References:

- Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.
- Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.
- An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.
- Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.
- John K. Karlof (2006). Integer programming: theory and practice. CRC Press. ISBN 978-0-8493-1914-3.
- H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.
- Michael Jünger; Thomas M. Liebling; Denis Naddef; George Nemhauser; William R. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A.

Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art. Springer. ISBN 978-3- 540-68274-5.

- Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN978-0-470-37306-4.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO 1: Formulate optimization problems.

CO 2: Understand and apply the concept of optimality criteria for various types of optimization problems.

CO 3: Solve various constrained and unconstrained problems in Single variable as well as multivariable.

CO 4: Apply the methods of optimization in real life situation.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L6	H	H	H	H	H	L	M	M	M	L	M	M
CO2	L2	H	H	H	M	M	M	L	L	L	L	L	L
CO3	L3	H	H	H	H	M	L	L	L	M	L	M	M
CO4	L3	H	H	H	H	M	M	L	L	M	L	M	M

COURSE OBJECTIVE

- To understand the role of business analytics within an organization.
- To analyze data using statistical and data mining techniques and understand relationships
- To understand the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- To use decision-making tools/Operations research techniques.
- To manage business process using analytical and management tools. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Unit-I: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics, Process and organisation, 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.

Unit-VI: Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

References:

- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
- Business Analytics by James Evans, persons Education.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Understand the role of business analytics within an organization.

CO2: Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

CO3: To become familiar with processes needed to develop, report, and analyze business data.

CO4: Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

CO5: Use decision-making tools/Operations research techniques.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	M	-	M	L	M	-	M	L	-	-	L	-
CO2	L3	M	L	-	L	-	L	M	-	H	M	L	L
CO3	L6	M	-	L	-	L	M	-	H	-	M	M	L
CO4	L3	-	M	-	M	-	L	H	L	H	L	L	-
CO5	L3	M	L	H	M	L	-	H	L	L	-	L	-

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To know about Industrial safety
- To know about fundamental concepts of maintenance engineering.
- To know about preventive measures to be taken.

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 machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

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

References:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Understand the role industrial safety.

CO2: Understand fundamentals of maintenance engineering.

CO3: Learn different methods of Wearing and Corrosion and their prevention.

CO4: Trace out the faults occurring in various electrical systems.

CO5: Know about Periodic and preventive maintenance of various systems.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	H	M	M	H	-	L	M	L	H	M	L	-
CO2	L2	-	L	M	-	M	L	M	-	H	M	L	L
CO3	L2	H	H	L	H	M	H	M	M	L	M	L	L
CO4	L5	H	-	-	M	-	H	H	H	M	L	M	-
CO5	L6	H	L	L	-	L	-	-	M	-	-	M	-

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To know about the optimization Techniques.
- To know about Competitive Models.
- To learn about Formulation of a LPP.

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

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

Unit 3:

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

Unit 4

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

Unit 5

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

References:

- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010
- Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Should able to carry out sensitivity analysis.

CO2: Should able to model the real world problem and simulate it.

CO3: Should able to apply the dynamic programming to solve problems of discrete and continuous variables.

CO4: Should able to apply the concept of non-linear programming

CO5: Should be able to formulate optimization techniques.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	M	-	L	M	-	M	M	M	-	M	L	-
CO2	L6	H	L	M	H	L	H	H	H	-	H	M	L
CO3	L3	M	M	L	M	L	M	M	-	M	M	L	L
CO4	L3	-	M	L	-	M	H	-	H	H	L	M	-
CO5	L6	L	-	L	M	L	-	-	L	L	-	M	-

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To know about Cost concepts in decision-making
- To know about Project making.
- To know about Cost Behavior and Profit Planning Marginal Costing

Unit 1: 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 2: Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution : conception to commissioning. Project execution as conglomeration of technical and non technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team : Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit 3: 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

Unit 4: Planning, Enterprise Resource Planning, 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 5: Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

- Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
- Charles T. Horngren and George Foster, Advanced Management Accounting
- Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
- Ashish K. Bhattacharya, Principles & Practices of CostAccounting A. H. Wheeler publisher
- N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Should able to do cost management for various projects.

CO2: Should able to understand the meaning of cost management.

CO3: Should able to analyze Cost Behavior and Profit Planning.

