DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Scheme of Instruction and Syllabus of

M. Tech (CSE)

(With effect from 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

Affiliated to Osmania University,

Hyderabad – 500 075, Telangana State

Institute Vision:

1. 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:

1. To provide a curriculum that balances engineering fundamentals, modern technologies and research.
2. To provide opportunities for solving real world problems.
3. 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 Course	Scheme Of Instructions			Duration Of SEE In Hours	Scheme Of Examination		
			Hours Per Week				Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
		THEORY							
1	20CSC 101	Mathematical Foundation of Computer Science	3	-	-	3	40	60	3
2	20CSC 102	Advanced Data Structures	3	-	-	3	40	60	3
3	20CSEXXX	Elective -I	3	-	-	3	40	60	3
4	20CSEXXX	Elective -II	3	-	-	3	40	60	3
5	20MEC 103	Research Methodology and IPR	2	-	-	2	40	60	2
6	20XXXXXX	Audit Courses-1	2	-	-	2	-	50	Non Credit
PRACTICAL									
7	20CSC 103	Laboratory 1 (Advanced Data Structures)	-	-	4	-	50	-	2
8	20CSEXXX	Laboratory 2 (Based on Elective-I,III)	-	-	4	-	50	-	2
	Total		**16**	**-**	**8**	**-**	**300**	**350**	**18**

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

ELECTIVE-I,III		
S.No	**Course Code**	**Title Of Course**
1	20CSE101	Machine Learning
2	20CSE102	Internet of Things
3	20CSE103	Introduction to Intelligent Systems
4	20CSE104	Data Preparation and Analysis
5	20CSE105	Secure Software Design & Enterprise Computing (SSDEC)
6	20CSE106	Computer Vision

ELECTIVE -I ,III LAB		
S.No	**Course Code**	**Title Of Course**
1	20CSE107	Machine Learning Lab
2	20CSE108	Internet of Things Lab
3	20CSE109	Introduction to Intelligent Systems Lab
4	20CSE110	Data Preparation and Analysis Lab
5	20CSE111	SSDE Lab
6	20CSE112	Computer Vision Lab

ELECTIVE –II,IV,V		
S.No	**Course Code**	**Title Of Course**
1	20CSE113	Data Science & Big Data Analytics
2	20CSE114	Distributed Database Systems
3	20CSE115	Advanced Wireless and Mobile Networks
4	20CSE116	Human and Computer Interaction
5	20CSE117	GPU Computing
6	20CSE118	Digital Forensics
7	20CSE119	Mobile Applications and Services
8	20CSE120	Compiler for HPC
9	20CSE121	Open Source Technologies

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SCHEME OF INSTRUCTION &EXAMINATIONS

II-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSC 104	Advanced Algorithms	3	-	-	3	40	60	3
2	20CSC 105	Soft Computing	3	-	-	3	40	60	3
3	20CSEXXX	Elective -III	3	-	-	3	40	60	3
4	20CSEXXX	Elective -IV	3	-	-	3	40	60	3
5	20XXXXXX	Audit Course 2	2	-	-	2	-	50	Non Credit
PRACTICAL									
7	20CSC 106	Laboratory 3 (AA& Soft Computing)	-	-	4	-	50	-	2
8	20CSEXXX	Laboratory 4 (Based on Electives-III)	-	-	4	-	50	-	2
9	20CSC 107	Mini Projects with seminar	-	-	4	-	50	-	2
TOTAL			**14**	**-**	**12**	**-**	**310**	**290**	**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

S.No	Course Code	Title Of Course
1	20EGA101	English for research paper writing
2	20CEA101	Disaster mitigation and management
3	20EEA101	Sanskrit for technical knowledge
4	20ECA101	Value education
5	20EGA102	Indian constitution & fundamental rights
6	20ITA101	Pedagogy studies
7	20EGA103	Stress Management by Yoga
8	20EGA104	Personality Development through Life Enlightenment Skills.

III-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSEXXX	Elective -V	3	-	-	3	40	60	3
2	20CSXXX	Open Elective	3	-	-	3	40	60	3
3	20CSC 108	Dissertation Phase – I	-	-	20	-	100	-	10
TOTAL			**6**	**-**	**20**	**-**	**180**	**120**	**16**

ELECTIVE-V		
S.No	**Course Code**	**Title Of Course**
1	20CSE119	Mobile Applications and Services
2	20CSE120	Compiler for HPC
3	20CSE121	Open Source Technologies
4	NPTEL	Software Project Management
		Natural Language Processing
		Block Chain Architecture Design and Use cases
		Social Networks
		Virtual Reality

Open ELECTIVE -VI		
S.No	**Course Code**	**Title Of Course**
1	20CSO 101	Business Analytics
2	20MEO 101	Industrial Safety
3	20MEO 102	Introduction to Optimization Techniques
4	20CEO101	Cost Management of Engineering Projects
5	20MEO103	Composite Materials
6	20EEO101	Waste to Energy
7	20PYO 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 Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSC 109	Dissertation Phase – II	0	0	32	3	100	100	16
TOTAL			**0**	**0**	**32**	**-**	**100**	**100**	**16**

SEMESTER-I

20CSC 101

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Discrete Mathematics.

