DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Scheme of Instruction and Syllabus of M. Tech (CSE) (With effect from 2019-20)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)
Affiliated to Osmania University,
Hyderabad – 500 075, Telangana State

Institute Vision:

- To be a centre of Excellence in Technical Education and Research.

Institute Mission:

- To address the emerging needs through quality technical education and advanced research.

Department Vision:

- To become a center of excellence in the field of Computer Science and Engineering that produces innovative, skillful, socially responsible and ethical professionals.

Department Mission:

- To provide a curriculum that balances engineering fundamentals, modern technologies and research.
- To provide opportunities for solving real world problems.
- To provide opportunities for overall personal and social skill development.

M.Tech(CSE) Program Educational Objectives (PEO's)

1. Will be able to practice their profession with confidence and global competitiveness by making intellectual contributions.
2. Will pursue a life-long career of personal and professional growth with superior work ethics and character.
3. Will be engaged in research leading to innovations/products or become a successful entrepreneur.

M.Tech. (CSE) Program Outcomes (PO's)

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

1 Apply the principles of Computer Science and Engineering to the appropriate problems

2. Investigate, analyze and formulate solutions to the complex real world problems

3. Demonstrate the use of modern tools and techniques in the field of Computer Science

4. Work with multidisciplinary groups in a collaborative manner to develop sustainable inclusive technologies

5. Communicate effectively and develop self-confidence and life-long learning

6 Able to possess leadership, project management and financial skills with professional ethics

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.TECH (CSE)
SCHEME OF INSTRUCTION & EXAMINATIONS

SEMESTER–I

S. No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1	19CSC 101	Mathematical Foundation of Computer Science	3	0	0	3	30	70	3
2	19CSC 102	Advanced Data Structures	3	0	0	3	30	70	3
3	19CSEXXX	Elective -I	3	0	0	3	30	70	3
4	19CSEXXX	Elective -II	3	0	0	3	30	70	3
5	19MEC 103	Research Methodology and IPR	2	0	0	2	20	50	2
6	19XXXXXX	Audit Courses-1	2	0	0	2		50	0
PRACTICAL									
7	19CSC 103	Laboratory 1 (Advanced Data Structures)	0	0	4	3	25	50	2
8	19CSEXXX	Laboratory 2 (Based on Elective-I,III)	0	0	4	3	25	50	2
		TOTAL	**16**	**0**	**8**	**-**	**190**	**480**	**18**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

ELECTIVE-I,III	
19CSE101	Machine Learning
19CSE102	Internet of Things
19CSE103	Introduction to Intelligent Systems
19CSE104	Data Preparation and Analysis
19CSE105	Secure Software Design & Enterprise Computing (SSDEC)
19CSE106	Computer Vision

ELECTIVE-II,IV,V	
19CSE113	Data Science & Big Data Analytics
19CSE114	Distributed Database Systems
19CSE115	Advanced Wireless and Mobile Networks
19CSE116	Human and Computer Interaction
19CSE117	GPU Computing
19CSE118	Digital Forensics
19CSE119	Mobile Applications and Services
19CSE120	Compiler for HPC
19CSE121	Open Source Technologies

ELECTIVE -I ,III LAB	
19CSE107	Machine Learning Lab
19CSE108	Internet of Things Lab
19CSE109	Introduction to Intelligent Systems Lab
19CSE110	Data Preparation and Analysis Lab
19CSE111	SSDE Lab
19CSE112	Computer Vision Lab

II-SEMESTER

SNO	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	19CSC 104	Advanced Algorithms	3	0	0	3	30	70	3
2	19CSC 105	Soft Computing	3	0	0	3	30	70	3
3	19CSEXXX	Elective -III	3	0	0	3	30	70	3
4	19CSEXXX	Elective -IV	3	0	0	3	30	70	3
5	19XXXXXX	Audit Course 2	2	0	0	2	-	50	0
PRACTICAL									
7	19CSC 106	Laboratory 3 (AA & Soft Computing)	-	-	4	3	25	50	2
8	19CSEXXX	Laboratory 4 (Based on Electives-III)	-	-	4	3	25	50	2
9	19CSC 107	Mini Projects with Seminar	-	-	4		50		2
		TOTAL	**14**	**0**	**12**	**-**	**220**	**430**	**18**

* Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break. **List of Audit Courses -1&2**

Code	Subjects
19EGA101	English for research paper writing
19CEA101	Disaster mitigation and management
19EEA101	Sanskrit for technical knowledge
19ECA101	Value education
19EGA102	Indian constitution & fundamental rights
19ITA101	Pedagogy studies
19EGA103	Stress Management by Yoga
19 EGA104	Personality Development through Life Enlightenment Skills.

III-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	19CSEXXX	Elective V	3	0	0	3	30	70	3
2	19CSXXX	Open Elective	3	0	0	3	30	70	3
3	19CSC 108	Dissertation Phase – I	0	0	20		100		10
		TOTAL	**6**	**0**	**20**	**-**	**160**	**140**	**16**

ELECTIVE-V	
19CSE119	Mobile Applications and Services
19CSE120	Compiler for HPC
19CSE121	Open Source Technologies
NPTEL Courses**	Software Project Management
	Natural Language Processing
	Block Chain Architecture Design and Use cases
	Social Networks
	Virtual Reality

Open ELECTIVE-VI	
19CSO 101	Business Analytics
19MEO 101	Industrial Safety
19MEO 102	Introduction to Optimization Techniques
19CEO101	Cost Management of Engineering Projects
19MEO103	Composite Materials
19EEO101	Waste to Energy
19PYO 01	History of Science and Technology

****Students going for Internship / Industrial project, may complete these courses through NPTEL/ MOOCs**

IV - SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	19CSC 109	Dissertation Phase – II	0	0	32	3	100	100	16
		TOTAL	**0**	**0**	**32**	**-**	**100**	**100**	**16**

SEMESTER-I

19CSC 101

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Prerequisites: UG level Course in Discrete Mathematics.

Course Objectives:

1. Gain knowledge in discrete and continuous probability and its applications.
2. Use Graph theory for solving real world problems.
3. Solve problems using counting technique.

Course Outcomes: After completion of the course, students will be able to:

1. Understand the basic concepts of discrete and continuous probability.
2. Understand the methods of statistical inference, and their roles.
3. Apply graphs models in various applications
4. Apply various counting techniques in solving combinatorial problems.
5. Understand stochastic process and its applications.

UNIT 1:

Fundamentals: Probability mass, Density, 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:

Statistical Inference: Introduction, Parameter Estimation, Hypothesis Testing, Least squares curve fitting, The Coefficients of Determination Confidence Intervals in Linear Regression, Trend Detection and Slope Estimation, Correlation Analysis.

UNIT 3:

Graphs: Graphs and Graph Models, Special Types of Graphs, Applications of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and

Hamilton Paths, Shortest Path Problems, Planar Graphs, Graph Coloring, Applications of Graph Colorings, Spanning Trees.

UNIT 4:

Counting: Basics of Counting, the Pigeon hole Principle, Permutations and Combinations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients.

Advanced Counting Techniques: recurrence Relations, Solving Linear Recurrence Relations, Divide and Conquer Algorithms, Generating functions, Inclusion-Exclusion, Applications of Inclusion – Exclusion

UNIT 5:

Number theory and cryptography: Fundamental algorithms involving numbers, cryptography computations, information security algorithms and protocols. Computer Science and Engineering Applications: HMM, Routing algorithms, Bayes Theorem.

Text Books:

1. Kishor S. Trivedi, "Probability & Statistics with Reliability. Queuing, and Computer Science Applications", 2ndEdition, John Wiley and Sons Ltd.2016.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications with Combinatorics and Graph Theory", 7thEdition, McGraw Hill Education (India) Private Limited, 2011.
3. M.T Goodrich, R.Tomasia, "Algorithm design- Foundations, analysis", and Internet algorithms, John Wiley,2002 .

Reference Books:

1. D.S. Malik and M.K. Sen., "Discrete Mathematics, Theory and Applications", Revised Edition, Cengage Learning, 2012.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Academic Press, 2012.
3. Douglas B. West, "Introduction to Graph Theory, 2ndEdition", PHI.2015.
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson Education, 1985.

Online Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf.

19CSC 102

ADVANCED DATA STRUCTURES

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Prerequisites: Undergraduate Course in Data Structures.

Course Objectives:

1. Able to choose appropriate data structures, understand the ADT/ libraries, and use them to design algorithms for a specific problem.
2. Able to understand the necessary mathematical abstractions to solve problems.
3. Familiarity with advanced paradigms and data structure used to solve algorithmic problems.

Course Outcomes:

After completion of the course, students will be able to

1. Demonstrate Dictionaries and various hashing techniques.
2. Analyze and construct Skip Lists.
3. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
4. Develop algorithms for text processing applications.
5. Identify suitable data structures and develop algorithms for computational geometry problems.

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, Recent trends in 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: String Operations, Brute-Force Pattern Matching, The Boyer Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman coding algorithm.

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.

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in JAVA", 3rd Edition, Pearson,2004.
2. M T Goodrich and Roberto Tamassia, Algorithm Design, John Wiley, 2002.

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++, 2ndEdition", Pearson, 2004.
2. Sartaj Sahni, "Data structures, Algorithms and Applications in Java", 2ndEdition, Universities Press,2005.