CO4: Understand Quantitative techniques for cost management

CO5: Analyze the pricing and apply for various projects.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	L	L	-	L	M	L	-	M	M	-	L	M
CO2	L2	L	-	M	-	H	L	H	-	L	L	L	L
CO3	L5	-	M	L	L	M	-	M	M	-	M	L	L
CO4	L3	L	M	L	M	-	H	-	L	M	L	M	L
CO5	L2	L	-	L	-	L	M	M	L	L	-	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To know about introduction to composite materials.
- To know about reinforcements.
- To know about manufacturing process of composite materials.

UNIT-I: INTRODUCTION: Definition – Classification and characteristics of Composite materials.

Advantages and application of composites. Functional requirements of reinforcement and matrix.

Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass

fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle

reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures.

Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: 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: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximum

strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight

strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

- Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
- Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

REFERENCES:

- Hand Book of Composite Materials-ed-Lubin.
- Composite Materials – K.K.Chawla.
- Composite Materials Science and Applications – Deborah D.L. Chung.
- Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Understand Definition – Classification and characteristics of Composite materials.

CO2: Know about Reinforcements.

CO3: Know about manufacturing of Metal Matrix Composites.

CO4: Know about manufacturing of Polymer Matrix Composites.

CO5: Know about strength and laminates.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L4	L	L	-	H	H	-	H	L	-	L	M	-
CO2	L2	L	-	M	H	-	L	H	-	M	M	L	L
CO3	L2	M	L	L	-	L	H	-	L	L	-	L	L
CO4	L2	-	M	-	M	M	-	H	M	-	M	L	-
CO5	L2	L	L	L	-	L	H	-	L	L	-	L	-

H- High, M- Moderate, L- Low, '-' for No correlation

COURSE OBJECTIVE

- To know about Energy waste introduction.
- To know about Biomass process.
- To know about various types of biomass plants and gasifiers.

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:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Know about various forms of Energy wastage.

CO2: Know about Biomass introduction.

CO3: Know about Biomass gasifiers.

CO4: Know about Biogas properties.

CO5: Know about Biomass combustion.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L4	H	-	H	L	-	L	H	H	H	-	M	L
CO2	L2	L	L	L	M	L	L	L	L	L	-	L	L
CO3	L2	H	L	-	L	-	-	H	H	H	-	L	L
CO4	L2	L	M	L	-	L	L	-	L	L	L	M	-
CO5	L2	H	-	H	M	L	-	H	-	H	-	M	-

H- High, M- Moderate, L- Low, '-' for No correlation

MTCS303 Dissertation I

Syllabus

Mid Sem Evaluation weightage - 30%

End Sem Evaluation weightage - 70%

Dissertation-I: will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution. Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

COURSE OUTCOMES

By the end of this course every student is expected to be able to

CO1: handle research problems and use modern research tools/methods.

CO2: analyze and review the existing literature on a research problem.

CO3: design and conduct experiments.

CO4: write dissertation and technical reports.

CO5: publish research papers.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L3	M	H	H	L	M	-	-	-	-	-	M	M
CO2	L4	M	M	H	L	M	M	-	-	-	L	M	L
CO3	L6	H	L	M	M	H	L	-	-	-	M	H	L
CO4	L3	H	-	M	H	H	H	-	-	-	L	M	M
CO5	L3	H	-	M	H	M	H	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

SEMESTER - IV

Course Number	Subject	L	T	P	IA	EA	Total	Credits
MTCS401	Dissertation II	0	0	32	300	400	700	16
Total		0	0	32	300	400	700	16

MTCS401 Dissertation II

Syllabus

Dissertation – II: will be extension of the to work on the topic identified in Dissertation – I. Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be presubmission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

COURSE OUTCOMES

By the end of this course every student is expected to be able to

CO1: handle research problems and use modern research tools/methods.

CO2: analyze and review the existing literature on a research problem.

CO3: design and conduct experiments.

CO4: write dissertation and technical reports.