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Solve the probability function by inequalities.
2. Infer the data by hypothesis testing procedure.
3. Apply graphs models in real time applications.
4. Apply various counting techniques in solving combinatorial problems.
5. Design solutions using Recurrence Relations for real time problems.
6. Apply number theory to cryptography problems.

UNIT-I

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-II

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-III

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-IV

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-V

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.

Textbooks:

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 .

Suggested Readings:

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

20CSC 102

ADVANCED DATA STRUCTURES

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: Undergraduate Course in Data Structures.

Course Objectives: The objectives of this course are

1. To use appropriate data structures and to design algorithms for a specific problem.
2. To analyze and implement dictionaries, hash algorithms skip list data structures as solutions to real-world problems.
3. To deal with text-processing algorithms and computational geometric concepts for efficient space utilization.

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

1. Analyze the significance of Dictionaries and apply them to solve real-world problems.
2. Apply various hashing techniques to perform linear and quadratic probing.
3. Construct Skip Lists in a randomized and deterministic way.
4. Develop algorithms for various tree data structures like red-black trees, B-trees and Splay trees.
5. Apply the text processing operations for efficient space utilization.
6. Analyze computational geometric problems in terms of priority and range search operations.

UNIT-I

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation ofDictionaries; **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-II

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search andUpdate Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.

UNIT-III

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

UNIT-IV

Text Processing: String Operations, Brute-Force Pattern Matching, The BoyerMoore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman coding algorithm.

UNIT-V

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

Textbooks:

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.

Suggested Readings:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++, 2ndEdition", Pearson, 2004.
2. SartajSahni, "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

20CSE101

MACHINE LEARNING

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Identify complexity of Machine Learning algorithms and their limitations.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
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.
6. Apply graphical models for probabilistic reasoning.

UNIT-I

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-II

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-III

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

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming.
Ensemble learning: Boosting, Bagging, Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis.

UNIT-V

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

Textbooks:

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

Suggested Readings:

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

Online resources:

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

20CSE102

INTERNET OF THINGS

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Understand an overview of IoT.
2. Use of devices and gateways in Service Oriented Architecture.
3. Analyze various communication protocols in sensor networks.
4. Design applications using Raspberry Pi and Node MCU.
5. Develop different IoT Automation Systems.
6. Apply IoT concepts in various domains such as Smart Cities, Home Automation, Weather Monitoring System, and Agriculture.

UNIT-I

Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators andTypes of Actuators.
Basics of Networking : IoT components, Functional Components of IoT, IoTinterdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT-II

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

UNIT-III

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-IV

Introduction to Node MCU: Node MCU pin diagram, Integration of Sensors andActuators with Node MCU.
Introduction to Raspberry Pi: About the board, Linux on Raspberry Pi, RaspberryPi Interfaces, Programming Raspberry Pi with Python.

UNIT-V

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.

Textbooks:

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

Suggested Readings:

1. Dr. SRN Reddy, RachitTirnkral 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. CunoPfister, "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 :

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.

20CSE103

INTRODUCTION TO INTELLIGENT SYSTEMS

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Describe knowledge of the fundamental principles of intelligent systems.
2. Identify various search strategies to solve problems.
3. Compare and contrast knowledge representation schemes.
4. Appraise knowledge in Uncertainty and Probabilistic reasoning approaches.
5. Apply different learning techniques to solve complex problems.
6. Define the basic concepts of phases and applications of Natural Language processing.

UNIT-I

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-II

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-III

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-IV

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-V

Advanced Knowledge Representation Techniques: Case Grammars, SemanticWeb.
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 :

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/.

20CSE104

DATA PREPARATION AND ANALYSIS

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives:

1. Identify data gathering and preparation techniques for industrial and scientific applications.
2. Apply exploratory data analysis techniques to develop meaningful data visualizations.
3. Analyze various statistical significance based testing mechanisms and apply them to deal with real-world problems.

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

1. Identify and analyze various data gathering and preparation techniques to format, parse and transform data as required.
2. Apply data cleaning techniques on various data sets to perform consistency check, transformation, and segmentation processes.
3. Apply exploratory data analysis techniques to perform descriptive and comparative statistics on data.
4. Analyze different visualization techniques and apply the suitable one to deal with real-world problems.
5. Apply correlations, connectivity, and interactivity techniques on different data items for any given dataset.
6. Analyze various statistical significance based testing mechanisms and apply them to build regression models.

