1st Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCSCE1-101	Mathematical Foundations of Computer Science	3	0	0	40	60	100	3
MCSCE1-102	Advanced Data Structures	3	0	0	40	60	100	3
MRMIP0-101	Research Methodology and IPR	2	0	0	40	60	100	2
MCSCE1-103	Lab.-I (Advanced Data Structures Lab)	0	0	4	60	40	100	2
Departmental Elective-I		3	0	0	40	60	100	3
MCSCE1-156	Machine Learning							
MCSCE1-157	Wireless Sensor Networks							
MCSCE1-158	Introduction to Intelligent Systems							
Departmental Elective-II		3	0	0	40	60	100	3
MCSCE1-159	Data Science							
MCSCE1-160	Distributed Systems							
MCSCE1-161	Advanced Wireless and Mobile Networks							
Lab.-II (Based on any one Departmental Elective chosen in 1st semester)		0	0	4	60	40	100	2
MCSCE1-162	Machine Learning Lab							
MCSCE1-163	Wireless Sensor Networks Lab							
MCSCE1-164	Introduction to Intelligent Systems Lab							
MCSCE1-165	Data Science Lab							
MCSCE1-166	Distributed Systems Lab							
MCSCE1-167	Advanced Wireless and Mobile Networks Lab							
Audit Course (Choose any one)		2	0	0	100	0	100	0
MHUMA0-101	English For Research Paper Writing							
MCIVE0-101	Disaster Management							
MHUMA0-102	Sanskrit for Technical Knowledge							
MHUMA0-103	Value Education							
MHUMA0-104	Constitution of India							
MHUMA0-105	Pedagogy Studies							
MHUMA0-106	Stress Management by Yoga							
MHUMA0-107	Personality Development through Life Enlightenment Skills							
Total		**16**	**0**	**8**	**420**	**380**	**800**	**18**

2nd Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCSCE1-204	Advanced Algorithms	3	0	0	40	60	100	3
MCSCE1-205	Soft Computing	3	0	0	40	60	100	3
Lab.-III (Based on Cores of 2nd Semester)		0	0	4	60	40	100	2
MCSCE1-268	Advanced Algorithm Lab.							
MCSCE1-269	Soft Computing Lab.							
Departmental Elective-III		3	0	0	40	60	100	3
MCSCE1-270	Data Preparation and Analysis							
MCSCE1-271	Secure Software Design & Enterprise Computing							
MCSCE1-272	Computer Vision							
Departmental Elective-IV		3	0	0	40	60	100	3
MCSCE1-273	Human and Computer Interaction							
MCSCE1-274	GPU Computing							
MCSCE1-275	Digital Forensics							
Lab.-IV 2 (Based on Electives of 2nd Semester)		0	0	4	60	40	100	2
MCSCE1-276	Data Preparation and Analysis Lab							
MCSCE1-277	Secure Software Design & Enterprise Computing Lab							
MCSCE1-278	Computer Vision Lab							
MCSCE1-279	Human and Computer Interaction Lab							
MCSCE1-280	GPU Computing Lab							
MCSCE1-281	Digital Forensics Lab							
MCSCE1-206	Mini Project With Seminar	0	0	4	60	40	100	2
Audit Course (Choose any one)		2	0	0	-	-	-	0
MHUMA0-101	English For Research Paper Writing							
MCIVE0-101	Disaster Management							
MHUMA0-102	Sanskrit for Technical Knowledge							
MHUMA0-103	Value Education							
MHUMA0-104	Constitution of India							
MHUMA0-105	Pedagogy Studies							
MHUMA0-106	Stress Management by Yoga							
MHUMA0-107	Personality Development through Life Enlightenment Skills							
Total		**14**	**0**	**12**	**340**	**360**	**700**	**18**

Note: Choose any one Audit Course in the table for 2nd semester except the one chosen in 1st semester.

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Subject Code: MCSCE1-101 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

To understand the mathematical fundamentals that is prerequisites for a variety of courses like:

1. Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
2. 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.
3. To study various sampling and classification problems.

Course Outcomes:

After completion of course, students would be able to:

CO1: To understand the basic notions of discrete and continuous probability.

CO2: To understand the methods of statistical inference, and the role that sampling distributions play in those methods.

CO3: To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

UNIT-I

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

UNIT-II

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

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

UNIT-III

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

UNIT-IV

Applications of Mathematics in various fields of Computer science and engineering.

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

Recommended Books:

1. John Vince, ‘Foundation Mathematics for Computer Science’, Springer.
2. K. Trivedi, ‘Probability and Statistics with Reliability, Queuing, and Computer Science Applications’, Wiley.
3. M. Mitzenmacher and E. Upfal, ‘Probability and Computing: Randomized Algorithms and Probabilistic Analysis’.
4. Alan Tucker, ‘Applied Combinatorics’, Wiley.

ADVANCED DATA STRUCTURES

Subject Code: MCSCE1-102 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

1. The student should be able to choose appropriate data structures, understand the ADT/libraries and use it to design algorithms for a specific problem.
2. Students should be able to understand the necessary mathematical abstraction to solve problems.
3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Student should be able to come up with analysis of efficiency and proofs of correctness.

Course Outcomes:

After completion of course, students would 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.
CO3: Develop algorithms for text processing applications.
CO4: Identify suitable data structures and develop algorithms for computational geometry problems

UNIT–I

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

UNIT–II

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists
Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

UNIT–III

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 – IV

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.