Online Resources:

1. https://www.cise.ufl.edu/~sahni/cop3530/presentations.htm.
2. http://www.nptelvideos.com/java
   java_video_LectureHours_tutorials.php

19CSE101

MACHINE LEARNING

Elective-I	
Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-requisites:
UG level course in probability, linear algebra and calculus. Any Programming experience is essential.

Course objectives:

1. Introduce students to state-of-the-art methods.
2. Expose to Modern programming tools for data analysis.
3. To study various sampling and classification problems

Course Outcomes: After completion of the course, students will be able to

1. Understand complexity of Machine Learning algorithms and their limitations, and also modern notions in data analysis oriented computing.
2. Apply common Machine Learning algorithms in practice and implementing their own
3. Design and implement machine learning solutions to classification, regression, and clustering problems;
4. Evaluate and interpret the results of the algorithms
5. Develop an appreciation for what is involved in learning from data.

UNIT 1:
Introduction: Learning, Types of Machine Learning.
Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.
Learning with Trees: Constructing Decision Trees, CART, Classification Example.

UNIT 2:
Linear Discriminants: The Perceptron, Linear Separability, Linear Regression
Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices,

Deriving back Propagation SUPPORT Vector Machines: Optimal Separation, Kernels.

UNIT 3:

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods,Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

UNIT 4:

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming.

Ensemble learning: Boosting, Bagging, Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis.

UNIT 5:

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks,Hidden Markov Models, The Forward Algorithm.. Reinforcement Learning - The Learning Task, Q Learning.

Text Books

1. Tom M. Mitchell, "Machine Learning", Mc Graw Hill, 1997
2. Stephen Marsland, Machine Learning - An Algorithmic Perspective, CRC Press, 2009.

Suggested Reading:

1. Margaret H Dunham, "Data Mining", Pearson Edition., 2003.
2. Galit Shmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007
3. Rajjan Shinghal, "Pattern Recognition", Oxford University Press, 2006.

Online resources

1. nptel https://nptel.ac.in/courses/106106139/.

19CSE102

INTERNET OF THINGS

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-requisites: UG level Course in CAMP, Programming Basics.

Course Objectives:

1. Identify the vision and understand the basics of IoT.
2. To explore the use of Devices, Gateways in IoT and understand IoT protocols
3. To introduce Node MCU, Raspberry Pi platform and Explore Industrial Automation, and Commercial Building Automation in IoT.

Course Outcomes: After completion of the course, students will be able to

1. Understand an Overview of IoT
2. Use Devices and Gateways in Service Oriented Architecture.
3. Analyze the use of communication protocols in sensor networks.
4. Design Applications using Raspberry Pi.
5. Develop different IoT Automation systems.

UNIT 1:

Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators and Types of Actuators.

Basics of Networking : IoT components, Functional Components of IoT, IoT interdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT 2:

Communication Protocols:6LoWPAN, 6LoWPAN Routing Considerations, LOADng Routing, RPL Routing, RFID, Functionality-based IoT Protocol Organization: MQTT, SMQTT, CoAP, XMPP, AQMP, Zigbee,Wireless HART, Z-Wave, Bluetooth, NFC, RFID.

UNIT 3:

Sensor Networks: Target Tracking, Wireless Multimedia Sensor Networks (WMSNs), Nano networks, Underwater Acoustic Sensor Networks, Opportunistic localization, WSN Coverage, Stationary Wireless Sensor Networks, Mobile Wireless Sensor Networks, Delay Tolerant Networks, UAV Networks, FANETs: Flying Ad Hoc Networks, VANETs, Machine-to-Machine Communications, Interoperability in IoT, Introduction to SDN: SDN for IoT , Recent advances in IoT.

UNIT 4:

Introduction to NodeMCU: NodeMCU pin diagram, Integration of Sensors and Actuators with NodeMCU.

Introduction to Raspberry Pi: About the board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python.

UNIT 5 :

IoT Systems : A Case Study.

Home Automation: Smart Lighting, Home Intrusion Detection , Smart Cities: Smart Parking Environment: Weather Monitoring System, Weather Reporting Bot, Air Pollution Monitoring, Forest Fire Detection, Agriculture: Smart Irrigation.

Text Books:

1. Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for LowPower and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby , K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)",Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?",Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

19CSE103

INTRODUCTION TO INTELLIGENT SYSTEMS

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites : UG level Course in Data Structures, Data Management. Probability and Statistics.

Course Objectives:

1. Understand the different learning techniques of AI systems.
2. Learn different knowledge representation techniques.
3. Developing systems to demonstrate intelligent behavior dealing with uncertainty.

Course Outcomes: After completion of course, students would be:

1. Understand knowledge of the fundamental principles of intelligent systems.
2. Select a search algorithm for different applications.
3. Understand the knowledge based systems.
4. Acquire knowledge in Uncertainity and Probabilistic reasoning approaches.
5. Apply different learning techniques to solve complex problems.

UNIT 1:

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of Al, Applications.

Problem Solving - State - Space Search and Control Strategies: Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look - Ahead Strategy and use of Evaluation Functions, Alpha Beta Pruning.

UNIT 2:

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau, A System in Propositional Logic, Resolution refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT 3:

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainity Factor Theory, Dempster - Shafer Theory.

UNIT 4:

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines.

Intelligent Agents: Agents vs Software programs, classification of agents, Multi-agent systems, Architecture of intelligent agents, Multi-agent application.

UNIT 5:

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web.

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

Text Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Edition, 2004.
3. Rich, Knight, Nair , Artificial Intelligence, Tata McGraw Hill, 3rd Edition 2009.

Online Resources/Weblinks/NPTEL Course:

1. http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf.
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lecture Hours/Lecture Hours.html.
3. https://nptel.ac.in/courses/106105077/.

19CSE104

DATA PREPARATION AND ANALYSIS
Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objective:

1. Prepare data analysis for industrial and scientific applications of data analytics.
2. Perform exploratory data analysis and develop meaningful data visualizations.
3. Learn how to prepare data sets for analysis by cleaning and reformatting.

Course Outcomes: After completion of course, students would be:

1. Understand the concepts of data gathering and preparation.
2. Ability to perform data cleaning techniques on data sets.
3. Analyze various data transformation and segmentation techniques.
4. Apply and various visualization techniques for analyzing the data.
5. Ability to solve correlations and connections, hierarchies and networks in business and scientific information using processing environment.

UNIT 1:

Data Gathering and Preparation:

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

UNIT 2:

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

UNIT 3:

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

UNIT 4:

Visualization:

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

UNIT 5:

Statistical Significance, ANOVA, T-test, Building machine learning Regression models.

Text books:

1. Making sense of Data : "A practical Guide to Exploratory Data Analysis and Data Mining", by Glenn J. Myatt, 2007.
2. Trochim, W. M. K. "Data Preparation" Research Methods Knowledge Base 2nd Edition. Accessed 2/24/09.

References:

1. The visual display of quantitative information by edward tufte, 2001.
2. "Visualizing Data:" Exploring and Explaining Data with the Processing Environment,by Ben Fry, 2008
3. Exploratory data Mining and data cleaning,by Tamraparni dasu, 2003.

Online Resources/Weblinks/NPTEL Course:

1. https://www.safaribooksonline.com/library/view/visualizingdata/9780596514556/ch08.html.
2. https://www.scribd.com/document/54993779/Making-Sense-of-Dataa-Practical-Guide-to-Exploratory-Data-Analysis-and-Data-Mining.

19CSE105

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING
Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites : UG level course in Computer Programming, Software Engineering.

Course Objective:

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

Course Outcome: After completion of course, students would be able to:

1. Understand various software vulnerabilities.
2. Software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.
5. Apply security to Web and Mobile applications.

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 enterprise system, 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 go about managing them.

UNIT 5:
Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.

Text books / References:

1. Theodor Richardson, Charles N Thies, "Secure Software Design", Jones & Bartlett, 2012.
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley, 2015 E book.

Online Resources/Web links/NPTEL Course:

1. https://www.coursera.org/specializations/secure-software-design.

19CSE106

COMPUTER VISION
Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre Requisites: UG level Course in Linear Algebra and Probability.

Course Objectives:

1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: After completion of the course, students will be able to

1. To develop algorithms and techniques to analyze and interpret the visible world around us.
2. To implement boundary tracking techniques.
3. To analyze Patterns in images
4. To apply in the field of Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.
5. To explore and contribute to research and further developments in the field of computer vision.

UNIT 1:

Image Formation and Description: Fundamental steps of image processing, the image model and Image acquisition, Sampling and quantization, Relationship between pixels. Sampling & Quantization, Elements of Digital Image Processing Systems.

Image Transforms: Digital Image Transforms - Fourier Transform, Extension to 2D.Properites of Fourier transformations.

UNIT 2:

Image Enhancements: Histogram Equalization, Image Smoothing, Image Sharpening, Edge Detection.

Segmentation: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts.
Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation.

UNIT 3:
Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion
Dense motion estimation: Translational alignment, parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT 4:
Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT 5:
3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction.

Text Books:

1. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008.
2. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

References

1. "Pattern Recognition: Statistical. Structural and Neural Approaches"; Robert J. Schallkoff; John Wiley and Sons; 1992.
2. "Computer Vision: A Modern Approach"; D. A. Forsyth and J. Ponce; Pearson Education; 2003.
3. "Multiple View geometry". R. Hartley and A. "Zisserman. 2002 Cambridge university Press".
4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online links

1 https://onlinecourses.nptel.ac.in/noc18_ee40.
2 CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline.
3. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/ html/vision.html.