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Textbooks:

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.

Suggested Readings:

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

Online Resources :

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.

20CSE105

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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 various software vulnerabilities and develop software to process vulnerabilities for an organization.
2. Evaluate various enterprise application design and development tools and standard practices.
3. Review techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
4. Know essential techniques for reducing and avoiding system and software security Problems.
5. Understand methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.
6. Solve enterprise scale problems emanating from lapses in security requirements and information system management practices.

UNIT-I

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

UNIT-II

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-III

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-IV

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-V

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

Textbooks:

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 :

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

20CSE106

COMPUTER VISION

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Explain the basic principles of image processing and its significance in real world.
2. Interpret and evaluate various approaches for image. transformation, segmentation, and restoration.
3. Choose object, scene recognition and categorization algorithms for real time images.
4. Analyze images and videos for problems such as tracking and structure from motion.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT-I

Image Formation and Description: Fundamental steps of image processing, theimage 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-II

Image Enhancements: Histogram Equalization, Image Smoothing, ImageSharpening, 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-III

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-IV

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

UNIT-V

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

Textbooks:

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.

Suggested Readings:

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 Resources:

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.

20CSE113

DATA SCIENCE AND BIG DATA ANALYTICS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Database Management Systems.

Course Objectives: The objectives of this course are

1. Acquire 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. Evaluate data visualization techniques to deal with various design aspects.

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

1. Understand and explore big data Ecosystem using exploratory and statistical evaluation methods.
2. Analyze various machine learning algorithms and apply them to solve real-world problems.
3. Apply advanced analytical tools to perform logistic regression through experiments and extract meaningful data.
4. Apply data visualization techniques to evaluate models and to overcome data leakage problems.
5. Understand and apply Hadoop Ecosystem to explore bigdata analytics using Map-reduce techniques.
6. Analyze the significance of NoSQL database systems and apply them to perform bigdata analysis.

UNIT-I

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

UNIT-II

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-III

Logistic Regression: Thought Experiments, Classifiers, M6D LogisticRegression.

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

UNIT-IV

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-V

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 .

Textbooks:

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.

Suggested Readings:

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/
   https://www.datascienceweekly.org

20CSE114

DISTRIBUTED DATABASE SYSTEMS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful 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-I

Introduction: Distributed data processing; what is a DDBS; Advantagesand disadvantages of DDBS. Problem areas; Overview of database and computer network concepts,DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.

UNIT-II

Distributed Database Design Alternative design strategies; Distributed design issues; Fragmentation; Data allocation SEMANTICS DATA CONTROL View management; Data security; Semantic Integrity Control

Query Processing Issues Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.

UNIT-III

Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms.

Transaction Management The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models

Concurrency Control Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

UNIT-IV

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

UNIT-V

Parallel Database Systems: Parallel architectures; parallel query processing and optimization; load balancing.

Advanced Topics: Mobile Databases, Distributed Object Management, Multi-databases.

Suggested Readings:

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.

20CSE115

ADVANCED WIRELESS AND MOBILE NETWORKS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-requisites: Undergraduate course in Computer Networks.

Course Objectives:

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: On Successful completion of the course, students will be able to

1. Identify the knowledge of wireless networking and its standards.
2. Recognize different cellular technologies (like 3G, 4G, 5G) and WLAN, WPAN, WWAN for performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Analyze various wireless network transmission to build effective communication.
5. Relate Security techniques to resolve network vulnerabilities.
6. Develop mobile applications to solve some of the real-world problems.

UNIT-I

Introduction: Wireless Networking Trends, Key Wireless Physical LayerConcepts, 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-II

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-III

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management.

UNIT-IV

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

UNIT-V

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

Textbooks:

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

Suggested Readings:

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

20CSE116

HUMAN AND COMPUTER INTERACTION

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful 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-I

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

UNIT-II

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-III

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

UNIT-IV

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

UNIT-V

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

Textbooks:

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 Readings:

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 :

1. https://nptel.ac.in/courses/106103115/
2. https://www.interaction-design.org/courses/human-computer-interaction?ad-set=human-computer-interactioncourse&gclid= EAIaIQobChMIkJu W09jM4QIVgTgrCh0PuwtXEAAYASAAEgLPhPD_BwE

20CSE117

GPU COMPUTING

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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: On Successful completion of the course, students will be able to

1. List out CPU/GPU comparisons and identify the features of parallel programming.
2. Write simple programs using CUDA programming model.
3. Distinguish various memory hierarchies and carryout performance evaluation with different memories.
4. Illustrate synchronization concepts in CPU and GPU.
5. Point out advanced topics in multi-GPU processing and heterogeneous processing.
6. Develop programs using GPUs for real world problems in image processing, simulation and deep learning.