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

Recommended Books:

1. Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C++', 2nd Edn., Pearson, **2004**.
2. M.T. Goodrich, Roberto Tamassia, 'Algorithm Design', John Wiley, **2002**.

RESEARCH METHODOLOGY AND IPR

Subject Code: MRMIP0-101 **L T P C** **Duration: 28 Hrs.**
2 0 0 2

Course Objectives:
To learn the fundamentals of Operating Systems and gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols

Course Outcomes:
At the end of this 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.

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT-II

Effective literature studies approaches, analysis Plagiarism, Research ethics, 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-III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. Introduction to international Scenario on Intellectual Property, Procedure for grants of patents, Patenting under PCT.

UNIT-IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases.

New Developments in IPR: Administration of Patent System. New developments in IPR: introduction to IPR of Biological Systems, Computer Software etc. Traditional Knowledge Case Studies, IPR or IITs

Recommended Books:

1. Stuart Melville and Wayne Goddard, 'Research methodology: An Introduction for Science & Engineering Students'.
2. Wayne Goddard and Stuart Melville, 'Research Methodology: An Introduction'.
3. Ranjit Kumar, 2nd Edn., 'Research Methodology: A Step by Step Guide for Beginners'.
4. Halbert, 'Resisting Intellectual Property', Taylor & Francis Ltd., **2007**.
5. Mayall , 'Industrial Design', McGraw Hill, **1992**.
6. Niebel , 'Product Design', McGraw Hill, **1974**.
7. Asimov, 'Introduction to Design', Prentice Hall, **1962**.

8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, 'Intellectual Property in New Technological Age', **2016**.
9. T. Ramappa, 'Intellectual Property Rights Under WTO', S. Chand, **2008.**

LAB.-I (ADVANCED DATA STRUCTURES)

Subject Code: MCSCE1-103 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using C/C++/java

EXP 1: Program to store k keys into an array of size n at the location computed using a hash function, loc = key % n, where k<=n and k takes values from [1 to m], m>n. To handle the collisions, use the following collision resolution techniques,

a) Linear probing,
b) Quadratic probing,
c) Double hashing/rehashing,
d) Chaining

EXP 2: Program for Binary Search Tree to implement following operations:

a) Insertion,
b) Deletion,
   i) Delete a node with only child,
   ii) Delete a node with both children
c) Finding an element,
d) Finding Min element,
e) Finding Max element,
f) Left child of the given node,
g) Right child of the given node,
h) Finding the number of nodes, leaves nodes, full nodes, ancestors, descendants.

EXP 3: Program for AVL Tree to implement following operations: (For nodes as integers)

a) Insertion: Test program for all cases (LL, RR, RL, LR rotation),
b) Deletion: Test Program for all cases (R0, R1, R-1, L0, L1, L-1),
c) Display: using set notation.

EXP 4: Program to implement Red-Black trees with insertion and deletion operation for the given input data as Integers/Strings

EXP 5: Program to implement insertion, deletion, display and search operation in m-way B tree (i.e. a non-leaf node can have at most m children) for the given data as integers.

EXP 6: Program to perform string matching using Knuth-Morris-Pratt algorithm.

EXP 7: Program to perform string matching using Boyer-Moore algorithm.

EXP 8: Program to implement 2-D range search over computational geometry problem

EXP 9: Program on latest efficient algorithms on trees for solving contemporary problems.

Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

MACHINE LEARNING

Subject Code: MCSCE1-156 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.

2. To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. To explore Deep learning technique and various feature extraction strategies.

Course Outcomes:

After completion of course, students would be able to:

CO1: Extract features that can be used for a particular machine learning approach in various IOT applications.

CO2: To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.

CO3: To mathematically analyze various machine learning approaches and paradigms.

UNIT-I

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

UNIT-II

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

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

UNIT-III

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

Scalable Machine Learning (Online and Distributed Learning). A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

UNIT-IV

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

Recommended Books:

1. Kevin Murphy, 'Machine Learning: A Probabilistic Perspective', MIT Press, **2012**.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, 'The Elements of Statistical Learning', Springer, **2009** (freely available online).
3. Christopher Bishop, 'Pattern Recognition and Machine Learning', Springer, **2007**.

WIRELESS SENSOR NETWORKS

Subject Code: MCSCE1-157 **L T P C** **Duration: 38 Hrs.**

3 0 0 3

Course Objectives:

1. Architect sensor networks for various application setups.
2. Devise appropriate data dissemination protocols and model links cost
3. Understanding of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
4. Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes:

After completion of course, students would be able to:

CO1: Describe and explain radio standards and communication protocols for wireless sensor networks.
CO2: Explain the function of the node architecture and use of sensors for various applications.
CO3: Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.

UNIT-I

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-II

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

UNIT-III

Routing Protocols: Introduction, MANET protocols
Routing Protocols for WSN: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast.
Opportunistic Routing Analysis: Introduction to opportunistic routing.

UNIT-IV

Security: Possible attacks, countermeasures, SPINS, Static and dynamic key distribution.
ADVANCED TOPICS Recent development in WSN standards, software applications.