19CSE113

DATA SCIENCE AND BIG DATA ANALYTICS
Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Prerequisites: UG level Course in Database Management Systems.

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. Critically evaluate data visualization based on their design and use for communicating stories from data.

Course Outcomes: After completion of the course, students will be able to

1. Understand and apply suitable algorithms for data science.
2. Compare various techniques and use appropriate methods for given dataset.
3. Design suitable models to extract and present useful information for the given data.
4. Understand and analyze data leakage problems in data.
5. Analyze various hypotheses for better understanding.

UNIT 1:

Introduction: Big Data and Data Science Hype, History of past and current, A Data Science Profile, Meta-Definition, Statistical Thinking, Exploratory Data Analysis, The Data Science Process.

UNIT 2:

Algorithms: Machine Learning Algorithms, Three Basic Algorithms

Spam Filters, Naive Bayes, and Wrangling: Learning by Example, Naive Bayes, Laplace Smoothing, Comparing Naive Bayes to KNN.

UNIT 3:

Logistic Regression: Thought Experiments, Classifiers, M6D Logistic Regression.

Extracting Meaning from Data: William Cukierski, The Kaggle Model, Ethical Implications of a Robo-Grader, Feature Selection, Google's Hybrid Approach to Social Research.

UNIT 4:

Data Visualization Techniques: Data Visualization History, Types of Visualization, Characteristics, Encoding schemes, Mapping variables to encodings, Visual encodings.

Data Leakage and Model Evaluation: Claudia's Data Scientist Profile, Data Mining Competitions, Characteristics of Good Modeler, Data Leakage, Avoid Leakage, Evaluating Mode.

UNIT 5:

Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples obig data, Big data and Data Risk, Big data technologies, The benefits of big data, Crowd sourcing analytics. Architecture of Apache Hadoop HDFS, **No SQL Data Management:** Types of NOSQL data bases Benefits of NO SQL, **Map Reduce:** Introduction, Map reduce example, Job Tracker, Map .

Text Books:

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, Straight Talk From The Frontline, O'Reilly, 2014.
2. "Big Data & Hadoop", V.K. Jain, Khanna Publishing House, 2017.

Reference Books:

1. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. "Mining of Massive Datasets", v2.1, Cambridge UniversityPress, 2014.
2. Foster Provost and Tom Fawcett, Data Science for Business, What You Need to Know about Data Mining and Data-Analytic Thinking, O'Reilly, 2013.
3. Samir Madhavan, "Mastering Python for Data Science, Packt Publishing, 2015.
4. "Big Data Black Book, DT Editorial Services," Wiley India
5. "Data Science & Analytics", V.K. Jain, Khanna Publishing House Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93-86173454, 2018.
6. Montgomery, Douglas C. and George C. Runger, Applied statistics and probability for engineers. John Wiley & Sons, 6th edition, 2013.

Online Resources:

1. http://datasciencemasters.org.
2. http://learnds.com/
3. https://www.datascienceweekly.org

19CSE114

DISTRIBUTED DATABASE SYSTEMS
Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objectives:

1. Acquire insight into difference between the centralized databases and distributed databases.
2. Understand distributed DBMS architecture, query decomposition and data localization.
3. Learn the techniques of transaction management, distributed concurrency control, client/server architectures and distributed multi-DBMSs.

Course Outcomes: After completion of the course, students will be able to

1. Differentiate key concepts and techniques for centralized databases and distributed databases.
2. Analyze and design distributed database systems based on the principles of distributed indexing, query evaluation, data replication.
3. Implement storage, indexing, query evaluation and query optimization techniques.
4. Implement the concepts of transaction management, concurrency control, crash recovery, deadlocks and catalog management.
5. Apply suitable architecture for distributed databases and concepts of inter-operability of databases.

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 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

ADVANCED TOPICS: Mobile Databases, Distributed Object Management, Multi-databases.

References:

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

19CSE115

ADVANCED WIRELESS AND MOBILE NETWORKS
Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-requisites: Undergraduate course in Computer Networks.

Course Objective:

1. Familiarity with the wireless/mobile market and the future needs and challenges.
2. Familiarity with key concepts of wireless networks, standards, technologies and their basic operations.
3. Learn how to design and analyze various medium accesses, evaluate MAC and network protocols using network simulation software tools.

Course Outcomes: After completion of course, students would be able to:

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Design WLAN, WPAN, WWAN, and Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Design wireless networks exploring trade-offs between wire line and wireless links.
5. Develop mobile applications to solve some of the real world problems.

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.

UNIT 2:

WIRELESS CELLULAR NETWORKS: WLAN ,3G, 4G and 5G introduction, 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.

UNIT 4:

WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors. Tiny OS Overview.

UNIT 5:

SECURITY

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

Text Books:

1. Schiller J., "Mobile Communications," Addison Wesley 2000
2. Stallings W., "Wireless Communications and Networks", Pearson Education 2005

References

1. Stojmenic Ivan, "Handbook of Wireless Networks and Mobile Computing", John Wiley and Sons Inc 2002
2. Yi Bing Lin and Imrich Chlamtac, "Wireless and Mobile Network Architectures", John Wiley and Sons Inc 2000
3. Pandya Raj, "Mobile and Personal Communications Systems and Services', PHI 20.

19CSE116

HUMAN AND COMPUTER INTERACTION
Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objectives:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for computer interaction and guidelines for web user interface
3. Learn the ecosystem and tools of mobile Human Computer interaction

Course Outcomes: After completion of the course, students will be able to

1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand the mobile ecosystem and use the corresponding tools for mobile design.
5. Design an interactive web interface on the basis of models studied.

UNIT 1:

Foundations: The human, the computer, The Interaction, Paradigms
Introduction: Our perception is biased; our vision is optimized to see structure.

UNIT 2:

We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action.

UNIT 3:

Recognition is Easy, Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational.

UNIT 4:

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

UNIT 5:

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

Text Books:

1. "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Jeff Johnson, Elsevier Inc., 2010.
2. "Human Computer Interaction", 3rd edition, Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education Limited, 2004.
3. Brian Fling, "Mobile Design and Development", First Edition , O Reilly Media Inc., 2009.
4. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O Reilly, 2009.

Suggested Reading:

1. "Designing the User Interface", 5th Edition, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Pearson Education Limited, 2013.
2. "Mind Design II, 2nd Edition", Revised and enlarged edition, John Haugeland, The MIT Press, 1997.

Online Resources / Weblinks / NPTEL Courses:

1. https://nptel.ac.in/courses/106103115/
2. https://www.interaction-design.org/courses/human-computer-interaction?ad-set=human-computer-interactioncourse&gclid=EAIaIQobChMIkJuW09jM4QIVgTgrCh0PuwtXEAAYASAAEgLPhPD_BwE

19CSE117

GPU COMPUTING
Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Prerequisites: UG level Course in Computer Graphics, Animation, Computer Vision, C Language.

Course Objective:

1. To learn parallel programming with Graphics Processing Units (GPUs).
2. Understand and Identify key elements of computer graphics pipeline and GPU hardware.
3. Recognize the computing problems and implement optimization procedures that will benefit GPU computing.

Course Outcomes: After completion of the course, students will be able to

1. Gain basic knowledge of parallel programming.
2. Have an understanding of GPUs and the CUDA programming model
3. Understand the memory management and data transfer methodology in CUDA.
4. Be able to develop programs using GPUs for relevant real world problems.
5. Gain knowledge and acquire unique skills in multi-GPU processing and heterogeneous computing.

UNIT 1:

Introduction: History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel Programming

CUDA: CUDA Open CL / Open ACC, Hello World, Computation Kernels, Launch parameters, Thread hierarchy, Warps /Wavefronts, Thread blocks / Workgroups, **Streams:** Streaming multiprocessors, 1D / 2D /3D thread mapping, Device properties, Simple Programs.

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,
Matrices: Programs with matrices, Performance evaluation with different memories.

UNIT 3:
Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence.
Prefix sum, Reduction, Synchronization across CPU and GPU Programs for concurrent Data Structures such as Work-lists, Linked-lists.
Functions: Device functions, Host functions, Kernels ,functions, Using libraries(such as Thrust), developing libraries.

UNIT 4:
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:
Advanced topics: Dynamic parallelism, Multi-GPU processing, Heterogeneous Processing.

Text Books:

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

References:

1. "CUDA by Example: An Introduction to General Purpose GPU Programming; Jason Sanders, Edward Kandrot; Addison-Wesley; 2011 (ISBN 978-0-13-138768-3)
2. The CUDA Handbook: A Comprehensive Guide to GPU Programming"; Nicholas Wilt; Addison Wesley; 2013(ISBN: 978-0321809469)

Online Resources/Weblinks/NPTEL Course:

1. CUDA C Programming Guide NVIDIA's Parallel Forall Blog
2. https://devblogs.nvidia.com/calibrating-videos-vrworks-360-video
3. Mapping from GPU name to Compute Capability.

19CSE118

DIGITAL FORENSICS
Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Prerequisites: UG level Course in Operating Systems, Computer Networks.

Course Objective:

1. To provide basics of the rapidly changing and fascinating field of Digital forensics.
2. To collect, process, analyze and present computer forensic evidence.
3. To learn about network forensics, mobile forensics and Legal Aspects of Digital Forensics.

Course Outcomes: After completion of the course, students will be able to

1. Understand fundamentals of digital forensics.
2. Collect, process, analyze, and present computer forensic evidence.
3. Preserve digital evidence during forensic analysis.
4. Perform network investigations.
5. Understand mobile network investigations.