UNIT-I

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, Launchparameters, Thread hierarchy, Warps / Wave fronts, Thread blocks / Workgroups, **Streams:** Streaming multiprocessors, 1D / 2D /3D thread mapping, Deviceproperties, Simple Programs.

UNIT-II

Memory: Memory hierarchy, DRAM / global, local / shared, private / local,textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices,

Matrices: Programs with matrices, Performance evaluation with differentmemories.

UNIT-III

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, Usinglibraries(such as Thrust), developing libraries.

UNIT-IV

Debugging GPU Programs: Profiling, Profile tools, Performance aspects **Streams:** Asynchronous processing, tasks, Task-dependence, Overlapped datatransfers, Default Stream, Synchronization with streams.

Events: Event-based-Synchronization - Overlapping data transfer and kernelexecution, pitfalls.

UNIT-V

Advanced topics: Dynamic parallelism, Multi-GPU processing, HeterogeneousProcessing.

Textbooks:

1. "CUDA Programming: A Developer's Guide to Parallel ComputingWith 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).

Suggested Readings:

1. "CUDA by Example: An Introduction to General Purpose GPU Programming; Jason Sanders, Edward Kandrot; Addison-Wesley; 2011(ISBN978-0-13-138768-3)
2. The CUDA Handbook: A Comprehensive Guide to GPU Programming";Nicholas Wilt; Addison Wesley; 2013(ISBN: 978-0321809469)

Online Resources :

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.

20CSE118

DIGITAL FORENSICS

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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: On Successful completion of the course, students will be able to

1. Explain the fundamentals of digital forensics.
2. Choose the methods for Collecting, preserving and recovering the evidence for use in investigations.
3. Explain the need to maintain the chain of evidence in criminal investigations and apply this in the context of simple case studies.
4. Analyze data acquired from various crime scene scenarios.
5. Describe the Legal Aspects of Digital Forensics.
6. Demonstrate the concept of Network Forensics and Mobile Forensics.

UNIT-I

Digital forensics 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-II

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-III

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-IV

Computer Forensics Analysis - Discovery of electronic evidence, identification of data, reconstructing past events, Investigating Live Systems (Windows &UNIX).
Network forensics: Network Security Tools, Network Attacks, Network Evidence and Investigations.

UNIT-V

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

Textbooks:

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 Readings:

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.

Online Resources:

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

20CSE119

MOBILE APPLICATIONS AND SERVICES

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives: The objectives of this course are

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. Design the User Interface for mobile applications.
3. Develop database management system to retrieve and/or store data for mobile application.
4. Analyze Android networking and Internet services use in Mobile Apps.
5. Illustrate the packaging and deploying mobile apps with performance best practices and location based services.
6. Evaluate the development process of mobile application with security concepts.

UNIT-I

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

UNIT-II

More on UIs: Voice UIs and Mobile Apps, Text-to-Speech Techniques, Designingthe 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-III

Communications via Network and the Web: State Machine, CorrectCommunications 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-IV

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

UNIT-V

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

Textbook:

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

Suggested Readings:

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.

Online Resources:

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

20CSE120

COMPILER FOR HPC

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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: On Successful 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. Explore the concepts of Parallel loops, data dependency, exception handling and debugging in a compiler.
3. Interpret and analyze the concepts involved in loop structuring and concurrency analysis.
4. Differentiate the various types of Machines, and the techniques like Vector Code from Sequential Loops for all Loops, Round off Error, Exceptions, and Debuggers, Multi.
5. Elaborate the Message passing Machines and Scalable Shared Machines
6. Determine the recent trends in compilers for efficient compiler building.

UNIT-I

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-II

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-III

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-IV

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

UNIT-V

Message -Passing Machines:, 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.

Textbooks:

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 :

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.

20CSE121

OPEN SOURCE TECHNOLOGIES

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
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 the course, students will be able to

1. Identify various OSS tools, platforms, licensing procedures, and development models, ethics
2. Describe various OSS projects, development models and project management
3. Adapt to the usage of OSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics, and models.

UNIT-I

Introduction to Open Source: Open Source, need and principles of OSS, OpenSource 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, OpenSource 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, OpenSource 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**.**

Textbooks:

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, GautamGuliani, “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.

20CSE107

MACHINE LEARNING LAB

Elective-I

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

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

Course Objectives:The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling of computer- based systems.
2. Identify and utilize modern tools that are useful for data analysis.
3. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
4. Implement unsupervised learning algorithms.
5. Implement and evaluate various Machine Learning approaches.
6. Design and develop solutions to real world problems using ML techniques.

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.

Textbooks:

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.