CO5: publish research papers.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	M	H	H	L	M	-	-	-	-	-	M	M
CO2	L4	M	M	H	L	M	M	-	-	-	L	M	L
CO3	L6	H	L	M	M	H	L	-	-	-	M	H	L
CO4	L3	H	-	M	H	H	H	-	-	-	L	M	M
CO5	L3	H	-	M	H	M	H	-	-	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Audit Courses (Common for all)

MTCSCS 106

MTCSCS 205

AUDIT 1 and 2 : ENGLISH FOR RESEARCH PAPER WRITING

COURSE OBJECTIVE

- To understand that how to improve your writing skills and level of readability
- To learn about what to write in each section
- To understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus

UNIT-1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT-2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

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

UNIT-3: 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-4: 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-5: useful phrases, how to ensure paper is as good as it could possibly be the first- time Submission.

Suggested Studies:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Students should know how to Plan and Prepare research paper.

CO2: Knowledge of Paraphrasing, Plagiarism and Literature review.

CO3: Knowledge and understanding of write every aspect and part of thesis like Abstract, Literature review, Title, etc.,

CO4: Discussion and skills developed in students when writing the Conclusions.

CO5: Ensuring students to write the paper first- time and also giving them knowledge about the quality of paper and procedure of Submission.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	H	M	H	M	-	L	M	L	L	M	L	L
CO2	L1	M	-	L	L	M	-	H	H	M	M	L	L
CO3	L1,L2	L	H	L	M	H	L	H	M	H	L	L	L
CO4	L2	M	M	-	L	H	M	-	M	M	-	L	L
CO5	L1	M	L	L	L	M	L	M	L	-	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2: DISASTER MANAGEMENT

COURSE OBJECTIVE

- To demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- To critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- To develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- To 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.

Syllabus

UNIT-1: Introduction

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT-2: 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, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War and Conflicts.

UNIT-3: Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT-4: 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-5: 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.

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.

Suggested Studies:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Knowledge of disaster and its types.

CO2: Knowledge of Repercussions of Disasters And Hazards.

CO3: Study of Seismic Zones and Disaster Prone Areas In India.

CO4: Study of Disaster Preparedness and Management.

CO5: Understanding Disaster Risk Situation, Risk Assessment and Disaster Mitigation in India.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom 's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
CO1	L1	H	M	H	L	-	L	M	L	L	M	L	L
CO2	L1	M	H	L	L	M	M	-	-	M	L	L	L
CO3	L2	-	M	L	M	L	M	-	M	H	M	L	L
CO4	L2	M	H	-	L	M	L	-	M	M	M	L	L
CO5	L2	M	M	L	H	M	L	L	H	L	-	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2 : SANSKRIT FOR TECHNICAL KNOWLEDGE

COURSE OBJECTIVE

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- To do Learning of Sanskrit to improve brain functioning
- To have thorough Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- To enhance the memory power
- To explore the huge knowledge from ancient literature

Syllabus

UNIT-1: Alphabets in Sanskrit.

UNIT-2: Past/Present/Future Tense.

UNIT-3: Simple Sentences Order.

UNIT-4: Introduction of roots.

UNIT-5: Technical information about Sanskrit Literature, Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested Studies:

1. “Abhyasustakam” – 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 OF SANSKRIT FOR TECHNICAL KNOWLEDGE

At the end of the course, the student will be able to:

CO1: Knowledge of Alphabets in Sanskrit.

CO2: Knowledge of Past/Present/Future Tense.

CO3: Study of Simple Sentences Order.

CO4: Introduction of roots and its knowledge.

CO5: Understanding Technical information and concepts about Sanskrit Literature and related Engineering concepts.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	M	M	H	L	-	L	M	L	L	L	L	L
CO2	L1	M	-	L	L	M	-	H	M	M	L	L	L
CO3	L2	L	H	L	M	H	M	L	M	H	M	L	L
CO4	L1	M	H	-	L	M	L	-	-	M	L	L	L
CO5	L2	-	M	L	L	M	M	L	H	L	-	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2 : VALUE EDUCATION

COURSE OBJECTIVE

- To understand value of education and self-development
- To imbibe good values in students
- To let the should know about the importance of character

Syllabus

UNIT-1: Values and self-development –Social values and individual attitudes.

Work ethics, Indian vision of humanism.

- Moral and non- moral valuation. Standards and principles.
- Value judgments

UNIT-2: 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-3: Personality and Behavior Development - Soul and Scientific attitude.

- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labor.
- Universal brotherhood and religious tolerance.

UNIT-4: Positive Thinking. Integrity and discipline. Positive Thinking. Integrity and discipline.

- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature

UNIT-5: 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.

Suggested Studies:

- 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:

CO1: Knowledge of Values and self-development.

CO2: Understanding the Importance of cultivation of values.

CO3: Study of Personality and Behavior Development.

CO4: Understanding and inculcating Positive Thinking.

CO5: Study of Character and Competence.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	M	H	H	L	-	L	M	L	L	L	L	L
CO2	L1	M	M	L	L	M	L	M	-	M	L	L	L
CO3	L2	L	H	L	M	M	M	M	L	H	-	L	L
CO4	L2	M	H	-	L	M	-	-	L	M	L	L	L
CO5	L2	-	M	L	L	M	L	L	L	L	L	L	L

H- High, M- Moderate, L- Low, ‘-’ for No correlation

AUDIT 1 and 2 : CONSTITUTION OF INDIA

COURSE OBJECTIVE

- To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

UNIT-1: History of Making of the Indian Constitution:

History Drafting Committee, (Composition & Working).

Philosophy of the Indian Constitution: Preamble Salient Features.

UNIT-2: 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-3: 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-3: 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: Zila Pachayat.

Elected officials and their roles, CEO Zila Pachayat: Position and role.

Block level: Organizational Hierarchy (Different departments),

Village level: Role of Elected and Appointed officials,

Importance of grass root democracy

UNIT-5: 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.

Suggested Studies:

- The Constitution of India, 1950 (Bare Act), Government Publication.
- Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
- M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Knowledge of History and Philosophy of the Indian Constitution.

CO2: Understanding the Contours of Constitutional Rights & Duties.

CO3: Study of Organs of Governance.

CO4: Understanding the Local Administration.

CO5: Study of Election Commission.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	M	H	H	L	-	L	M	L	L	M	L	L
CO2	L2	M	M	L	M	M	-	M	M	M	H	-	-
CO3	L2	L	M	L	M	L	M	H	M	H	M	-	-
CO4	L2	-	H	-	L	M	H	-	M	M	-	L	-
CO5	L2	L	M	L	L	M	L	L	-	L	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2 : PEDAGOGY STUDIES

COURSE OBJECTIVE

- To review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- To identify critical evidence gaps to guide the development.

Syllabus

UNIT-1: 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-2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.

- Curriculum, Teacher education

UNIT-3: 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-4: 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-5: Research gaps and future directions

- Research design

- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact

Suggested Studies:

- Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2):245-261.
- Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
- Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
- 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.
- Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
- Chavan M (2003) *Read India: A mass scale, rapid, ‘learning to read’ campaign*.
- www.pratham.org/images/resource%20working%20paper%202.pdf.

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Knowledge of Theories of learning and Conceptual framework.

CO2: Understanding the Pedagogical practices.

CO3: Interpretating the Theory of change when pedagogical practices are done.

CO4: Understanding the Professional development and Barriers to learning.

CO5: Study of Research gaps and future directions.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	H	M	H	L	-	L	M	L	L	L	L	L
CO2	L2	M	M	L	L	M	M	-	M	M	L	L	L
CO3	L2	H	H	L	M	M	M	M	M	H	M	L	L
CO4	L2	L	H	-	L	M	-	M	-	M	M	L	L
CO5	L2	L	M	L	L	M	L	L	L	L	-	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

COURSE OBJECTIVE

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

Syllabus

UNIT-1: Definitions of Eight parts of yog (Ashtanga).

UNIT-2: Yam and Niyam: Do`s and Don`t`s in life.

UNIT-3: Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwar pranidhan.

UNIT-4: Asan and Pranayam

I) Various yog poses and their benefits for mind & body

UNIT-5: Regularization of breathing techniques and its effects-Types of pranayam.

Suggested Studies:

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

COURSE OUTCOMES

At the end of the course, students will be able to:

CO1: Knowledge of Eight parts of yog (Ashtanga).

CO2: Understanding the Do`s and Don`t`s in life.

CO3: Knowledge and application of Ahinsa, satya, astheya, bramhacharya, aparigraha, Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

CO4: Pracicing Asan and Pranayam..