UNIT 1:

Digitalforensics fundamentals: Forensics science, digital forensics, Uses of Digital Forensics, The Digital Forensics Process, Use of Computer forensics in law Enforcement, Computer forensics assistance to Human resources/ employment proceeding, Computer forensics services, Benefits of professional forensics methodology.

UNIT 2:

Data recovery: Data recovery defined, Data backup and data recovery,the role of backup in data recovery, Data recovery solution, Hiding and Recovering Hidden Data.

Evidence collection and data seizure: Why collect evidence, Collection options, obstacles, Types of evidence, rules of evidence, Volatile evidence, general procedure, Collection and archiving, methods of collection, artifacts, Collection steps, controlling contamination: The chain of custody.

UNIT 3:

Duplication and preservation of digital evidence: Preserving the digital crime scene, Computer evidence processing steps, Legal aspects of collection and preserving Computer forensics evidence Computer image verification and authentication Special needs of evidential authentication, Practical consideration, implementation.

UNIT 4:

Computer Forensics Analysis- Discovery of electronic evidence, identification of data, reconstructing past events, Investigating Live Systems (Windows &Unix).

Network forensics: Network Security Tools, NetworkAttacks, Network Evidence and Investigations.

UNIT 5:

Mobile forensics: Collecting and Handling Cell Phones as Evidence, Cell Phone Forensic 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

Text Books:

1. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications, First Edition 2015.
2. John Sammons, “The Basics of Digital Forensics”, The Primer for Getting Started in Digital Forensics, 2nd Edition, Syngress (2014).
3. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, TataMcGrawHill, 2006.

Suggested Reading:

1. Marjie T. Britz, “Computer Forensics and Cyber Crime An Introduction”, 3rd Edition, Pearson Education 2013.
2. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, Elsevier Publications, 2011.
3. Brian Carrier, “File System Forensic Analysis”, Pearson Education, 2005.

Web Resources:

1. https://www.cs.nmt.edu/~df/lectures.html
2. http://www.cyberforensics.in/
3. https://www.ncdrc.res.in/

19CSE119

MOBILE APPLICATIONS AND SERVICES
Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites: UG level Course in Wireless Communication and Mobile Computing.

Course Objectives:

1. This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.
2. It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smart phones and tablets
3. It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile.

Course Outcomes : After completion of the course, students will be able to

1. Identify the target platform and users and be able to define and sketch a mobile application
2. Develop database management system to retrieve data for mobile application.
3. Use Intent, Broadcast receivers and Internet services in Android App.
4. Understand the lifecycle of mobile application on Android platform.
5. Design and develop a mobile application in one of the platform.

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: Voice UIs 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.

UNIT 4:

Putting It All Together: Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services

UNIT 5:

Platforms and Additional Issues: Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking, Active Transactions.

Text book:

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

References:

1. Jeff Mc Wherter, "Scott Gowell, PROFESSIONAL Mobile Application Development", Wrox, 1 edition, 2012.
2. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.

Weblinks:

1. https://nptel.ac.in/courses/106106147/6
2. https://nptel.ac.in/courses/106106156/30

19CSE120

COMPILER FOR HPC
Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites :UG Level course in Data Structure, Compiler Design, Theory of Computation.

Course Objective:

1. To introduce the structure of compilers and high-performance compiler design to the field of Computer Science.
2. Analyze the basic steps involved in converting a source language to target code or target language.
3. Understands the concepts of cache coherence and parallel loops in compilers are included. Gain the knowledge to write a compiler program or can able to build a compiler.

Course Outcomes : After completion of the course, students will be able to

1. Identify the basic concepts needed for the development of a compiler structure of a compiler.
2. Analyze and understand Parallel loops, data dependency, exception handling and debugging in a compiler.
3. Understand the concepts involved in loop structuring and concurrency analysis.
4. Differentiate the various types of Machines, Message passing Machines
5. Explores recent trends in compilers for efficient compiler building.

UNIT 1:

High-Performance Systems, Structure of a Compiler, Programming Language Features, Languages for High Performance, Compiler transformation for high performance computing.

Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.

UNIT 2:

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. Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls,Inter-procedural Analysis.

UNIT 3:

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

UNIT 4:

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

UNIT 5:

Message-Passing Machines:, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics. Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines. Recent trends in compiler design for high performance computing and message passing machines and scalable shared memory machine, Nvidiacuda parallel computing.

Text Books:

1. Michael Wolfe, "High-Performance Compilers for Parallel Computing", Pearson, 2007.
2. "Compiler transformation for High performance computing" –DAVID F. BACON, SUSAN L, 1994.

Online Resources/Weblinks/NPTEL Course:

1. www.springer.com/gp/book/9783540280095
2. www.chpc.utah.edu/documentation/software/compilers.php
3. https ://www.aspsys.com/solutions/software-solutions/hpc-compilers
4. https://link.springer.com/book/10.1007%2fBFboo17241.

19CSE121

Open Source Technologies
Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objectives: The objectives of this course are:

1. Familiarity with Open Source Technologies
2. Study some FOSS Projects to under the principles, methodologies of FOSS.
3. Understand the policies, licensing procedures and ethics of FOSS.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: Principles and Open Source Methodology- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice**.**

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy**.**

Text Books:

1. Kailash Vadera, Bhavyesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 2008.

Suggested Reading:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills, 2015.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media, 2004.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

19CSE107

MACHINE LEARNING LAB
Elective-I

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50
Continuous Internal Evaluation	25
Credits	2

Pre Requisites: UG level Course in Probability and Statistics, Proficiency in programming basics.

Course Objectives:

1. To implement the machine learning algorithms
2. Implement the machine learning concepts in any suitable language of choice.
3. To explore Deep learning technique and various feature extraction strategies.

Course outcomes: After completion of the course, students will be able

1. To apply knowledge of computing and mathematics to machine learning problems, models and algorithms.
2. To apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems.
3. To design, implement, and evaluate an algorithm to meet desired needs; and
4. To design and develop principles in the construction of software systems of varying complexity.
5. To analyze a problem and identify the computing requirements appropriate for its solution;

Description (If any):

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Lab Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Text Books

1. Tom M. Mitchell, "Machine Learning", India Edition, McGraw Hill Education 2013.
2. Herbert Schildt & Dale Skrien, "Java Fundamentals-A Comprehensive Introduction", 2013 Edition, Tata McGraw-Hill.
3. Herbert Schildt, "The Complete Reference Java", 7 Edition, Tata McGraw-Hill 2007.
4. ReemaThareja "Python Programming", Oxford Press, 2017.
5. Mike McGrath "Python in easy steps: Makes Programming Fun", Kindle Edition, 2017.

Web references:

1. http://www.cs.cmu.edu/~tom/mlbook-chapter-slides.html
2. http://www.cs.cmu.edu/afs/cs.cmu.edu/user/mitchell/ftp/mlbook.html

19CSE108

INTERNET OF THINGS LAB
Elective-I

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50
Continuous Internal Evaluation	25
Credits	2

Pre-requisites: UG level Course in CAMP, Programming Basics.

Course Objectives:

1. Identify the vision and understand the basics of IoT.
2. Impart necessary and practical knowledge of components of Internet of Things.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: After completion of the course, students will be able to

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication module.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and control devices.
5. Develop real time IoT based projects.

LIST OF PRACTICALS

1. Introduction of IoT equipments and perform necessary software installation.
2. Write a program to interface LED/Buzzer with Arduino and to turn ON LED for 1sec after every 2 seconds.
3. Write a program to interface Digital sensor PIR with Arduino and to turn ON LED when motion detected.
4. Write a program to interface DHT22 sensor with Arduino and display temperature and humidity readings.
5. Write a program to interface motor using relay with Raspberry Pi. Turn ON motor when the temperature is high.
6. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
7. Interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
8. Write a program to interface flame/smoke sensor with Arduino / Raspberry Pi and give an alert message when flame/smoke is detected.
9. Install MySQL database on Raspberry Pi and perform basic SQL queries.

10. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
11. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
12. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data local/cloud server.
13. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from local/cloud server.
14. Implement any case study using Arduino/Raspberry Pi.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for LowPower and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby , K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)",Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?",Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22 -33, March 2015.

19CSE109

INTRODUCTION TO INTELLIGENT SYSTEMS LAB
Elective-I

Instruction	4 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	25
Credits	2

Pre Requisites: UG level Course in Probability and Statistics ,Proficiency in programming basics.

Course Objectives:

1. Design and analyze various computing algorithms and techniques using Python/Scilab.
2. Able to apply different learning algorithms to solve real time problems.
3. Recognize the underlying mathematics and logic behind various AI techniques.

Course Outcomes: After completion of the course, students will be able to

1. Write programs in Python/Scilab language.
2. Recognize the underlying mathematics and logic behind various computing algorithms under AI system.
3. Apply variety of uncertain algorithms to solve problems of moderate complexity.
4. Describe and apply various techniques for logic programming and machine learning.
5. Acquire knowledge in game playing algorithms.

Lab Experiments:

1. Implement an 8-puzzle solver using Heuristic search technique.
2. Implement the Constraint Satisfaction problem using backtracking.
3. Implement a program for game search.
4. Build a bot to implement any game using easy AI library(ex.. tic-tac-toe, game of bones).
5. Implement a Bayesian network from a given data.
6. Infer the data from the Bayesian network.
7. Implement an application to classify data using Support Vector Machines.
8. Develop a NLP application to perform the following tasks.
   a. Tokenizing text data.

b. Converting words to their base forms using stemming .
c. Converting words to their base forms using lemmatization.
d. Dividing text data into chunks.