Online Resources:

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

20CSE108

INTERNET OF THINGS LAB

Elective-I

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

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

Course Objectives: The objectives of this course are

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: On Successful 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 ofIoTequipment's 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.

Textbooks:

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

Suggested Readings:

1. Dr. SRN Reddy, RachitTirnkral 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. CunoPfister, "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:

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.

20CSE109

INTRODUCTION TO INTELLIGENT SYSTEMS LAB

Elective-I

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

Pre Requisites: Basics of python programming.

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Write programs in Python/Prolog language.
2. Recognize the underlying mathematics and logic behind various computing algorithms under AI system.
3. Apply variety of uncertain algorithms to solve problems.
4. Describe and apply various techniques for logic programming and machine learning.
5. Implement problems using game search algorithms.
6. Develop solutions for real world problems using NLP.

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.

Textbooks:

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.

Suggested Readings:

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.

20CSE110

DATA PREPARATION AND ANALYSIS LAB

Elective-III

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

Course Objectives: The objectives of this course are

1. Identify data gathering and preparation techniques for industrial and scientific applications.
2. Apply exploratory data analysis techniques to develop meaningful data visualizations.
3. Analyze various statistical significance based testing mechanisms and apply them to deal with real-world problems.

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

1. Differentiate between numerical and categorical attributes and apply various pre-processing techniques to clean any chosen dataset.
2. Apply discretization and clustering techniques on preprocessed data.
3. Apply Association Rule mining technique to explore relationships among various attributes.
4. Apply exploratory data analysis techniques to develop meaningful data visualizations.
5. Apply various file-processing operations to deal with real-world datasets.
6. Create applications to deal with interactive datasets suitable to explore the significance of variables.

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.

Textbooks:

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.

Suggested Readings:

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.

20CSE111

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB

Elective-III

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

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

Course Objectives:

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: On Successful completion of the course, students will be able to

1. Develop a security model for any enterprise based application on its threats and vulnerabilities.
2. Implement methodologies and tools to design secure software enterprise application.
3. Compare different types of threats and attacks.
4. Implement the various security algorithms to be implemented for secured computing and computer networks.
5. Evaluate various methods of authentication and access control for web based applications.
6. Analyze and apply different anti-intrusion techniques.

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.

Suggested Readings:

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

20CSE112

COMPUTER VISION LAB

Elective-III

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

Prerequisites: Basics of programming languages.

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Identify the fundamental issues and challenges of computer vision.
2. Apply image enhancement techniques.
3. Detect edges using various kernels and transformations.
4. Apply histogram processing and conversion between various colour spaces.
5. Analyze 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

Familiarization of the tool used for computer vision.

1. Implement basic image operations
a. Loading and displaying an image.
b. Color formats
c. Image enhancement.
2. Implement smoothing filters on an image using
d. Gaussian filter
e. Median filter
f. Mean Filter
3. Demonstrate fourier Transformations.
4. Implement histogram calculation and equalization for the given image.
5. Implement morphological operations like dilation, erosion, opening and closing on the given image.
6. Implement edge detection on images using any two edge detection masks.
7. Detection of motion from structure .
8. Implement texture extraction of a given image.
9. Case Study :Object detection like recognizing pedestrians..
10. Case Study :Face recognition of an image using K-Means clustering.
11. Case Study :Dimensionality reduction using PCA for the givenimages.
12. Case Study :Demonstrate model based reconstruction using tensorflow.

Textbooks:

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.

Suggested Readings:

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.

20CSC 103

ADVANCED DATA STRUCTURES LAB

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

Prerequisites: Undergraduate course on Data Structures.

Course Objectives: The objectives of this course are

1. To use appropriate data structures and to design algorithms for a specific problem.
2. To analyze and implement dictionaries, hash algorithms skip list data structures as solutions to real-world problems.
3. To deal with text-processing algorithms and computational geometric concepts for efficient space utilization.

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

1. Analyze and implement various data structures like stacks, queues and priority queues using arrays.
2. Analyze and implement various data structures like stacks, queues and priority queues using linked list.
3. Implement Dictionary ADT using Linear and quadratic probing operations.
4. Construct a skip list data structure and perform various operations on it.
5. Analyze and implement various binary tree operations.
6. Analyze and implement the significance of various text processing operations for pattern matching.

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

Textbooks:

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.

Suggested Readings:

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.

SEMESTER - II

20CSC 104

ADVANCED ALGORITHMS

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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: On Successful completion of the course, students will be able to

1. Define and discuss 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. Evaluate various algorithmic design techniques.
5. Design appropriate mathematical notation to solve a problem using algorithmic paradigms.
6. Develop solutions for real world problem.

UNIT-I

Sorting: Review of various sorting algorithms, topological sorting

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

UNIT-II

Matroids: Introduction to greedy paradigm, algorithm to compute a maximumweight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization ofmaximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-III

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide andconquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT-IV

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamicprogramming 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-V

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

Textbooks:

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

Suggested Readings:

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 :

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

20CSC 105

SOFT COMPUTING

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

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

Course Objectives:

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

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

1. Identify and describe soft computing techniques and their roles in building Intelligent Machines.
2. Comprehend appropriate learning rules for each of the neural network architectures and learn several neural network paradigms, its applications and limitations.
3. Apply fuzzy logic and reasoning to handle uncertainties and solve various engineering problems.
4. Apply genetic algorithms to combinatorial optimization problems.
5. Evaluate and compare solutions by various soft computing approaches for a given problem.
6. Recognize the underlying mathematics and logic behind various soft computing algorithms.

UNIT-I

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

UNIT-II

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-III

Unsupervised Learning Neural Networks: Kohonenself organizing networks,Adaptive resonance theory.
Associate Memory Networks: Bidirectional associative memory network,Hopfield networks.

UNIT-IV

Fuzzy logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, MembershipFunctions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-V

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

Textbooks:

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 :

1. www.soukalfi.edu.sk/01_NeuroFuzzyApproach.pdf
2. https://drive.google.com/file/d0B0z1VRAPGVkT2MyTXlwdE9XWXc/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

20CSC 106

ADVANCED ALGORITHM and SOFT COMPUTING LAB

Instruction	4 hrs per week
Duration of End examination	3 hrs
Continuous Internal Evaluation	50
Credits	2

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

Course Objectives:

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: On Successful completion of the course, students will be able to

1. Describe and analyze various advanced Algorithms.
2. Implement various algorithmic design techniques.
3. . Design and identify the suitable algorithmic paradigm to solve real world problems
4. Design and analyze various Neural Networks Architectures.
5. Implement fuzzy sets and Genetic Algorithms with its operators.
6. 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.

Textbooks:

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 :

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/

20MEC103

RESEARCH METHODOLOGY AND IPR

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	20
Credits	2

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students 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 ofResearch, 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 purposeof 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 ResearchReport, 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 ofParametric, 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.

Textbooks:

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 Readings:

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 PressPvt. Ltd, New Delhi, 7th Edition, 2008.
3. Lauri Rozakis, Schaum's, Quick Guide to Writing Great ResearchPapers, Tata McGraw Hills Pvt. Ltd, New Delhi, 2007.

Online Resources:

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

20EGA101

ENGLISH FOR RESEARCH PAPER WRITING
((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	-

Course Objectives: The objectives of this course are

1. To the various purposes of Research Papers and help them infer the benefits and limitations of research.
2. To developing the content, formulating a structure and illustrating the format of writing a research paper.
3. In differentiating between qualitative and quantitative research types.
4. To constructing paragraphs and developing thesis statement.
5. To producing original research papers while avoiding plagiarism.

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

1. Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
2. Classify different types of research papers and organize the format and citation of sources.
3. Review the literature and categorize between different types of research.
4. Draft paragraphs and write thesis statement in a scientific manner.
5. Develop an original research paper while acquiring the knowledge of how and where to publish their papers.

UNIT- I
Academic Writing: Meaning & Definition of a research paper; Purpose of a research paper – Scope, Benefits, Limitations and outcomes.

Unit -II
Research Paper Format: Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT -III
Research Methodology Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT- IV
Process of Writing a research paper Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft –Revising/Editing - The final draft and proof reading. IEEE Style.

UNIT- V
Research Paper Publication Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits.

Textbook:

1. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4thEdition.

Suggested Readings:

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, 7thEdition.
3. Lipson, Charles(2011), Cite Right: A Quick Guide to Citation Styles; MLA, APA, Chicago, the n)Sciences, Professions, and more (2nd Edition). Chicago [u.a] :Univ of Chicago Press.

Online Resources:

1. NPTEL https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. NPTEL: https://nptel.ac.in/courses/121/106/121106007/
3. https://www.classcentral.com/course/swayam-introduction-to-research-5221

20CEA101

DISASTER MITIGATION AND MANAGEMENT

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

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
2. Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
4. 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-I

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-II

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-III

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-IV

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-V

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.

Textbooks:

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 Readings:

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.

20EEA101

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	50
CIE	-
Credits	-

Course Objectives:The objectives of this course are

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: On Successful completion of the 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-I

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-II

Role of Sanskrit in Basic sciences: Brahmagupthas lemmas (second degreeindeterminate 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-III

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-Pingalachandasutram (origination of digital logic system)

UNIT-IV

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-V

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-kosthiyanthram-

Textbooks:

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
3. College Students, MotilalBanarsidass Publishers, ISBN-13: 978-8120801783,2015.
4. Kapail Kapoor, Language, Linguistics and Literature: The Indian
5. Perspective, ISBN-10: 8171880649, 1994.
6. Pride of India, SamskritaBharati Publisher, ISBN: 81-87276-27-4, 2007
7. Shri RamaVerma, Vedas the source of ultimate science, Nag publishers, ISBN:81-7081-618-1,2005.

20ECA101

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	-

Course Objectives : The objectives of this course are

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: On Successful 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-I

Human Values, Ethics and Morals: Concept of Values, Indian concept ofhumanism, 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-II

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

UNIT-III

Spiritual outlook and social values: Personality and Behavior, Scientific attitudeand 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-IV

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

UNIT-V

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

Suggested readings:

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

20EGA102

INDIANCONSTITUTION & 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
CIE	-
Credits	-

Course Objectives: The objectives of this course are

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

UNIT-II
Contours of Constitutional Rights and Duties - Fundamental Rights, Right toEquality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III
Organs of Governance - Parliament: Composition, Qualifications, Powers andFunctions
Union executives : President, Governor, Council of Ministers, Judiciary, appointment and transfer of judges, qualifications, powers and functions

UNIT-IV
Local Administration - District's Administration head: Role and importance.
Municipalities: Introduction, Mayor and role of Elected Representative, CEO of
Municipal Corporation. 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-V
Election commission: Election Commission: Role and functioning, Chief Election Commissioner and Election Commissioners, State Election Commission :Role and functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings:

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

20ITA101

PEDAGOGY STUDIES
Audit Course-2)

Instruction	2 Hours per week
Duration of End Exam	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	-

Course Objectives: The objectives of this course are

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: On Successful completion of the 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 thein 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 upsupport - 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.

Textbooks:

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 ofevaluation", Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.

Suggested Readings:

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
4. Primary Education”, Oxford and Boston: Blackwell, 2001.
5. Chavan M, “Read India: A mass scale, rapid, ‘learning to read’ campaign”, 2003.

Online Resources:

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

20EGA103

STRESS MANAGEMENT BY YOGA

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

Instruction	2 Hours per week
Duration of End examination	2 Hours
Semester end examination	50 Marks
CIE	-
Credits	-

Course Objectives : The objectives of this course are

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: On Successful completion of the course, 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 ofAstanga 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 ofAsana, Pranayama and Meditation in the management of stress.

UNIT 4:

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

UNIT-V

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

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

Suggested Readings:

1. "Yogic Asanas for Group Training - Part-I": Janardhan Swami Yogabhyasi Mandal, Nagpur, 2019.
2. "Rajayoga or Conquering the Internal Nature"by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata, 1998.
3. Nagendra H.R nadNagaratna 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

20 EGA104

PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS

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

Instruction	2 Hours per week
Duration of end examination	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	-

Course Objectives: The objectives of this course are

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: On Successful completion of the course, 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-I

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-II

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-III

Introduction to Bhagavadgeetha for Personality Development - Shrimad BhagawadGeeta: Chapter 2 – Verses 41, 47, 48 - Chapter 3 – Verses13,21,27,35 - 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-IV

Statements of basic knowledge - Shrimad BhagawadGeeta: Chapter 2- Verses56, 62,68 - Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad BhagawatGeeta.

UNIT-V

Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 - Chapter3 – Verses 36, 37, 42 - Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Readings:

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

Online Courses:

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

20CSO 101

BUSINESS ANALYTICS

(Open Elective)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be able to

1. Identify and describe complex business problems in terms of analytical models.
2. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
3. Interpret 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.
6. Create viable solutions to decision making problems.

UNIT-I

Introduction to Business Analytics: Introduction to Business Analytics, needand 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-II

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

UNIT-III

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-IV

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-V

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.

Textbooks:

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 Readings:

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

Online Resources::

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

20MEO 101

INDUSTRIAL SAFETY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, 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-I

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

UNIT-II

Fundamentals of Maintenance Engineering: Definition and aim of maintenanceengineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their Prevention: Wear- types, causes, effects, wearreduction 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-IV

Fault Tracing: Fault tracing-concept and importance, decision tree concept,need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and Preventive Maintenance: Periodic inspection-concept and need,degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of 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

Textbooks:

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

20MEO102

INTRODUCTION TO OPTIMIZATION TECHNIQUES

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students 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 ProjectManagement, 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.

Textbooks:

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 Readings:

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

20CEO101

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students will be 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-I

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-II

Project Planning and Scheduling: Introduction for project planning, definingactivities 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-III

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-IV

Resources Management and Costing-Variance Analysis: Planning, EnterpriseResource 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-V

Budgetary Control: Flexible Budgets; Performance budgets; Zero-basedbudgets. 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.