Recommended Books:

1. W. Dargie and C. Poellabauer, 'Fundamentals of Wireless Sensor Networks –Theory and Practice', Wiley, **2010.**
2. Kazem Sohraby, Daniel Minoli and Taieb Znati, 'Wireless Sensor Networks -Technology, Protocols, and Applications', Wiley Interscience, **2007**.
3. Takahiro Hara, Vladimir I. Zadorozhny and Erik Buchmann, 'Wireless Sensor Network Technologies for the Information Explosion Era', Springer, **2010**.

INTRODUCTION TO INTELLIGENT SYSTEMS

Subject Code: MCSCE1-158 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:
The aim of the course is 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.
Course Outcomes:
After completion of course, students would be:
CO1 Able to demonstrate knowledge of the fundamental principles of intelligent systems and would be able to analyses and compare the relative merits of a variety of AI problem solving techniques.

UNIT-I

Biological Foundations to Intelligent Systems I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks.
Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.

UNIT-II

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. Optimization and search such as stochastic annealing and genetic algorithm.

UNIT-III

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-IV

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

Recommended Books:

1. G.F. Luger and W.A. Stubblefield, 'Artificial Intelligence: Structures and Strategies for Complex Problem Solving', 6th Edn., Addison Wesley, **2008**.
2. S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', 3rd Edn., Prentice-Hall, **2009**.

DATA SCIENCE

Subject Code: MCSCE1-159 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

1. Provide you with the knowledge and expertise to become a proficient data scientist.
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
3. Produce Python code to statistically analyses a dataset
4. Critically evaluate data visualizations based on their design and use for communicating stories from data

Course Outcomes:

On completion of the course the student should be able to
CO1: Explain how data is collected, managed and stored for data science;
CO2: Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
CO3: Implement data collection and management scripts using MongoDB

UNIT-I

Introduction to Core Concepts and Technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.
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-II

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-III

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

UNIT-IV

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

Recommended Books:

1. Cathy O'Neil and Rachel Schutt, 'Doing Data Science, Straight Talk from the Frontline', O'Reilly.
2. Jure Leskovek, Annand Rajaraman and Jeffrey Ullman, 'Mining of Massive Datasets', Vol.- 2.1, Cambridge University Press.

DISTRIBUTED SYSTEMS

Subject Code: MCSCE1-160 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:
Course Outcomes: After completion of course, students would be:
CO1: Design trends in distributed systems.

UNIT-I

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

UNIT-II

Distributed Database: Design Alternative design strategies; Distributed design issues; Fragmentation; Data allocation. BASICS OF SEMANTIC DATA CONTROL, QUERY PROCESSING ISSUES Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.

UNIT-III

Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries;
Transaction Management The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models.
Concurrency Control Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

UNIT-IV

Reliability: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols.
Parallel Database Systems: Parallel architectures; parallel query processing and optimization; load balancing.
Advanced Topics: Mobile Databases, Multi-databases.

Recommended Books:

1. M.T. Ozsu and P. Valduriez, 'Principles of Distributed Database Systems', Prentice Hall, **1991**.
2. D. Bell and J. Grimson, 'Distributed Database Systems', Addison Wesley, **1992**.

ADVANCED WIRELESS AND MOBILE NETWORKS

Subject Code: MCSCE1-161 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

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

Course Outcomes:

After completion of course, students would be:

CO1: Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
CO2: Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
CO3: Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
CO4: Design wireless networks exploring trade-offs between wire line and wireless links.
CO5: Develop mobile applications to solve some of the real world problems.

UNIT-I

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-II

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-III

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-IV

WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors.

Security: Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.
Advanced Topics: IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks.
Recommended Books:

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

MACHINE LEARNING LAB.

Subject Code: MCSCE1-162 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using WEKA/R/PYTHON etc. similar software
Expt. 1: Study of platform for Implementation of Assignments Download the open source software of your interest. Document the distinct features and functionality of the software platform. You may choose WEKA, R or any other software.
Expt. 2: Supervised Learning – Regression Generate a proper 2-D data set of N points. Split the data set into Training Data set and Test Data set.
a) Perform linear regression analysis with Least Squares Method.
b) Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error.
c) Verify the Effect of Data Set Size and Bias-Variance Trade off.
d) Apply Cross Validation and plot the graphs for errors. v) Apply Subset Selection Method and plot the graphs for errors. Describe your findings in each case.
Expt. 3: Supervised Learning – Classification Implement Naïve Bayes Classifier and K-Nearest Neighbour Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.
Expt. 4: Unsupervised Learning Implement K-Means Clustering and Hierarchical clustering on proper data set of your choice. Compare their Convergence.
Expt. 5: Dimensionality Reduction Principal Component Analysis-Finding Principal Components, Variance and Standard Deviation calculations of principal components.
Expt. 6: Supervised Learning and Kernel Methods Design, Implement SVM for classification with proper data set of your choice. Comment on Design and Implementation for Linearly non-separable Dataset.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

WIRELESS SENSOR NETWORKS LAB.

Subject Code: MCSCE1-163 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using NS2/NS3
Expt. 1: Introduction to Network Simulators used for Wireless Sensor Networks.
Expt. 2: Introduction to TCL scripting: Demonstration of one small network simulator setup.

Expt. 3: To study various trace files formats of Network Simulators.
Expt. 4: To create a sensor network setup using the nodes configured with fixed initial energy, transmission power, reception power, routing agent, transport agent and application in rectangular area.
Expt. 5: Create different simulation scenarios by varying MAC protocols.
Expt. 6: Compute the performance of above created simulation scenarios of network in terms of total energy consumption, transmission latency, number of packets generated, received and dropped.
Expt. 7: To implement and compare various routing protocols using above mentioned performance metrics.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

INTRODUCTION TO INTELLIGENT SYSTEMS LAB.