9. Implement a case study on sentiment analysis.
10. Implementation of any case study using AI techniques.

Text Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.
2. Prateek Joshi, "Artificial Intelligence with Python:" A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers, Packt publishing, January 2017.

Reference Books:

1. Prateek Joshi, Artificial Intelligence with Python – Heuristic Search [Video], PACKT, 2017.

Online Resources:

1. https://www.researchgate.net/file.PostFileLoader.html?id...assetKey
2. http://artint.info/AIPython/aipython.pdf.

19CSE110

DATA PREPARATION AND ANALYSIS LAB
Elective-III

Instruction	4 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	25
Credits	2

Course Objectives:

1. Intended to obtain hands-on experience using data analysis application.
2. Intended to provide practical exposure of clustering and association rules mining.
3. Apply a variety of different data exploration techniques like statistics and visualization methods.

Course Outcomes: After completion of the course, students will be able to

1. Apply pre-processing statistical methods for any given raw data.
2. Ability to perform heterogeneous, cleaning techniques to replace missing data.
3. Analyze various data transformation techniques on various data sets.
4. Apply and analyze the various clustering techniques.
5. Comprehend visualize the data related to in real world applications.

List of programs

Implement the following programs:

1. Load any one dataset and perform following activities
2. List all the categorical (or nominal) attributes and the real-valued attributes separately.
3. What attributes do you think might be crucial in building the any data set?
4. Apply the cleaning process for the dataset (Replace Missing values).
5. Do you really need to input so many attributes to get good results? May be only a few would do. For example, you could try just having some combination of attributes, the class attribute (naturally)). Try out some combinations. (You had removed two attributes from the data set. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)
6. Implement the discretization on any data set.
7. Demonstrate performing clustering on data sets.
8. Perform data pre-processing tasks and demonstrate performing association rule mining on data sets.

9. Load the mlb dataset and write a program to: Explore how relationships can be instantly and powerfully conveyed through the spatial arrangement of data,visual elements such as icons and lines, and most significantly, the use of animation.
   a. Loading Text Data.
   b. Files Too Large for loadStrings( )
   c. Reading Files Progressively.
   d. Reading Files Asynchronously with a Thread.
   e. Parsing Large Files As They Are Acquired.
   f. Load Milk, Tea, and Coffee dataset and perform the following activities
   g. Write a program to Acquiring a table of data from a text file.
   h. Write a program to perform parsing the contents of the file into a usable data structure.
   i. Write a program to calculate the boundaries of the data to facilitate representation.
   j. Write a program to find a suitable representation and considering alternatives.
   k. Write a program to refine the representation with consideration for placement, type, line weight, and color.
10. Design an application by providing a means of interacting with the data so that the variables can be compared against one another or against the average of the whole data set.

Text Books:

1. Glenn J. Myatt, "Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining", John Wiley & Sons, Inc,2007.
2. Ben Fry, "Visualizing Data: Exploring And Explaining Data With The Processing Environment", O'Reilly Media, Inc, 2007.

Reference Books:

1. Robert Wysocki, "Effective Project Management: " Traditional, Agile, Extreme, Sixth edition, Wiley India, rp2011.
2. Watts S. Humphrey "An Introduction to the Team Software Process", Pearson Education, 2000.
3. James R. Persse, Process Improvement essentials, O'Reilly, 2006.
4. Bob Hughes & Mike Cotterell, "Software Project Management", fourth Edition, TMH, 2006.
5. Andrew Stellman & Jennifer Greene, Applied Software Project Management, O'Reilly, 2006.

Online Resources:

1. https://www.safaribooksonline.com/library/view/visualizing- data/9780596514556/ch08.html.
2. https://www.scribd.com/document/54993779/Making-Sense-of-Data-a-Practical-Guide-to-Exploratory-Data-Analysis-and-Data- Mining.

19CSE111

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB
Elective-III

Instruction	4 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	25
Credits	2

Pre-Requisites : UG level Course in Computer Programming, Software Engineering, JAVA, J2EE.

Course Objective:

1. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
2. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
3. 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:

1. Differentiate between various software vulnerabilities.
2. Software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.
5. Analyse Enterprise Computing security issues.

List of Experiments

1. Study of multi-tier software environment.
2. Study of web servers / web browser and Tools for enterprise software Development and deployment.
3. Develop a package using JDBC
4. Develop a package using servlets / JSP.
5. Study of System threat attacks - Denial of Services.
6. Implementation of S-DES algorithm for data encryption .
7. Implementation of Asymmetric Encryption Scheme – RSA.
8. Study of Symmetric Encryption Scheme – RC4.
9. Study of Techniques uses for Web Based Password Capturing.
10. Study of Anti-Intrusion Technique – Honey Pot.

References Books

1. Paul J Perrone, Venkata S.R. Krishna R and Chayanti, "Building Java Enterprise
2. Systems with J2EE", Techmedia , New Delhi, 2000.
3. George Reese, " Database programming, with JDBC and Java" Second Edition,
4. O'Reiliy Publishers, New Delhi, 2000.

19CSE112

COMPUTER VISION LAB
Elective-III

Instruction	4 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	25
Credits	2

Course Objectives:

1. To Make students acquainted with practical aspects of computing with images.
2. To Improve quality of image by applying enhancement techniques.
3. To understand Feature Extraction algorithms.

Course Outcomes: After completion of the course, students will be able to:

1. Understand the basic image processing techniques.
2. Apply image enhancement techniques.
3. Detect edges using various kernels and transformations.
4. Apply histogram processing and convertion between various colour spaces.
5. Analyse datasets using classification and clustering.
6. Evaluate computer vision system for real world problems.

Description :

Use any tool like OpenCV/ Scilab/ python/R Programming etc.,

List of Programs

1. Familiarization of the tool used for computer vision.
2. Implement basic image operations
   a. Loading and displaying an image.
   b. Color formats
   c. Image enhancement.
3. Implement smoothing filters on an image using
   a. Gaussian filter
   b. Median filter
   c. Mean Filter
4. Demonstrate fourier Transformations.
5. Implement histogram calculation and equalization for the given image.
6. Implement morphological operations like dilation, erosion, opening and closing on the given image.

7. Implement edge detection on images using any two edge detection masks.
8. Detection of motion from structure .
9. Implement texture extraction of a given image.
10. **Case Study :** Object detection like recognizing pedestrians..
11. **Case Study :** Face recognition of an image using K-Means clustering.
12. **Case Study :** Dimensionality reduction using PCA for the given images.
13. **Case Study :** Demonstrate model based reconstruction using tensor flow.

Text Books:

1. Gary Bradski and Adrian Kaehler, "Learning OpenCV", O'Reilly Media, Inc., 1st Edition, 2008.
2. Talita Perciano and Alejandro C Frery, "Introduction to Image Processing Using R:" Learning by Examples, Springer, 1st Edition, 2013.
3. "Computer Vision: Algorithms and Applications" by Richard Szeliski; Springer-Verlag London Limited 2011.

Reference Books:

1. R C Gonzalez and R E woods, "Digital Image Processing", Addison Pearson, 3rd Edition, 2013.
2. David A.Forsyth and Jean Ponce, Computer Vision-A Modern Approach, PHI, 1st Edition, 2003.

Online Resources:

1. https://atoms.scilab.org/toolboxes/IPCV/1.1
2. https://docs.opencv.org/2.4/doc/tutorials/tutorials.html.

19CSC 103

ADVANCED DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50
Continuous Internal Evaluation	25
Credits	2

Prerequisites: Undergraduate course on Data Structures.

Course Objectives:

1. Write and execute programs to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, hash tables and search trees.
2. Learn to implement various text processing .
3. Learn to use appropriate data structures for real world problems.

Course Outcomes: After completion of the course, students will be able to:

1. Develop programs for various data structures for stacks, queues and skip lists.
2. Develop programs for various non-linear data structures for linked lists
3. Develop programs for various non-linear data structures for binary search tree
4. Develop programs for dictionaries.
5. Implement various text processing algorithms.

List of Programs:

1. Implement StackADT using an array.
2. Implement QueueADT using an array .
3. Implement StackADT using a singly linked list.
4. Implement QueueADT using a singly linked list.
5. Implement priority queue ADT.
6. Implement all the functions of a dictionary (ADT) using Linear Probing.
7. Implement all the functions of a dictionary (ADT) using Quadratic Probing.
8. Implement skip list data structure with the following operations.
9. Construct, Search, Update.
10. Implement a binary search data structure to perform the following operations.
11. Construct a binary search tree of elements.

12. Search for a key element in the above binary search tree.
13. Delete an element from the above binary search tree.
14. Implement KMP algorithm for pattern matching.
15. Implement Boyer-Moore algorithm for pattern matching

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in JAVA", 3rdEdition, Pearson,2004.
2. M T Goodrich and Roberto Tamassia, "Algorithm Design", John Wiley, 2002.

Reference Books:

1. S.Sahni, "Data structures, Algorithms and Applications in Java", 2ndEdition, Universities Press,2005.
2. A.Drozdek, "Data Structures and Algorithms in java", 3rd Edition, Cengage Learning,2008.
3. J.R.Hubbard, Data Structures with Java, 2ndEdition, Schaum's Outlines, TMH, 2007.