Suggested Readings:

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 NeerajJha “Construction Project Management Theory and Practice”,Pearson Education India; 2 edition (2015)

20MEO103

COMPOSITE MATERIALS

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

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: On Successful completion of the course, students 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-I

Introduction: Definition – Classification and characteristics of Compositematerials. Advantages and application of composites.Functional requirements of reinforcement and matrix.Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT-II

Reinforcements: Preparation-layup, curing, properties and applications of glassfibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusiontechnique, Cladding – Hot isostatic pressing. Properties and applications.Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV

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

UNIT-V

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

Textbooks:

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:

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

20EEO 101

WASTE TO ENERGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course objectives: The objectives of this course are

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: On Successful completion of the 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-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exoticdesigns, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V

Biogas: Properties of biogas (Calorific value and composition) - Biogas planttechnology 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.

Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

20PYO101

HISTORY OF SCIENCE AND TECHNOLOGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution.
3. Aware of modern scientific developments from 19th century onwards.

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

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

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): Europeandomination, 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 (1895AD – 1945 AD):** The growth of 20thcentury science, New philosophies, Quantumreality, 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

Textbooks:

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

20CSC 107

MINI PROJECT with SEMINAR

Instruction	4 Hours per week
Duration of End examination	-
Semester end examination	-
CIE	50 Marks
Credits	2

Pre-requisites: Basic knowledge of problem solving, Software Engineering

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

1. Demonstrate a sound technical knowledge of their selected project topic
2. Undertake problem identification, formulation and solution
3. Design engineering solutions to complex problems using a systems approach
4. Analyze and interpret the results using appropriate modern tools
5. Communicate with engineers and the community at large in written an oral forms.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer

Guidelines:

- As part of the the curriculum in II-Semester, each student shall do a mini project. Generally student should work 3 to 4 weeks of prior reading, 12 weeks of active research, and and finally a presentation of their work for assessment
- Each student will be allotted to a faculty supervisor for monitoring the mini project work.
- 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 disciplinary/industry relevance.
- The students can select a mathematical modeling based/Experimental investigation 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, detailed discuss 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 Criteria / Parameter**
Supervisor	20	Progress and Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Writing

20CSC 108

DISSERTATION PHASE-I

Instruction	20 Hours per week
Duration of End examination	-
Semester end examination	-
CIE	100 Marks
Credits	10

Pre-requisites: Research Methodologies and IPR, Basic knowledge of problem solving,

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

1. Inculcate the culture of self-learning on various topics
2. Review literature such as books, journal, technical documents related to problem specific domain
3. Analyze the complex real world problems
4. Formulate the solutions using the appropriate methodology
5. Design and represent solutions using the appropriate design diagrams
6. Develop research culture, communicate with engineers and the community at large in written an oral forms.

Guidelines:

- The dissertation topic shall be a complex real world problem with research potential and should involve scientific research.
- Student shall carry out literature review, gather or generate the required data and analyze data, determine the suitable solution and must preferably bring out the individual contrition.
- Seminar shall be based on the area in which the student has undertaken the dissertation work.
- The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature reviewed.
- The preliminary results (if available) of the problem along with the design may also be discussed in the report
- The work carried out by the student shall be presented in front of the Committee consisting of Head, Chairman-BoS, Supervisor and Project Coordinator
- Students shall be in regular contact with their supervisor and the topic of dissertation must be mutually decided by the supervisor and the student.

CIE Assessment Guidelines Max Marks: 100		
Evaluation by	**Max. Marks**	**Evaluation Criteria**
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 Every two weeks.

20CSC 109

DISSERTATION PHASE-II

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

Pre-requisites: Research Methodologies and IPR, Basic knowledge of problem solving,Technical Writing

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

1. Use different experimentation techniques and technologies
2. Develop experimental set up/ Environment test rig
3. Conduct experiments by using the benchmark data sets
4. Analyze and interpret the results by using appropriate modern tools
5. Communicate effectively with technical reports and oral presentation
6. Make research contributions by publishing their work to the research community

Guidelines:

- It is a continuation of Project work started in semester III-Semester.
- Students have to submit the report in a prescribed format and also present a seminars
- The dissertation work shall be presented in a standard format as provided by the department.
- Students have to prepare a detailed project report 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 discussions.
- The report must also 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 Chairperson), supervisor/Co-Supervisor.
- Students should be in regular contact with their supervisor/Co-Supervisor.

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

SEE Assessment Guidelines		**Max Marks: 100**
Evaluation by	**Max. Marks**	**Evaluation Criteria**
Supervisor	20	Power Point Presentation
	40	Quality of dissertation report and Evaluation
Department Committee	20	Quality of the Dissertation: • Innovations • Applications • Live Research work • Scope for future study • Application to Society • Regularity and Punctuality
	20	Viva-Voce

Note: Department Committee shall assess the progress of the student for every TWO weeks.