Subject Code: MCSCE1-164 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using Matlab/Python
Expt. 1: Implementation of simple artificial neural network.
Expt. 2: Implementation of neural network with backpropagation.
Expt. 3: Implementation of radial basis function network
Expt. 4: Implementation of recurrent neural network.
Expt. 5: Implementation of fuzzy neural network.
Expt. 6: Implementation of iterative deepening search.
Expt. 7: Implementation of Hill climbing Search algorithm.
Expt. 8: Implementation of optimization genetic algorithm.
Expt. 9: Implementation of induction based learning method such as decision tree.
Expt. 10: Implementation of statistical learning methods such as naive Bayes.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

DATA SCIENCE LAB.

Subject Code: MCSCE1-165 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using Matlab/Python/R
Expt. 1: **Introduction to R:** This Cycle introduces you to the use of the R statistical package within the Data Science and Big Data Analytics environment. After completing the tasks in this cycle you should able to: a. Read data sets into R, save them, and examine the contents. Tasks you will complete in this Cycle include:
a) Invoke the R environment and examine the R workspace.
b) Created table and datasets in R.
c) Examine, manipulate and save datasets. d. Exit the R environment.
Expt. 2: **Basic Statistics and Visualization:** This Cycle introduces you to the analysis of data using the R statistical package within the Data Science and Big Data Analytics environment. After completing the tasks in Tins Cycle you should able to:
a) Perform summary (descriptive) statistics on the datasets.

b) Create basic visualizations using R both to support investigation of the data as well as exploration of the data.
c) Create plot visualizations of the data using a graphics package.

Tasks you will complete in this Cycle include:

a) Reload data sets into the R statistical package.
b) Perform summary statistics on the data.
c) Remove outliers from the data.
d) Plot the data using R.
e) Plot the data using lattice and ggplot.

Expt. 3: **K-means Clustering:** This Cycle is designed to investigate and practice K-means Clustering. After completing the tasks in This Cycle you should able to:

a) Use R functions to create K-means Clustering models.
b) Use ODBC connection to the database and execute SQL statements and load datasets from the database in an R environment.
c) Visualize the effectiveness of the K-means Clustering algorithm using graphic capabilities in R.
d) Use the ODBC connection in the R environment to create the average household income from the census database as test data for K-means Clustering.
e) Use R graphics functions to visualize the effectiveness of the K-means Clustering algorithm.

Expt. 4: **Association Rules:** This Cycle is designed to investigate and practice Association Rules. After completing the tasks in This Cycle you should able to: a. Use R functions for Association Rule based models. Tasks you will complete in this Cycle include:

a) Use the R-Studio environment to code Association Rule models.
b) Apply constraints in the Market Basket Analysis methods such as minimum thresholds on support and confidence measures that can be used to select interesting rules from the set of all possible rules.
c) Use R graphics "rules" to execute and inspect the models and the effect of the various thresholds.

Expt. 5: Linear Regression: This Cycle is designed to investigate and practice linear regression. After completing the tasks in This Cycle you should able to:

a) Use R functions for Linear Regression (Ordinary Least Squares - OLS).
b) Predict the dependent variables based on the model.
c) Investigate different statistical parameter tests that measure the effectiveness of the model. Tasks you will complete in This Cycle include:

a) Use the R-Studio environment to code OLS models
b) Review the methodology to validate the model and predict the dependent variable for a set of given independent variables
c) Use R graphics functions to visualize the results generated with the mode

Expt. 6: **Naïve Bayesian Classifier:** This Cycle is designed to investigate and practice Navive Bayesian classifier. After completing the tasks in this Cycle you should able to:

a) Use R functions for Naïve Bayesian Classification
b) Apply the requirements for generating appropriate training data
c) Validate the effectiveness of the Naïve Bayesian Classifier with the big data.

Tasks you will complete in Tins Cycle include:

a) Use R-Studio environment to code the Naïve Bayesian Classifier
b) Use the ODBC connection to the "census" database to create a training data set for Naïve Bayesian Classifier from the big data.
c) Use the Naive Bayesian Classifier program and evaluate how well it predicts the results using the training data and then compare the results with original data.

Expt. 7: **Decision Trees:** This Cycle is designed to investigate and practice Decision Tree (DT) models covered in the course work. After completing the tasks in This Cycle you should able to:

a) Use R functions for Decision Tree models.
b) Predict the outcome of an attribute based on' the model.

Tasks you will complete in This Cycle include:

a) Use the R-Studio environment to code Decision Tree Models.
b) Build a Decision Tree Model based on data whose schema is composed of attributes.
c) Predict the outcome of one attribute based on the model.

Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

DISTRIBUTED SYSTEMS LAB.

Subject Code: MCSCE1-166 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using any open source tool

Expt. 1: Installation and configuration of database packages.
Expt. 2: Creating and managing database objects (Tables, views, indexes etc.)
Expt. 3: Creating and managing database security through user management.
Expt. 4: Creating and maintaining database links.
Expt. 5: Implement Partitioning on the database tables.
Expt. 6: Implement various Transaction concurrency control methods [i.e. lock's] by executing multiple update and queries.
Expt. 7: Performance tuning of SQL queries.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

ADVANCED WIRELESS AND MOBILE NETWORKS LAB.

Subject Code: MCSCE1-167 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using NS2/NS3/Omnet++

Expt. 1: Setup & Configuration of Wireless Access Point (AP)
Expt. 2: Study of WLAN: Ad Hoc & Infrastructure Mode
Expt. 3: Study of Bluetooth Protocol and Applications
Expt. 4: GSM modem study and SMS client-server application
Expt. 5: Mobile Internet and WML
Expt. 6: J2ME Program for Mobile Node Discovery
Expt. 7: Mobile protocol study using omnet++
Expt. 8: Wireless Network Security: kismet and Netstumbler
Expt. 9: Design and Program Income Tax and Loan EMI Calculator for Mobile Phones
Mini Project: Implementation of Mobile Network using Network Simulator (NS2/NS3).

ADVANCED ALGORITHMS

Subject Code- MCSCE1-204 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:

1. Introduce students to the advanced methods of designing and analysing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes:

After completion of course, students would be able to:

CO1: Analyze the complexity/performance of different algorithms.
CO2: Determine the appropriate data structure for solving a particular set of problems.
CO3: Categorize the different problems in various classes according to their complexity.
CO4: Students should have an insight of recent activities in the field of the advanced data structure.

UNIT-I (12 Hrs.)

Sorting: Review of various sorting algorithms, topological sorting Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis. **Matroids**: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-II (11 Hrs.)

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

UNIT-III (11 Hrs.)

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

UNIT-IV (11 Hrs.)

Linear Programming: Geometry of the feasibility region and Simplex algorithm. NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Advanced Number Theoretic Algorithm.

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

Recommended Books:

1. Cormen, Leiserson, Rivest, Stein, ‘Introduction to Algorithms’.
2. Aho, Hopcroft, Ullman, ‘The Design and Analysis of Computer Algorithms’.
3. Kleinberg and Tardos, ‘Algorithm Design’.

SOFT COMPUTING

Subject Code: MCSCE1-205 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:

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

Course Outcomes:

After completion of course, students would be able to:

CO1: Identify and describe soft computing techniques and their roles in building intelligent machines

CO2: Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

CO3: Apply genetic algorithms to combinatorial optimization problems.

CO4: Evaluate and compare solutions by various soft computing approaches for a given problem.

UNIT-I (11 Hrs.)

Introduction to Soft Computing and Neural Networks: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-II (11 Hrs.)

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-III (13 Hrs.)

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

UNIT-IV (10 Hrs.)

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.

Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

Recommended Books:

1. Jyh: Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, 'Neuro: Fuzzy and Soft Computing17', Prentice-Hall of India, **2003**.
2. George J. Klir and Bo Yuan, 'Fuzzy Sets and Fuzzy Logic: Theory and Applications17', Prentice Hall, **1995**.
3. MATLAB Toolkit Manual.

ADVANCED ALGORITHMS LAB.

Subject Code: MCSCE1-268 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using C/C++/java
Expt. 1: Program to implement Dijkstra's algorithm for single-source shortest path in a weighted directed graph.
Expt. 2: Program to find all-pairs shortest path using Floyd-Warshall algorithm.
Expt. 3: Program to find inverse of a triangular matrix using divide and conquer strategy.
Expt. 4: Program to convert base (decimal/hexa) representation to modulo representation.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

SOFT COMPUTING LAB.

Subject Code: MCSCE1-269 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using Matlab/Python
Expt. 1: Program to implement array operations in Python
Expt. 2: Program to append strings using functions in Python
Expt. 3: Study of Neural Network Tool Box/ use of Library functions
Expt. 4: Study of Fuzzy Logic Tool Box/ use of Library functions
Expt. 5: Program to perform operations on fuzzy sets.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

DATA PREPARATION AND ANALYSIS

Subject Code: MCSCE1-270 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:
To prepare the data for analysis and develop meaningful Data Visualizations
Course Outcomes:
After completion of course, students would be:
CO1 Able to extract the data for performing the Analysis.

UNIT-I (11 Hrs.)

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

UNIT-II (12 Hrs.)

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

UNIT-III (11 Hrs.)

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

UNIT-IV (11 Hrs.)

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

Recommended Books:

1. Glenn J. Myatt, 'Making Sense of Data: A Practical Guide to Exploratory Data Analysis and Data Mining'.

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

Subject Code: MCSCE1-271 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:

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

Course Outcomes:

After completion of course, students would be able to:
CO1: Differentiate between various software vulnerabilities.
CO2: Software process vulnerabilities for an organization.
CO3: Monitor resources consumption in a software.
CO4: Interrelate security and software development process

UNIT-I (11 Hrs.)

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-II (11 Hrs.)

Enterprise Application Development Describe the nature and scope of enterprise software applications, Design distributed Ntier 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 enterprise system, Present software solution.

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-III (11 Hrs.)

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

UNIT-IV (12 Hrs.)

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

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

Recommended Books:

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

COMPUTER VISION

Subject Code: MCSCE1-272 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

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

Course Outcomes:
After completion of course, students would be able to:
CO1 Developed the practical skills necessary to build computer vision applications.
CO2 To have gained exposure to object and scene recognition and categorization from images.

UNIT-I (11 Hrs.)
Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.
Edge detection, Edge detection performance, Hough transform, corner detection.

UNIT-II (11 Hrs.)
Segmentation, Morphological filtering, Fourier transform.

UNIT-III (11 Hrs.)
Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre- processing.

UNIT-IV (12 Hrs.)
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 Nonparametric methods.
Recent trends in Activity Recognition, computational photography, Biometrics.

Recommended Books:
1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Good fellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisheretal.

HUMAN AND COMPUTER INTERACTION

Subject Code: MCSCE1-273 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:
1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Be aware of mobile Human Computer interaction.
4. Learn the guidelines for user interface.
5. Understand the structure of models and theories of human computer interaction and vision.
6. Design an interactive web interface on the basis of models studied.

Course Outcomes:
After completion of course, students would be
CO1: Understand the structure of models and theories of human computer interaction and vision.
CO2: Design an interactive web interface on the basis of models studied.

UNIT-I (11 Hrs.)

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models– frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT-II (12 Hrs.)

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration Models-Hypertext, Multimedia and WWW.

UNIT-III (11 Hrs.)

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT-IV (11 Hrs.)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Recent Trends: Speech Recognition and Translation, Multimodal System.

Recommended Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, 'Human Computer Interaction', 3rd Edn., Pearson Education, **2004.**
2. Brian Fling, 'Mobile Design and Development', 1st Edn., O17Reilly Media Inc., **2009**.
3. Bill Scott and Theresa Neil, 'Designing Web Interfaces', 1st Edn., O17Reilly, **2009**.

GPU COMPUTING

Subject Code: MCSCE1-274 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:

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

Course Outcomes:

After completion of course, students would be:

CO1 Students would learn concepts in parallel programming, implementation of programs on GPUs, debugging and profiling parallel programs.

UNIT-I (11 Hrs.)

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

UNIT-II (12 Hrs.)

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

UNIT-III (11 Hrs.)

Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists,

Linked-lists. Synchronization across CPU and GPU Functions: Device functions, Host functions, Kernels functions, using libraries (such as Thrust), and developing libraries.

UNIT-IV (11 Hrs.)

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.

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

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

Recommended Books:

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

DIGITAL FORENSICS

Subject Code: MCSCE1-275 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:

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

Course Outcomes:

After completion of course, students would be able to:
CO1: Understand relevant legislation and codes of ethics
CO2: Computer forensics and digital detective and various processes, policies and procedures
CO3: E-discovery, guidelines and standards, E-evidence, tools and environment.
CO4: Email and web forensics and network forensics.

UNIT-I (11 Hrs.)

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.

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-II (12 Hrs.)

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-III (11 Hrs.)

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-IV (11 Hrs.)

Mobile Forensics: mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.

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

Recommended Books:

1. John Sammons, 'The Basics of Digital Forensics', Elsevier.
2. John Vacca, 'Computer Forensics: Computer Crime Scene Investigation', Laxmi Publications.

DATA PREPARATION AND ANALYSIS LAB.

Subject Code: MCSCE1-276 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs to be implemented using WEKA.

Expt. 1: Using weka tool to explore the data.
Expt. 2: Using weka tool to do Parametric–Means.
Expt. 3: Using weka tool to do Parametric -T-Test.
Expt. 4: Using weka tool to do Correlation analysis
Expt. 5: Preprocess the given data using weka tool.
Expt. 6: Apply different classification techniques to classify the given data set.
Expt. 7: Apply various clustering techniques to cluster the data.
Expt. 8: Apply various association rule mining algorithms.
Expt. 9: Implement classification using Decision tree.
Expt. 10: Apply Visualization methods using weka tool.

Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB.

Subject Code: MCSCE1-277 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Expt.1: Program to implement authentication to prevent various attacks.
Expt.2: Program to Limit or increasingly delay failed login attempts.
Expt.3: Create a scenario to test authentication of various security attacks.
Expt.4: Program to debug backdrop entry of given source code.
Expt.5: Program to debug HTTP headers, input fields, hidden fields, drop down lists, and other web components.
Expt.6: Program to test Input filtering via white list validation
Expt.7: Create a scenario to Set Up Your Own Private Cloud Storage.
Expt.8: Setup and configuration Various network services (DNS/ DHCP/ Terminal Services/ Clustering/ Web/ Email).
Expt.9: Design and build a database using an enterprise database system.

Expt.10: Design and implement a directory-based server infrastructure in a heterogeneous systems environment.
Expt.11: An attacker wishing to execute SQL injection manipulates a standard SQL query to exploit non-validated input vulnerabilities in a database. Show different ways that this attack vector can be executed.
Expt.12: Install IBM Rhapsody Tool using NetBeans for Java and Junit (a unit testing tool).
Expt.13: Create a Unified Modelling Language (UML) Class diagram and a UML Sequence diagram using IBM's Rhapsody modelling tool.
Expt.14: Configure NetBeans to use JUnit and test code written for the classes and methods described in the UML.

COMPUTER VISION LAB.