19CSC 104

ADVANCED ALGORITHMS

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites: UG level course in Algorithm Design and Analysis .

Course Objective:

1. Introduce advanced methods of choosing, designing and analyzing algorithms.
2. Familiarize with basic paradigms and data structures used to solve advanced algorithmic problems.
3. Understand different classes of problems concerning their computation difficulties.

Course Outcomes: After completion of course, students would be able to:

1. Understand the different problems solved by using algorithmic paradigms.
2. Apply the suitable data structure for solving a problem using various strategies
3. Differentiate the complexities of a problem solved in various approaches.
4. Design appropriate mathematical notation to solve a problem using algorithmic paradigms.
5. Develop solutions for real world problem.

UNIT 1:

Sorting: Review of various sorting algorithms, topological sorting

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

UNIT 2:

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 3:

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 4:

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm-Optimal Binary Search Tree, 0/1 Knapsack Problem, Longest Common Subsequence, Matrix Chain Multiplication .

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

UNIT 5:

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: proof of NP-hardness and NP-completeness-Clique Problem, Vertex-Cover Problem, Subset-Sum Problem.

Approximation algorithms: Introduction, Vertex-Cover Problem

Text Books

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition,The MIT Press, 2009.

Suggested Reading

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Addison-Wesley Publication, Originally published on 1974.
2. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Addison-Wesley Publication, 2009.

Online Resources/Weblinks/NPTEL Course:

1. https://nptel.ac.in/courses/106104019/

19CSC 105

SOFT COMPUTING

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Pre-Requisites : UG level course in Basic knowledge of mathematics.

Course Objective:

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.

Course Outcomes: After completion of course, students would be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent Machines.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.
5. Recognize the underlying mathematics and logic behind various soft computing algorithms.

UNIT 1:

Introduction: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence, Hard vs Soft computing.

UNIT 2:

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, Important terminologies of ANNs. McCulloch-Pitts neuron, Linearseparability, Hebb network.Supervised Learning Neural Networks:Perceptron networks, Adaptive linear neuron(Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network

UNIT 3:

Unsupervised Learning Neural Networks: Kohonen self organizing networks, Adaptive resonance theory.

Associate Memory Networks: Bidirectional associative memory network, Hopfield networks.

UNIT 4:

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 5:

Genetic algorithms: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning :Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Machine Learning Approach to Knowledge Acquisition.

Text Books:

1. S.N. Sivanandam& S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2008.
2. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro :Fuzzy and Soft Computing , Prentice:Hall of India, 2003.

Suggested Readings:

1. LiMin Fu, "Neural Networks in Computer Intelligence",McGraw-Hill edition, 1994.
2. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition
3. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications , Prentice Hall, 1995.
4. MATLAB Toolkit Manual.

Online Resources/Weblinks/NPTEL Course:

1. www.soukalfi.edu.sk/01_NeuroFuzzyApproach.pdf
2. https://drive.google.com/file/d 0B0z1VRAPGVkT2MyTXlwdE9XWXc/view?usp=sharing
3. https://github.com/rohanchikorde/Data-Sciencebooks/blob/master/python-machine-learning-2nd.pdf
4. http://www.myreaders.info/html/soft_computing.html

19CSC 106

ADVANCED ALGORITHM and SOFT COMPUTING LAB

Instruction	4 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	25
Credits	2

Pre-Requisites : UG level course in Design and analysis of algorithm Lab using any programming Language.

Course Objective:

1. Familiarize with efficient utilization of programming language constructs and strategies to solve real time problems.
2. Fundamentals of Neural Networks & Feed Forward Networks, Associative Memories & ART Neural Networks
3. Fuzzy Logic and Fuzzy Systems; Genetic Algorithms and its design.

Course Outcomes: After completion of course, students would be able to:

1. Understand and Analyze implementation of various advanced Algorithms.
2. Design and identifies the suitable algorithmic paradigm for any application.
3. Design and analyze various Neural Networks Architectures.
4. Implement fuzzy sets and Genetic Algorithms with its operators.
5. Apply soft computing strategies for various real time applications.

List of Experiments:

1. Implementation of Sorting- heap sort, quick sort, topological sort.
2. Implementation of Minimum Spanning Trees.
3. Implementation of Maximum Sub-Array Problem, Stassen's Matrix Multiplication
4. Implementation of Shortest Path Algorithms.
5. Implementation of Longest Common Subsequence.
6. Implementation of Matrix Chain Multiplication, Simplex Algorithm.
7. Implementation of Simple Neural Network (McCulloh-Pitts model) for realizing AND Operation and OR operation using Perceptron learning algorithm.
8. Implementation of XOR problem using MADALINE network.

9. Design and implementing the back Propagation algorithm for training a non-linear network.
10. Implementation of BAM network.
11. Implementation of KSOFM network for Clustering.
12. Implement the Genetic Algorithm for TSP.

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, MIT Press., 2009.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2nd Edition, Pearson, 2004.
3. S.N.Sivanandam, S.N.Deepa “Principles of Soft Computing” Second Edition, Wiley Publication 2016.
4. Satish Kumar, –"Neural Networks -A classroom approach"; Second Edition, TMH, 2017.

Online Resources/Weblinks/NPTEL Course:

1. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
2. https://www.geeksforgeeks.org/top-algorithms-and-data-structures-for-competitive-programming/
3. http://www.nptelvideos.com/java/java_video_Lecture Hours_tutorials.php
4. https://nptel.ac.in/courses/106104019/

19MEC 103

RESEARCH METHODOLOGY AND IPR

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	25
Credits	2

Course Objectives:

To make the students to

1. Motivate to choose research as career
2. Formulate the research problem, prepare the research design
3. Identify various sources for literature review and data collection report writing
4. Equip with good methods to analyze the collected data
5. Know about IPR copyrights.

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

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights.

UNIT - I

Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem, Selection of Research Problem, Necessity of Defining the Problem.

UNIT - II

Literature Survey Report writing: Literature Survey: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report.

Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

UNIT - III

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT - IV

Data Collection and Analysis: Methods of data collection, importance of Parametric, non parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, Ftest, z-test.

UNIT - V

Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection.

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique"; New Age International Publishers, 2004
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011
3. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publs., Pvt., Ltd., New Delhi, 2004

Suggested Reading:

1. Day R (2006) **How to Write and Publish a Scientific Paper,** Cambridge University Press.
2. **MLA Hand book for writers of Research Papers**, East West Press Pvt. Ltd, New Delhi, 7th Edition, 2008.
3. Lauri Rozakis, Schaum's, **Quick Guide to Writing Great Research Papers**, Tata McGraw Hills Pvt. Ltd, New Delhi, 2007.

Online Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview

19CE A101

DISASTER MITIGATION AND MANAGEMENT

(MTech Audit Course I/II Sem - Common to all branches)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objectives: To enable the student

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases ina disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions

Course Outcomes: At the end of the course the student

1. Ability to analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
2. Ability to understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Ability to understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
4. To understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same.
5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective

disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

UNIT 1:

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT 2:

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT 3:

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storeyed buildings.

UNIT 4:

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects-gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT 5:

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response-

water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni," Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh," Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs". Government of India, "National disaster management plan, Part I and II", Latest 2016.
2. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs, 2003.

19EEA101

SANSKRIT FOR TECHNICAL KNOWLEDGE

(MTech. Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	0

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. To make the novice Learn the Sanskrit to develop the logic in mathematics, science & other subjects
3. To explore the huge knowledge from ancient Indian literature

Course Outcomes: After completion of this course, students will be able to:

1. Develop passion towards Sanskrit language
2. Decipher the latent engineering principles from Sanskrit literature.
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress
5. Explore the avenue for research in engineering with aid of Sanskrit

UNIT 1:

Introduction to Sanskrit language: Sanskrit Alphabets-vowels-consonants-significance of Amarakosa-parts of speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive voice-Past/Present/Future Tense-syntax-Simple Sentences (elementary treatment only)

UNIT 2:

Role of Sanskrit in Basic sciences: Brahmagupthas lemmas (second degree indeterminate equations), sum of squares of n-terms of AP- sulba_sutram or baudhayana theorem (origination of pythogorous theorem)-value of pie-Madhava's sine and cosine theory (origination of Taylor's series).The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of michealson and morley theory).

UNIT 3:

Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering):

Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower- Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingala chandasutram (origination of digital logic system)

UNIT 4:

Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology): Computer languages and the Sanskrit languages-computer command words and the vedic command words-analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequence and logical sequence, programming.

UNIT 5:

Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants-plants, the living-plants have senses-classification of living creatures

Chemical laboratory location and layout-equipment-distillation vessel-kosthi yanthram-

Text Books:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. M.R. Kale, A Higher Sanskrit Grammar: For the Use of School and College Students, Motilal Banarsidass Publishers, ISBN-13: 978-8120801783, 2015.
3. Kapail Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Pride of India, Samskrita Bharati Publisher, ISBN: 81-87276-27-4, 2007
5. Shri Rama Verma, Vedas the source of ultimate science, Nag publishers, ISBN:81-7081-618-1, 2005.

19EC A101

VALUE EDUCATION

(MTech Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	—
Credits	Non credit

Course Objectives

This course aims to:

1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals
3. Cultivate individual and National character.