CO5: Regularization of breathing techniques and its effects.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	M	M	H	L	-	L	M	L	L	L	L	L
CO2	L2	M	M	L	L	M	M	H	-	M	-	L	L
CO3	L1,L3	L	H	L	M	L	M	M	M	H	M	L	L
CO4	L3	M	H	-	L	M	M	-	M	M	M	-	-
CO5	L1,L2	L	M	L	L	M	L	H	L	L	L	-	-

H- High, M- Moderate, L- Low, '-' for No correlation

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

COURSE OBJECTIVE

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

Syllabus

UNIT-1: Neetisatakam - Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29, 31, 32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52, 53, 59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-2: 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-3: Statements of basic knowledge.

- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16, 17, 18

UNIT-4: 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

Suggested Studies:

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

At the end of the course, students will be able to:

CO1: Knowledge of Neetisatakam - Holistic development of personality.

CO2: Approach to day to day work and duties.

CO3: Understanding the Theory of Statements of basic knowledge.

CO4: Understanding the Personality of Role model. Shrimad Bhagwad Geeta.

CO5: Study of Personality Development through Life Enlightenment Skills.

Mapping of Course Outcomes with Program Outcomes

Course Outcome S	Bloom's Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L1	M	M	M	L	-	L	M	L	L	M	-	-
CO2	L1,L2	M	H	L	L	M	M	-	H	M	L	-	-
CO3	L2	L	H	L	M	M	L	M	L	H	L	-	-
CO4	L2	M	L	-	L	L	M	M	M	M	-	-	-
CO5	L2	M	M	L	L	M	L	L	L	L	M	-	-

H- High, M- Moderate, L- Low, '-' for No correlation

6. TEACHING-LEARNING PROCESS/ METHODOLOGY (TLM):

The teaching-learning process should be aimed at systematic exposition of basic concepts so as to acquire knowledge of technical program in a canonical manner. In this context, applications of technical program and linkage with the theory constitute a vital aspect of the teaching-learning process. The course offers many modes of learning and assessment methods. Students have great freedom of choice of course which they can study. The various components of teaching learning process are summarized in the following heads.

1. **Class room Lectures:** The most common method of imparting knowledge is through lectures. There are diverse modes of delivering lectures such as through blackboard, power point presentation and other technology aided means. A judicious mix of these means is a key aspect of teaching-learning process.
2. **Tutorials:** To reinforce learning, to monitor progress, and to provide a regular pattern of study, tutorials are essential requirements. During these tutorials, difficulties faced by the students in understanding the lectures, are dealt with. Tutorials are also aimed at solving problems associated with the concepts discussed during the lectures.
3. **Practical:** To provide scientific visualization and obtaining results of Technical program in practical sessions. These sessions provide vital insights into scientific concepts and draw learner's attention towards limitations of scientific computations. During practical, scientific models arising in real life problems can also be simulated.
4. **Choice based learning/Open elective:** LOCF in this undergraduate program provides great flexibility both in terms of variety of courses and range of references in each course.
5. **Field based learning:** Students may enhance their knowledge through field based learning while understanding the practical importance.
6. **Textbooks learning:** A large number of books are included in the list of references of each course for enrichment and enhancement of knowledge.
7. **E-learning:** Learner may also access electronic resources and educational websites for better understanding and updating the concepts.
8. **Self-study materials:** Self-study material provided by the teachers is an integral part of learning. It helps in bridging the gaps in the classroom teaching. It also provides scope for teachers to give additional information beyond classroom learning.
9. **Assignment/Problem solving:** Assignments at regular intervals involving applications of theory are necessary to assimilate basic concepts of courses.

Hence, it is incumbent on the part of a learner to complete open-ended projects assigned by the teacher.

10. **Internships:** The teaching-learning process needs to be further supported by other activities devoted to subject-specific and interdisciplinary skills, summer and winter internships. During these internships it is expected that a learner will interact with experts and write a report on a topic provided to the learner.
11. **Institute visits:** Institute visit by a learner is also a part of learning process. During such visits a learner has access to knowledge by attending academic activities such as seminars, colloquia, library consultation and discussion with faculty members. These activities provide guidance and direction for further study.
12. **Industrial visits:** Industrial visits offer an opportunity to observe applications of scientific concepts. These visits also give an opportunity to realize the power of mathematical ideas and their translation in problem solving.
13. **Training programs:** Training programs organized by various agencies/institutes provide an opportunity to learn various dimensions of courses.