Subject Code: MCSCE1-278 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using MATLAB/C/C++/Java/Python on binary/grayscale/color images.
Expt. 1: Implementation of basic image transformations: a. Log b. Power law c. Negation
Expt. 2: Implementation the following:
a) Histogram processing
b) Histogram equalization/matching
Expt. 3: Implementation of piecewise linear transformations
a) Contrast stretching
b) Grey level slicing
c) Bit plane slicing
Expt. 4: Implementation of image enhancement/smoothing using
a) Linear (weighted and non-weighted filters)
b) Order statistics filters (Nonlinear filters) i. Mean ii. Median iii. Min iv. Max v. Average
Expt. 5: Implementation of image enhancement/sharpening using
a) Laplacian operators
b) Sobel's operators
c) Robert's cross operators
Expt. 6: Implement the 2D-DFT to obtain Fourier coefficients and reconstruct the image, i.e., IDFT.
Expt. 7: Implement image enhancement using Fourier low pass filters,
a) Ideal,
b) Butterworth,
c) Gaussian
Expt. 8: Implement image enhancement using Fourier high pass filters,
a) Ideal,
b) Butterworth,
c) Gaussian
Expt. 9: Implement algorithms to detect the following in an image,
a) Point,
b) Line,
c) Boundary
Expt. 10: Implement Hough transform to detect a line.
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

HUMAN AND COMPUTER INTERACTION LAB.

Subject Code: MCSCE1-279 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using C, C++, Python
Expt. 1: To understand the trouble of interacting with computers - Redesign interfaces of home appliances.
Expt. 2: Design a system based on user-centred approach.
Expt. 3: Understand the principles of good screen design.
Expt. 4: Redesign existing Graphical User Interface with screen complexity
Expt. 5: Implementation of Different Kinds of Menus
Expt. 6: Implementation of Different Kinds of Windows
Expt. 7: Design a system with proper guidelines for icons
Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The team will have to demonstrate as well as have to give a presentation of the same.

GPU COMPUTING LAB.

Subject Code: MCSCE1-280 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using C.
Expt. 1: Setting up Cuda environment.
Expt. 2: Program for parallel matrix multiplication with Cuda.
Expt. 3: Program to demonstrate grids, blocks and threads.
Expt. 4: Program for parallel radix sort.
Expt. 5: Demonstrate parallel reduction with Cuda.
Expt. 6: Program to demonstrate parallel programming for merging two lists.
Expt. 7: Program to demonstrate concept of global memory.
Expt. 8: Program to demonstrate concept of multi-GPUs.
Expt. 9: Program to demonstrate concept of profiling with parallel Nsight.
Expt. 10: Implementation of deep networks for image classification with GPU programming.

DIGITAL FORENSICS LAB.

Subject Code: MCSCE1-281 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

Programs may be implemented using tools mentioned below:
1. SysInternals Suite Microsoft System utilities for diagnosis of Windows systems
2. SANS SIFT SANS Investigate Forensic Toolkit (SIFT)
3. Wireshark Network protocol analyser
4. Trinity Rescue Kit: A Linux based recovery and repair toolkit for Windows computers.
5. Kali Linux A Pen Test toolkit based on Linux. This should only be used to check your own equipment or equipment you have been asked to test.

Expt. 1: To Develop multifaceted cyber-crime scenario (cyber-crime and cyber-terrorism) Build a top-down systematic process
a) Structure the team and players
b) Use an integrated Framework (SI-FI)
c) Integrate GOTS, COTS, and R & D Tools Use real investigators/compliment with technology experts

d) Carefully collect all data, decisions actions during experiment
e) Develop metrics for evaluation that match scenario
f) Quantify results

Expt. 2: To perform packet-level analysis using appropriate tools (e.g., Wireshark, tcpdump).
Expt. 3: To identify and extract data of forensic interest in diverse media (i.e., media forensics).
Expt. 4: To identify, modify, and manipulate applicable system components within Windows, UNIX, or Linux (e.g., passwords, user accounts, files).
Expt. 5: To collect, process, package, transport, and store electronic evidence to avoid alteration, loss, physical damage, or destruction of data.
Expt. 6: To set up a forensic workstation.
Expt. 7: To use forensic tool suites (e.g., EnCase, Sleuthkit, FTK).
Expt. 8: To use virtual machines. (e.g., Microsoft Hyper-V, VMWare vSphere, Citrix XenDesktop/Server, Amazon Elastic Compute Cloud, etc.).
Expt. 9: To conduct forensic analyses in multiple operating system environments (e.g., mobile device systems).
Expt. 10: To analyse captured malicious code (e.g., malware forensics).
Expt. 11: To use binary analysis tools (e.g., Hexedit, command code xxd, hexdump).
Expt. 12: To implement one-way hash functions (e.g., Secure Hash Algorithm [SHA], Message Digest Algorithm [MD5]).
Expt. 13: To analyse anomalous code as malicious or benign.
Expt. 14: To identify obfuscation techniques.
Expt. 15: To interpret results of debugger to ascertain tactics, techniques, and procedures.

MINI PROJECT WITH SEMINAR

Subject Code: MCSCE1-206 **L T P C**
0 0 4 2

Mini project based on any one of departmental cores and departmental electives of current semester.

ENGLISH FOR RESEARCH PAPER WRITING

Subject Code: MHUMA-101 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

UNIT-I

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

UNIT-II

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

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, 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-III

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

Recommended Books:

1. R. Goldbort, 'Writing for Science', Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses, Vol.-I, **2006**.
2. R. Day, 'How to Write and Publish a Scientific Paper', Cambridge University Press, **2006**.
3. N. Highman, 'Handbook of Writing for the Mathematical Sciences', SIAM. Highman's Book, **1998**.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg, London, **2011**.

DISASTER MANAGEMENT

Subject Code: MCIVE0-101 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:

Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. 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

UNIT-I

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

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-II

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-III

Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV

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

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.

Recommended Books:

1. R. Nishith, A.K. Singh, 'Disaster Management in India: Perspectives, Issues and Strategies', New Royal Book Company, Model Curriculum of Engineering & Technology PG Courses, Vol.-I.
2. Sahni, Pardeep et. al.(Eds.), 'Disaster Mitigation Experiences and Reflections', Prentice Hall of India, New Delhi.
3. S.L. Goel, 'Disaster Administration and Management, Text and Case Studies', Deep & Deep Publication Pvt. Ltd., New Delhi.

SANSKRIT FOR TECHNICAL KNOWLEDGE

Subject Code: MHUMA0-102 **L T P C** **2 0 0 0** **Duration: 30 Hrs.**

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the
6. Huge knowledge from ancient literature

Alphabets in Sanskrit, Past/Present/Future Tense
Simple Sentences
Order
Introduction of roots
Technical information about Sanskrit Literature
Technical concepts of Engineering-Electrical, Mechanical
Architecture, Mathematics

Recommended Books:

1. Vishwas, 'Abhyaspustakam', Samskrita-Bharti Publication, New Delhi.
2. 'Teach Yourself Sanskrit', Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi, Publication.
3. Suresh Soni, 'India's Glorious Scientific Tradition', Ocean Books Pvt. Ltd., New Delhi.

Course Outcomes:

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students.

VALUE EDUCATION

Subject Code: MHUMA0-103 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:
Students will be able to
1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

UNIT-I

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

UNIT-II

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

UNIT-III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

UNIT-IV

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.

Recommended Books:
1. S.K. Chakroborty, 'Values and Ethics for Organizations Theory and Practice', Oxford University Press, New Delhi.

Course Outcomes:
Students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

CONSTITUTION OF INDIA

Subject Code: MHUMA0-104 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:
Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. 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.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT-1

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working). Philosophy of the Indian Constitution: Preamble Salient Features

UNIT-II

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

UNIT III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. **Pachayati Raj:** Introduction, PRI: 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 **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.

Recommended Books:

1. 'The Constitution of India', (Bare Act), Government Publication, **1950**.
2. S.N. Busi, B.R. Ambedkar, 'Framing of Indian Constitution', 1st Edn., **2015**.
3. M.P. Jain, 'Indian Constitution Law', 7th Edn., Lexis Nexis, **2014**.
4. D.D. Basu, 'Introduction to the Constitution of India', Lexis Nexis, **2015**.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. 4. Discuss the passage of the Hindu Code Bill of 1956.

PEDAGOGY STUDIES

Subject Code: MHUMA0-105 **L T P C** **Duration: 30 Hrs.**

2 0 0 0

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

UNIT-I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

Thematic overview: Pedagogical practices are being used by teachers in formal and informal, classrooms in developing countries. Curriculum, Teacher education.

UNIT-II

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-III

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 IV

Research Gaps and Future Directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Recommended Books:

1. J. Ackers, F. Hardman, 'Classroom Interaction in Kenyan Primary Schools, Compare', 31 (2): 245-261, **2001**.
2. M. Agrawal, 'Curricular Reform in Schools: The Importance of Evaluation, Journal of Curriculum Studies', 36 (3): 361-379, **2004**.
3. K. Akyeampong, 'Teacher Training in Ghana - Does it Count?', Multi-site Teacher Education Research Project (MUSTER) Country Report 1. London: DFID, **2003**.
4. K. Akyeampong, K. Lussier, J. Pryor, J. Westbrook, 'Improving Teaching and Learning of basic Maths and Reading in Africa: Does Teacher Preparation Count?', International Journal Educational Development, 33 (3): 272–282, **2013**.
5. R.J. Alexander, 'Culture and Pedagogy: International Comparisons in Primary Education, Oxford and Boston', Blackwell, **2001**.
6. M. Chavan, 'Read India: A Mass Scale, Rapid, 'Learning to Read' Campaign, **2003**.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

STRESS MANAGEMENT BY YOGA

Subject Code: MHUMA0-106 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:

1. To achieve overall health of body and mind
2. To overcome stress

UNIT-I

Definitions of Eight parts of Yog. (Ashtanga)

UNIT-II

Yam and Niyam. Do`s and Don'ts in life:

a) Ahinsa, satya, astheya, bramhacharya and aparigraha
b) Shaucha, santosh, tapa, swadhyay, ishwar pranidhan

UNIT-III

Asan and Pranayam:

a) Various yog poses and their benefits for mind & body
b) Regularization of breathing techniques and its Effects-Types of pranayam

Recommended Books:

1. 'Yogic Asanas for Group Tarining', Part-I, Janardan Swami Yogabhyasi Mandal, Nagpur.
2. 'Rajayoga or Conquering the Internal Nature', Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency.

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Subject Code: MHUMA0-107 **L T P C** **Duration: 30 Hrs.**
2 0 0 0

Course Objectives:

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

Course Outcomes:

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

UNIT-I

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

UNIT-II

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

UNIT-III

Statements of basic knowledge.3 Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model. Shrimad Bhagwad Geeta: Chapter 2-Verses 17, Chapter 3-Verses 36, 37, 42, Chapter 4-Verses 18, 38, 39, Chapter18 – Verses 37, 38, 63

Recommended Books:

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