Course outcomes: After completion of the Course, Students will be able to:

1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day to day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all-round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT 1:

Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT 2:

Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT 3:

Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, Avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT 4:

Values in Holy Books: Self-management and Good health; and internal & external Cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT 5:

Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasic gunas.

Suggested reading

1. Chakroborty, S.K. "Values & Ethics for organizations Theory and practice", Oxford University Press, New Delhi, 1998.
2. Jaya Dayal Goyandaka, "Srimad Bhagavad Gita", with Sanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

19EGA102

INDIAN CONSTITUTION & FUNDAMENTAL RIGHTS
(MTech Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50

Course Objectives:
The course will introduce the students to :

1. The history of Indian Constitution and its role in the Indian democracy.
2. 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. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes : After successful completion of the course he students will be able to :

1. Understand the making of the Indian Constitution and its features.
2. Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
3. Have an insight into various Organs of Governance - composition and functions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
5. Understand Electoral Process, special provisions.

UNIT 1:
History of making of the Indian constitutions - History, Drafting Committee (Composition & Working).
Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT 2:
Contours of Constitutional Rights and 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, Powers and Functions

Union executives : President, Governor, Council of Ministers, Judiciary, appointment and transfer of judges, qualifications, powers and functions

UNIT 4:

Local Administration - District's Administration head: Role and importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati Raj: Introduction, PRI: Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: positions 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 Reading:

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

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

19ITA101

PEDAGOGY STUDIES
(Audit Course-2)

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
Credits	0

Course Objectives:

1. To present the basic concepts of design and policies of pedagogy studies.
2. To provide understanding of the abilities and dispositions with regard to teaching techniques, curriculum design and assessment practices.
3. To familiarize various theories of learning and their connection to teaching practice.
4. To create awareness about the practices followed by DFID, other agencies and other researchers.
5. To provide understanding of critical evidence gaps that guides the professional development.

Course Outcomes: Upon completing this course, students will be able to:

1. Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives of research.
4. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I

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

UNIT-II

Thematic Overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT-III

Evidence on the Effectiveness of Pedagogical Practices: Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and Practicum) and the school curriculum and guidance material best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and pedagogic strategies.

UNIT-IV

Professional Development: alignment with classroom practices and follow up support - Support from the head teacher and the community – Curriculum and assessment - Barriers to learning: Limited resources and large class sizes.

UNIT-V

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

Text Books:

1. Ackers J, Hardman F, "Classroom Interaction in Kenyan Primary Schools, Compare", 31 (2): 245 – 261, 2001.
2. Agarwal M, "Curricular Reform in Schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.

Suggested Reading:

1. Akyeampong K, "Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER)", Country Report 1.London: DFID, 2003.
2. Akyeampong K, Lussier K, Pryor J, Westbrook J, "Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count?, International Journal Educational Development, 33 (3): 272- 282, 2013.
3. Alexander R J, "Culture and Pedagogy: International Comparisons in Primary Education", Oxford and Boston: Blackwell, 2001.
4. Chavan M, "Read India: A mass scale, rapid, 'learning to read' campaign", 2003.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ge03/preview
2. www.pratham.org/images/resources%20working%20paper%202.pdf.

19EGA103

STRESS MANAGEMENT BY YOGA

((MTech Audit Course I/II Sem - Common to all branches)

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks

Course Objectives

The Course will introduce the students to :

1. Creating awareness about different types of stress and the role of yoga in the management of stress.
2. Promotion of positive health and overall wellbeing (Physical, mental, emotional, social and spiritual).
3. Prevention of stress related health problems by yoga practice.

Course Outcomes : After successful completion of the course, the students will be able to :

1. To understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas
5. Improve work performance and efficiency.

UNIT 1:

Meaning and definition of Yoga - Historical perspective of Yoga - Principles of Astanga Yoga by Patanjali.

UNIT 2:

Meaning and definition of Stress - Types of stress - Eustress and Distress. Anticipatory Anxiety and Intense Anxiety and depression. Meaning of Management- Stress Management.

UNIT 3:

Concept of Stress according to Yoga - Stress assessment methods - Role of Asana, Pranayama and Meditation in the management of stress.

UNIT 4:

Asanas- (5 Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar

UNIT 5:

Pranayama- Anulom and Vilom Pranayama - Nadishudhi Pranayama - Kapalabhati Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama.

Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Suggested Reading:

1. "**Yogic Asanas for Group Training - Part-I**": Janardhan Swami Yogabhyasi Mandal, Nagpur, 2019.
2. "**Rajayoga or Conquering the Internal Nature**"by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata, 1998.
3. Nagendra H.R nad Nagaratna R, **Yoga Perspective in Stress Management**, Bangalore, Swami Vivekananda Yoga Prakashan, 2014.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

19 EG A 104

PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS

(MTech. Audit Course I/II Sem - Common to all branches)

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks

Course Objectives:

The course will introduce the students to :

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 among themselves.

Course Outcomes: After successful completion of the course the students will be able to :

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self regulation.
4. Develop a positive approach to work and duties.
5. Develop a versatile personality.

UNIT 1:

Neetisatakam – Holistic development of personality - Verses 19, 20, 21, 22 (Wisdom) - Verses 29, 31, 32 (Pride and Heroism) - Verses 26,28,63,65 (Virtue)

UNIT 2:

Neetisatakam – Holistic development of personality (cont'd) - Verses 52, 53, 59 (dont's) - Verses 71,73,75 & 78 (do's) - Approach to day to day works and duties.

UNIT 3:

Introduction to Bhagavadgeetha for Personality Development - Shrimad Bhagawad 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 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT 4:

Statements of basic knowledge - Shrimad BhagawadGeeta: Chapter 2- Verses 56, 62,68 - Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad Bhagawat Geeta.

UNIT 5:

Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 - Chapter 3 – Verses 36, 37, 42 - Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Readings:

1. "**Srimad Bhagavad Gita"** by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata, 2016.
2. Bhartrihari's **Three Satakam** (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi , 2010.

Online Courses:

1. NTPEL: http://nptel.ac.in/downloads/109104115

19CSO 101

BUSINESS ANALYTICS

(Open Elective)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	70
CIE	30
Credits	3

Course Objectives: The main objectives of this course are to:

1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes: After completion of the course, students will be able:

1. To understand the basic concepts of business analytics
2. Identify the application of business analytics and use tools to analyze business data
3. Become familiar with various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques

UNIT 1:

Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

UNIT 2:

Descriptive Analytics: Introduction, data types and scales, types of measurement scales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization.

UNIT 3:

Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

UNIT 4:

Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. Clustering: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, Prescriptive Analytics- Linear Programming(LP) and LP model building,

UNIT 5:

Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox.

Text Books:

1. U Dinesh Kumar, "Data Analytics", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications with SAS", Associate Publishers, 2015

Suggested Reading:

1. S. Christian Albright, Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", 5th Edition, Cengage, 2015.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

19MEO 101

INDUSTRIAL SAFETY
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course Objectives:
The students will be able to understand

1. Causes for industrial accidents and preventive steps to be taken.
2. Fundamental concepts of Maintenance Engineering.
3. About wear and corrosion along with preventive steps to be taken
4. The basic concepts and importance of fault tracing.
5. The steps involved in carrying out periodic and preventive maintenance of various equipments used in industry.

Course Outcomes: At the end of the course the students will be able to

1. Identify the causes for industrial accidents and suggest preventive measures.
2. Identify the basic tools and requirements of different maintenance procedures.
3. Apply different techniques to reduce and prevent Wear and corrosion in Industry.
4. Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
5. Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc

UNIT 1:
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 2:
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 3:

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

UNIT 4:

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, any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.

UNIT 5:

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 Machine tools, Pumps, Air compressors, Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. H. P. Garg, "Maintenance Engineering", S. Chand and Company, 2012.
2. Audels, "Pump-hydraulic Compressors", Mcgraw Hill Publication, 2001.

Suggested Readings:

1. Higgins & Morrow, "Maintenance Engineering Handbook", Da Information Services, Copy Right 2002.
2. Winterkorn, Hans, "Foundation Engineering Handbook", Chapman & Hall London, Originally published 1975.

19MEO 102

INTRODUCTION TO OPTIMIZATION TECHNIQUES

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course Objectives:

The students will

1. Come to know the formulation of LPP models
2. Understand the Transportation and Assignment techniques
3. Come to know the procedure of Project Management along with CPM and PERT techniques
4. Understand the concepts of queuing theory and inventory models
5. Understand sequencing techniques

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

1. Formulate a linear programming problems (LPP)
2. Build and solve Transportation Models and Assignment Models.
3. Apply project management techniques like CPM and PERT to plan and execute project successfully
4. Apply queing and inventory concepts in industrial applications
5. Apply sequencing models in industries

UNIT - I

Operations Research: Definition, scope, Models, Linear programming problems (LPP), Formulation, Graphical Method, and Simplex Method.

UNIT - II

Transportation Models: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in Transportation, Profit Maximization in Transportation**.**

UNIT - III

Project Management: Definition, Procedure and Objectives of Project Management, Differences between PERT and CPM, Rules for drawing Network

diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of ES and EF times in forward path, LS & LF times in backward path, Determination of critical path, duration of the project, Free float, Independent float and Total float.

UNIT - IV

Queuing Theory and Inventory: Kendols Notation, single server models, Inventory control - deterministic inventory models - Probabilistic inventory control models.

UNIT - V

Sequencing Models: Introduction, Objectives, General assumptions, processing 'n' jobs through two Machines, processing 'n' jobs through three machines.

Text Books:

1. H.A. Taha, "Operations Research, An Introduction", PHI, 2008
2. H.M. Wagner, "Principles of Operations Research", PHI, Delhi, 1982
3. J.C. Pant, "Introduction to Optimisation: Operations Research", Jain Brothers, Delhi, 2008

Suggested Reading:

1. Hitler Libermann, "Operations Research", McGraw Hill Pub. 2009
2. Pannerselvam, "Operations Research", Prentice Hall of India 2010
3. Harvey M Wagner, "Principles of Operations Research", Prentice Hall of India 2010

19CEO 101

COST MANAGEMENT OF ENGINEERING PROJECTS
(OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course Objectives:

1. To enable the students to understand the concepts of Project management.
2. To provide knowledge on concepts of Project Planning and scheduling.
3. To create an awareness on Project Monitoring and Cost Analysis
4. To provide adequate knowledge to the students on Recourse Management Costing-Variance Analysis
5. To train the students with the concepts of Budgetary Control for cost management and to provide basic platform on Quantitative techniques for cost management.

Course Outcomes: At the end of course students will able to

1. Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.
2. Determine the critical path of a typical project using CPM and PERT techniques.
3. Prepare a work break down plan and perform linear scheduling using various methods.
4. Solve problems of resource scheduling and leveling using network diagrams.
5. Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.

UNIT 1:

Project Management: Introduction to project managements, stakeholders, roles, responsibilities and functional relationships. Principles of project management, objectives and project management system. Project team, organization, roles, responsibilities. Concepts of project planning, monitoring, staffing, scheduling and controlling.

UNIT 2:

Project Planning and Scheduling: Introduction for project planning, defining activities and their interdependency, time and resource estimation. Work break down structure. Linear scheduling methods-bar charts, Line of Balance (LOB), their limitations. Principles, definitions of network-based scheduling methods: CPM, PERT. Network representation, network analysis-forward and backward passes.

UNIT 3:

Project Monitoring and Cost Analysis: introduction-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, Time cost tradeoff-Crashing project schedules, its impact on time on time, cost. Project direct and indirect costs.

UNIT 4:

Resources Management and Costing-Variance Analysis: Planning, Enterprise Resource Planning, Resource scheduling and levelling. Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis

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 5:

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

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

References:

1. Charles T Horngren "Cost Accounting A Managerial Emphasis", Pearson Education; 14 edition (2012),
2. Charles T. Horngren and George Foster, "Advanced Management Accounting" Prentice-Hall; 6th Revised edition (1 February 1987)
3. Robert S Kaplan Anthony A. Atkinson, "Management & Cost Accounting" , Pearson; 2 edition (18 October 1996)
4. K. K Chitkara, "Construction Project Management: Planning, scheduling and controlling", Tata McGraw-Hill Education. (2004).
5. Kumar Neeraj Jha "Construction Project Management Theory and Practice",Pearson Education India; 2 edition (2015)

19MEO 103

COMPOSITE MATERIALS

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course Objectives:

To make the students to learn the

1. Composite materials and their constituents.
2. Classification of the reinforcements and evaluate the behavior of composites.
3. Fabrication methods of metal matrix composites.
4. Manufacturing of Polymer matrix composites.
5. Failure mechanisms in composite materials.

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

1. Classify and characterize the composite materials.
2. Describe types of reinforcements and their properties.
3. Understand different fabrication methods of metal matrix composites.
4. Understand different fabrication methods of polymer matrix composites.
5. Decide the failure of composite materials.

UNIT 1:

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 2:

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 3:

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 4:

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

UNIT 5:

Strength: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength;

Text Books:

1. R.W.Cahn – VCH , "Material Science and Technology", (Vol 13) Composites , West Germany, Sept. 1993.
2. WD Callister, Jr., Adapted by R. Balasubramaniam , "Materials Science and Engineering, An introduction"., John Wiley & Sons, NY, Indian edition, 2007.

Suggested Readings:

1. Ed-Lubin, "Hand Book of Composite Materials"
2. K.K.Chawla, "Composite Materials".
3. Deborah D.L. Chung, "Composite Materials Science and Applications"
4. Daniel Gay, Suong V. Hoa, and Stephen W. Tsai, "Composite Materials Design and Applications"

19EEO 101

WASTE TO ENERGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course objectives:

1. To know the various forms of waste
2. To understand the processes of Biomass Pyrolysis.
3. To learn the technique of Biomass Combustion.

Course outcomes: After completion of this course, students will be able to:

1. Understand the concept of conservation of waste.
2. Identify the different forms of wastage.
3. Chose the best way for conservation to produce energy from waste
4. Explore the ways and means of combustion of biomass
5. Develop a healthy environment for the mankind

UNIT 1:

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

UNIT 2:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT 3:

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 4:

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 5:

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.

Text Books:

1. "Non Conventional Energy", Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. "Biogas Technology - A Practical Hand Book" - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Suggested Readings:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

19PYO 101

HISTORY OF SCIENCE AND TECHNOLOGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70
CIE	30
Credits	3

Course Objectives: The main objectives of this course are:

1. Enable students to understand science as a socio-cultural product in specific socio-historical contexts.
2. Expose students to philosophical, historical and sociological perspectives to look at science as a practice deeply embedded in culture and society.
3. Inculcate the scientific culture and ethics in the development of technologies.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
2. Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
3. Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
4. Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
5. Demonstrate academic rig our and a sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.

UNIT - I

Science - The Beginning (through 599 BC): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances. Science in Antiquity (600 BC - 529 AD): Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT - II

Medieval Science (530 AD - 1452 AD): The decline of science in Europe , Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances. The Renaissance and the Scientific Revolution (1453 AD – 1659 AD): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT - III

Scientific Method: Measurement and Communication (1660 AD – 1734): European domination, The scientific method, Major advances. The Industrial Revolution (1735 AD – 1819 AD): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT - IV

Science and Technology in the 19th Century (1820 AD – 1894 AD): philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances. Rise of **Modern Science and Technology (1895 AD – 1945 AD):** The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT - V

Big Science and the Post-Industrial Society (1946 AD – 1972 AD): Big science, Specialization and changing categories, Technology changes society, Major advances.; **The Information Age (1973 AD – 2015 AD):** Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Text Books:

1. Bryan and Alexander Hellemans, "The History of Science and Technology", Houghton Mifflin Company, 2004.
2. JD Bernal, "Science in History", 4 volumes, Kindle Edition.

Suggested Readings:

1. Kara Rogers, "The 100 Most Influential Scientists of All Time", Britannica Educational Publishing, 2010
2. Alberto Hernandez, "A Visual History of Science and Technology", The Rosen Publishing Group, 2016

19CSC 107

MINI PROJECT with SEMINAR

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Outcomes:

Students are able to

1. Formulate a specific problem and give solution.
2. Develop model/models either theoretical/practical/numerical form.
3. Solve, interpret/correlate the results and discussions.
4. Conclude the results obtained.
5. Write the documentation in standard format.

Guidelines:

- As part of the curriculum in II- semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Students are advised to select the mini project in such a way that they can demonstrate their competence in research techniques for the challenging issues/problems, and get an opportunity to contribute something more original.
- Mini projects shall have inter disciplinary/industry relevance.
- The students can select a mathematical modeling based/Experimental investigations or Numerical modeling.
- All the investigations are clearly stated and documented with the reasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.

  Department committee: Supervisor and two faculty coordinators

Guidelines for awarding marks (CIE):		Max. Marks: 50
Evaluation by	**Max .Marks**	**Evaluation Ccriteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Department Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

19CSC 108

DISSERTATION PHASE-I

Instruction	20 Hours per week
CIE	100 Marks
Credits	10

Course Outcomes:

At the end of the course:

1. Students will be exposed to self-learning various topics.
2. Students will learn to survey the literature such as books, national/ international refereed
3. journals and contact resource persons for the selected topic of research.
4. Students will learn to write technical reports.
5. Students will develop oral and written communication skills to present.
6. Student will defend their work in front of technically qualified audience.

Guidelines:

- The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
- Seminar should be based on the area in which the candidate has undertaken the dissertation work.
- The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
- The preliminary results (if available) of the problem may also be discussed in the report.
- The work has to be presented in front of the committee consists of Head, Chairperson-BoS, Supervisor and Project coordinator.
- The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

Guidelines for the award of Marks:		Max. Marks: 100
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Department Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note : Department committee has to assess the progress of the student for every two weeks.

19CSC 109

DISSERTATION PHASE- II

Instruction	32 Hours per week
Duration of SEE	3
SEE	100 Marks
CIE	100 Marks
Credits	16

Course Outcomes:

At the end of the course:

1. Students will be able to use different experimental techniques and will be able to use different software/ computational/analytical tools.
2. Students will be able to design and develop an experimental set up/ equipment/test rig.
3. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
4. Students will be able to either work in a research environment or in an industrial environment.
5. Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.

Guidelines:

- It is a continuation of Project work started in semester III.
- The student has to submit the report in prescribed format and also present a seminar.
- The dissertation should be presented in standard format as provided by the department.
- The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
- The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner(HoD and BoS Chair Person) guide/co-guide.
- The candidate has to be in regular contact with his/her guide/co-guide.

Guidelines for awarding marks in CIE: Max. Marks: 100		
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report reportstandard format
	10	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

Guidelines for awarding marks in SEE: (Max. Marks: 100)Max. Marks: 100		
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiner(s) together	20	Power Point Presentation
	40	Quality of thesis and evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce