Curriculum, Syllabus and Course Structure

For

Postgraduate Degree Programmers

In

Engineering & Technology

Regulation 2018

COMPUTER SCIENCE & ENGINEERING

Vision of the Department:

To be globally acclaimed as a premier COmputer Science and Engineering department through excellent teaching and strong research environment by creating professionally COmpetent engineers with moral values COmmitted to build a vibrant nation.

Mission of the Department:

- Provide a positive and professional learning environment to master the fundamental principles of COmputing, problem solving skills, leadership qualities, team-spirit, ethics and societal responsibilities.
- To enable the graduates to use modern tools and technologies in the area of COmputer science and information technology.
- Establish Industry Institute Interaction program to enhance the employability skills.
- To promote innovative research in COmputer science and engineering to serve the needs of industry, government and society at large.

Programme Educational Objectives:

PEO-1:
To render best platform for adequate training and opportunities to work as teams on projects with effective COmmunication skills and leadership qualities and understand professional ethics, social awareness and organizational COntext in which their engineering skills are utilized.

PEO-2:
To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO-3:

To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

Programme Specific OutComes:

PSO1:*To provide students an understanding of the expectations of industry and practical COmpetence with a broad range of programming language and open source platforms through value added Courses.*

PSO 2:*The ability to analyze and develop COmputer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of COmputer-based systems of varying COmplexity.*

PROGRAM OUTCOMES

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of COmplex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze COmplex engineering problems reaching substantiated COnclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for COmplex engineering problems and design system COmponents or processes that meet the specified needs with appropriate COnsideration for the public health and safety, and the cultural, societal, and environmental COnsiderations.

4. **COnduct investigations of COmplex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid COnclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to COmplex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the COntextual knowledge to assess societal, health, safety, legal and cultural issues and the COnsequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental COntexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and COmmit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **COmmunication**: COmmunicate effectively on COmplex engineering activities with the engineering COmmunity and with society at large, such as, being able to COmprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: ReCOgnize the need for, and have the preparation and ability to engage e in independent and life-long learning in the broadest COntext of technological change.

PG in COmputer Science & Engineering

I SEMESTER [FIRST YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC		Mathematical Foundation of COmputer Science	3	0	0	3
2	PC		Advanced Data Structures	3	0	0	3
3	PE		Machine Learning	3	0	0	3
			Wireless Sensor Networks				
			Introduction to Intelligent System				
4	PE		Data Science	3	0	0	3
			Distributed Systems				
			Advanced Wireless and Mobile Networks				
5	Audit		Research Methodology and IPR	2	0	0	2
6	Audit		Audit Course	2	0	0	0
PRACTICAL / SESSIONAL							
7	PC		Laboratory- 1(Advanced Data Structures)	0	0	4	2
8	PE		Laboratory- 2 (Based on Electives)	0	0	4	2
TOTAL				**16**	**0**	**4**	**18**

PG in COmputer Science & Engineering

II SEMESTER [FIRST YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC		Advance Algorithms	3	0	0	3
2	PC		Soft COmputing	3	0	0	3
3	PE		Data Preparation and Analysis	3	0	0	3
			Secure Software Design and Enterprise COmputing				
			COmputer Vision				
4	PE		Human and COmputer Interaction	3	0	0	3
			GPU COmputing				
			Digital Forensics				
5	Audit		Audit Course	2	0	0	0
PRACTICAL / SESSIONAL							
6	PC		Laboratory-3 (Based on COres)	0	0	4	2
7	PE		Laboratory-4 (Based on Electives)	0	0	4	2
8			Mini Project with Seminar	2	0	0	2
TOTAL				**15**	**0**	**12**	**18**

PG in COmputer Science & Engineering

III SEMESTER [SECOND YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PE		Mobile Applications and Services	3	0	0	3
2	PE		COmpiler for HPC				
3	PE		Optimization Techniques				
4	OE		Business Analytics	3	0	0	3
			Industrial Safety				
			Operations Research				
			COst Management of Engineering Projects				
			COmposite Materials				
			Waste to Energy				
PRACTICAL / SESSIONAL							
5			Dissertation-I/ Industrial Training	0	0	20	10
6							
7							
TOTAL				**6**	**0**	**12**	**16**

PG in COmputer Science & Engineering

IV SEMESTER [SECOND YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Credits
THEORY							
1	PC	MCSOE3011	Dissertation-I	0	0	32	16
TOTAL							**16**

I Semester

Syllabus, Course Educational Objectives and Course OutComes for various post graduation Courses.

COre Subjects:

Course Code		L	T	P	C	QP
Course Name	Mathematical Foundation of Computer Science					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	To understand the mathematical fundamentals that is prerequisites for avariety of Courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.					
CEO2	To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design and Concurrency.					
CEO3	To study various sampling and classification problems.					
COURSE OUTCOMES						
CO1	To understand the basic notions of discrete and Continuous probability.					
CO2	To understand the methods of statistical inference, and the role that sampling distributions play in those methods.					
CO3	To be able to perform Correct and meaningful statistical analyses of simple to moderate COmplexity.					

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1

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

Unit 2

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

Unit 3 Statistical inference**,** Introduction to multivariate statistical models: regression and classification problems, principal Components analysis**,** The problem of overfitting model assessment.
Unit 4 Graph Theory: Isomorphism, Planar graphs, graph Colouring, hamilton circuits and euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve Combinatorial enumeration problems
Unit 5 **Computer science and engineering applications** Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
Unit 6 Recent Trands in various distribution functions in mathematical field of Computer science for varying fields like bioinformatics, soft Computing, and Computer vision.
Text Books
Ref. Books 1. John Vince, Foundation Mathematics for Computer Science, Springer. 2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley. 3. M. Mitzenmacher and E. Upfal.Probability and COmputing: Randomized Algorithms and Probabilistic Analysis. 4. Alan Tucker, Applied Combinatorics, Wiley

Course Code		L	T	P	C	QP
Course Name	Advanced Data Structures					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
CEO2	Students should be able to understand the necessary mathematical abstraction to solve problems.
CEO3	To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
CEO4	Student should be able to Come up with analysis of efficiency and proofs of Correctness.

COURSE OUTCOMES	
CO1	Understand the implementation of symbol table using hashing techniques.
CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO3	Develop algorithms for text processing applications.
CO4	Identify suitable data structures and develop algorithms for Computational geometry problems.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1
Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, COllision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit 2
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

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

Unit 4 **Text Processing:** Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.
Unit 5 **Computational Geometry:** One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.
Unit 6 Recent Trends in Hashing, Trees, and various Computational geometry methods for efficiently solving the new evolving problem
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books
Ref. Books 1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004. 2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

Course Code		L	T	P	C	QP
Course Name	Machine learning					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	To learn the Concept of how to learn patterns and Concepts from data without being explicitly programmed in various IOT nodes.					
CEO2	To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.					
CEO3	Explore supervised and unsupervised learning paradigms of machine learning.					
CEO4	To explore Deep learning technique and various feature extraction strategies.					
COURSE OUTCOMES						
CO1	Extract features that can be used for a particular machine learning approach in various IOT applications.					
CO2	To Compare and Contrast pros and Cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.					
CO3	To mathematically analyze various machine learning approaches and paradigms.					

CO-PO & PSO Mapping															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Supervised Learning (Regression/Classification)

- Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes
- Linear models: Linear Regression, Logistic Regression, Generalized Linear Models
- Support Vector Machines, Nonlinearity and Kernel Methods
- Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit 2:
Unsupervised Learning

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

Unit 3
Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Unit 4
Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit 5
Scalable Machine Learning (Online and Distributed Learning)
A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Unit 6:
Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

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

Course Code		L	T	P	C	QP
Course Name	Wireless Sensor Networks					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	Architect sensor networks for various application setups.
CEO2	Devise appropriate data dissemination protocols and model links Cost.
CEO3	Understanding of the fundamental Concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
CEO4	Evaluate the performance of sensor networks and identify bottlenecks.

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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:

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

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

Hardware Platforms: Motes, Hardware parameters
Unit 2: **Introduction to ns-3: I**ntroduction to Network Simulator 3 (ns-3), Description of the ns-3 Core module and simulation example.
Unit 3: **Medium Access Control Protocol design:** Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled **Introduction to Markov Chain:** Discrete time Markov Chain definition, properties, classification and analysis **MAC Protocol Analysis:** Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)
Unit 4: **Security**: Possible attacks, Countermeasures, SPINS, Static and dynamic key Distribution
Unit 5: **Routing protocols:** Introduction, MANET protocols **Routing protocols for WSN**: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast **Opportunistic Routing Analysis**: Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.
Unit 6: **ADVANCED TOPICS** Recent development in WSN standards, software applications
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Reference Books: 1. W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks –Theory and Practice", Wiley 2010 2. KazemSohraby, Daniel Minoli and TaiebZnati, "wireless sensor networks -Technology, ProtoCOls, and Applications", Wiley Interscience 2007 3. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, "Wireless Sensor Network Technologies for the Information Explosion Era", springer 2010

Course Code		L	T	P	C	QP
Course Name	Introduction to Intelligent System					

COURSE EDUCATIONAL OBJECTIVES

CEO1	The aim of the Course is to introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

COURSE OUTCOMES

CO1	Able to Demonstrate knowledge of the fundamental principles of intelligent systems and would be able to analyze and Compare the relative merits of a variety of AI problem solving techniques.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Biological foundations to intelligent systems I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks.

Unit 2:
Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.

Unit 3: Search Methods Basic Concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimization and search such as stochastic annealing and genetic algorithm.
Unit 4: Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and Conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic Components. Ideas of Blackboard architectures.
Unit 5: Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.
Unit 6: Recent trends in Fuzzy logic, Knowledge Representation
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Reference Books: 1. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition. 2. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

Course Code		L	T	P	C	QP
Course Name	Data Science					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	Provide you with the knowledge and expertise to become a proficient data scientist.					
CEO2	Demonstrate an understanding of statistics and machine learning Concepts that are vital for data science;					
CEO3	Produce Python Code to statistically analyze a dataset;					
CEO4	Critically evaluate data visualizations based on their design and use for Communicating stories from data;					
COURSE OUTCOMES						
CO1	Explain how data is Collected, managed and stored for data science;					

CO2	Understand the key Concepts in data science, including their real-world applications and the toolkit used by data scientists;
CO3	Implement data Collection and management scripts using MongoDB

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Introduction to Core Concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Unit 2:
Data Collection and management: Introduction, Sources of data, Data Collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources

Unit 3:
Data analysis: Introduction, Terminology and Concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

Unit 4:
Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit 5:
Applications of Data Science, Technologies for visualization, Bokeh (Python)

Unit 6:
Recent trends in various data COllection and analysis techniques, various visualization techniques, application development methods of used in data science.

Teaching Methods: Chalk& Board/ PPT

Text Books:

Reference Books:
1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

Course Code		L	T	P	C	QP
Course Name	Distributed Systems					

COURSE EDUCATIONAL OBJECTIVES

CEO1	To introduce the fundamental Concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.

COURSE OUTCOMES

CO1	Design trends in distributed systems.
CO2	Apply network virtualization.
CO3	Apply remote method invocation and objects.

Course Code

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															
Avg.															

SYLLABUS

Unit 1:
INTRODUCTION
Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and Computer network Concepts
DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

Unit 2:
DISTRIBUTED DATABASE DESIGN
Alternative design strategies; Distributed design issues; Fragmentation; Data allocation
SEMANTICS DATA CONTROL
View management; Data security; Semantic Integrity Control
QUERY PROCESSING ISSUES
Objectives of query processing; Characterization of query processors; Layers of query

processing; Query decomposition; Localization of distributed data
Unit 3: **DISTRIBUTED QUERY OPTIMIZATION** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms **TRANSACTION MANAGEMENT** The transaction Concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **CONCURRENCY CONTROL** Concurrency Control in centralized database systems; Concurrency Control in DDBSs; Distributed Concurrency Control algorithms; Deadlock management
Unit 4: **RELIABILITY** Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols
Unit 5: **PARALLEL DATABASE SYSTEMS** Parallel architectures; parallel query processing and optimization; load balancing
Unit 6: **ADVANCED TOPICS** Mobile Databases, Distributed Object Management, Multi-databases
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books &Reference Books: : 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..

Course Code		L	T	P	C	QP
Course Name	Advanced Wireless and Mobile Networks					
Course Educational Objectives						
CEO1	The students should get familiar with the wireless/mobile market and the future needs and challenges.					
CEO2	To get familiar with key Concepts of wireless networks, standards, technologies and their basic operations					
CEO3	To learn how to design and analyze various medium access					
CEO4	To learn how to evaluate MAC and network protocols using network simulation software tools.					
CEO5	The students should get familiar with the wireless/mobile market and the future needs and challenges.					

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

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1														-	
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:

INTRODUCTION:

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

WIRELESS LOCAL AREA NETWORKS:

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

Unit 2:

WIRELESS CELLULAR NETWORKS:

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

Unit 3:

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

Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.
Unit 4: **WIRELESS PANs** Bluetooth AND ZigBee, Introduction to Wireless Sensors,.
Unit 5: **SECURITY** Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless Communication.
Unit 6: **ADVANCED TOPICS** IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
References: 1. Schiller J., Mobile Communications, Addison Wesley 2000 2. Stallings W., Wireless Communications and Networks, Pearson Education 2005 3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002 4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000 5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

Course Code		L	T	P	C	QP
Course Name	Research Methodology and IPR					
Course Outcomes						
CO1	Understand research problem formulation.					
CO2	Analyze research related information					
CO3	Follow research ethics					
CO4	Understand that today's world is Controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, Concept, and creativity.					
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.					

CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data Collection, analysis, interpretation, Necessary instrumentations

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

Unit 3: Effective technical writing, how to write report, Paper
Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review Committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International Cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

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

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

Reference Books:

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

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

II Semester

Syllabus, Course Educational Objectives and Course OutComes for various post graduation Courses.
COre Subjects:

Course Code		L	T	P	C	QP
Course Name	Advance Algorithms					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	Introduce students to the advanced methods of designing and analyzing algorithms.
CEO2	The student should be able to choose appropriate algorithms and use it for a specific problem.
CEO3	To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
CEO4	Students should be able to understand different classes of problems concerning their computation difficulties.
CEO5	To introduce the students to recent developments in the area of algorithmic design.

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

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit1
Sorting: Review of various sorting algorithms, topological sorting
Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-

weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.
Unit 2 **Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. **Graph Matching:** Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.
Unit 3 **Flow-Networks:** Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.
Unit 4 **Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. **Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation.Extension to polynomials. Application: Interpolation problem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm
Unit 5 **Linear Programming:** Geometry of the feasibility region and Simplex algorithm **NP-completeness:** Examples, proof of NP-hardness and NP-completeness. **One or more of the following topics based on time and interest** Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm
Unit 6 Recent Trands in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.
Text Books
Ref. Books 1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein. 2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman. 3. "Algorithm Design" by Kleinberg and Tardos.

Course Code		L	T	P	C	QP
Course Name	Soft Computing					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
CEO2	To implement soft computing based solutions for real-world problems.
CEO3	To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
CEO4	To provide student an hand-on experience on MATLAB to implement various strategies.

COURSE OUTCOMES	
CO1	Identify and describe soft computing techniques and their roles in building intelligent machines
CO2	Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
CO3	Apply genetic algorithms to combinatorial optimization problems.
CO4	Evaluate and compare solutions by various soft computing approaches for a given problem.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1
INTRODUCTION TO SOFT COMPUTING AND NEURAL
NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit 2
FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership

Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.
Unit 3 **NEURAL NETWORKS:** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks
Unit 4 **GENETIC ALGORITHMS:** Introduction to Genetic Algorithms (GA),Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.
Unit 5 **Matlab/Python Lib:** Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic
Unit 6 Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books
Ref. Books 1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003. 2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995. 3. MATLAB Toolkit Manual

Course Code		L	T	P	C	QP
Course Name	Data Preparation and Analysis					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	To prepare the data for analysis and develop meaningful Data Visualizations					
COURSE OUTCOMES						
CO1	Able to extract the data for performing the Analysis.					
CO-PO & PSO Mapping						

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit1:
Data Gathering and Preparation:
Data formats, parsing and transformation, Scalability and real-time issues

Unit2:
Data Cleaning:
Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Unit3:
Exploratory Analysis:
Descriptive and comparative statistics, Clustering and association, Hypothesis Generation

Unit4:
Visualization:
Designing visualizations, Time series, Reallocated data, Correlations and connections, Hierarchies and networks, interactivity

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

Ref. Books:

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

Course Code		L	T	P	C	QP
Course Name	Secure Software Design and Enterprise Computing					

COURSE EDUCATIONAL OBJECTIVES

CEO1	To fix software flaws and bugs in various software.
CEO2	To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
CEO3	Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.

CEO4	Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

COURSE OUTCOMES

CO1	Differentiate between various software vulnerabilities.
CO2	Software process vulnerabilities for an organization.
CO3	Monitor resources consumption in a software.
CO4	Interrelate security and software development process.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Secure Software Design
Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

Unit 2:
Enterprise Application Development
Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.

Unit 3:
Enterprise Systems Administration
Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

Unit 4:
Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.

Unit 5:

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.
Unit 6: Case study of DNS server, DHCP configuration and SQL injection attack.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Reference Books: 1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett 2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

Course Code		L	T	P	C	QP
Course Name	Computer Vision					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	Be familiar with both the theoretical and practical aspects of computing with images.					
CEO2	Have described the foundation of image formation, measurement, and analysis.					
CEO3	Understand the geometric relationships between 2D images and the 3D world.					
CEO4	Grasp the principles of state-of-the-art deep neural networks.					
COURSE OUTCOMES						
CO1	Developed the practical skills necessary to build computer vision applications.					
CO2	To have gained exposure to object and scene recognition and categorization from images.					

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis
Unit 2: Edge detection, Edge detection performance, Hough transform, corner detection
Unit 3: Segmentation, Morphological filtering, Fourier transform
Unit 4: Feature extraction, shape, histogram, color, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing
Unit 5: Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.
Unit 6: Recent trends in Activity Recognition, computational photography, Biometrics.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Reference Books: 1. Computer Vision: Algorithms and Applications by Richard Szeliski. 2. Deep Learning, by Goodfellow, Bengio, and Courville. 3. Dictionary of Computer Vision and Image Processing, by Fisher et al.

Course Code		L	T	P	C	QP
Course Name	Human and Computer Interaction					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	Learn the foundations of Human Computer Interaction					
CEO2	Be familiar with the design technologies for individuals and persons with disabilities					
CEO3	Be aware of mobile Human Computer interaction.					
CEO4	Learn the guidelines for user interface.					
COURSE OUTCOMES						
CO1	Understand the structure of models and theries of human computer interaction and vision.					

CO2	Design an interactive web interface on the basis of models studied.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Unit 2:
Interactive Design basics – process – scenarios – navigation – screen design –Iteration and prototyping. HCI in software process – software life cycle –usability engineering – Prototyping in practice – design rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Unit 3:
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit 4:
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture,Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Unit 5:
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Unit 6:
Recent Trends: Speech Recognition and Translation, Multimodal System

Teaching Methods: Chalk& Board/ PPT

Text Books:

Reference Books:

1. Alan Dix, Janet Finlay, Gregory Avowed, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009 (UNIT –

IV)
3.Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O□Reilly, 2009.(UNIT-V)

Course Code		L	T	P	C	QP
Course Name	GPU Computing					

COURSE EDUCATIONAL OBJECTIVES

CEO1	To learn parallel programming with Graphics Processing Units (GPUs).

COURSE OUTCOMES

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

Course Code

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															
Avg.															

SYLLABUS

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

Unit 2:
Memory: Memory hierarchy, DRAM / global, local / shared, private / local,textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories

Unit 3:
Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU

Functions: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.
Unit 4: **Support**: Debugging GPU Programs. Profiling, Profile tools, Performance aspects **Streams**: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.
Unit 5: **Case Studies**: Image Processing, Graph algorithms, Simulations, Deep Learning
Unit 6: **Advanced topics**: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books &Reference Books: : 1. Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-mei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722) 2. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN: 978-0124159334)

Course Code		L	T	P	C	QP
Course Name	Digital Forensics					

Course Educational Objectives	
CEO1	Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
CEO2	Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
CEO3	Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
CEO4	E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Course Outcomes	
CO1	Understand relevant legislation and codes of ethics
CO2	Computer forensics and digital detective and various processes, policies and procedures
CO3	E-discovery, guidelines and standards, E-evidence, tools and environment.

CO4	Email and web forensics and network forensics														
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1														-	
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Unit 2:
Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Unit 3:
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Unit 4:
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,
Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Unit 5:
Mobile Forensics: mobile forensics techniques, mobile forensics tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.

Unit 6:
Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

References:

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

III Semester

Syllabus, Course Educational Objectives and Course OutComes for various post graduation Courses.
COre Subjects:

Course Code		L	T	P	C	QP
Course Name	Mobile Applications and Services					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.					
CEO2	It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smart phones and tablets					
CEO3	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						
CO1	identify the target platform and users and be able to define and sketch a mobile application					
CO2	understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and PhoneGap					
CO3	Design and develop a mobile application prototype in one of the platform (challenge project)					

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1: Introduction: Introduction to Mobile Computing, Introduction to Android Development

Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User
Unit 2: More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider
Unit 3: Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony, Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics
Unit 4: Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia
Unit 5: Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android
Unit 6: Recent trends inCommunication protocols for IOT nodes, mobile computimng techniques in IOT, agents based communications in IOT
Text Books
Ref. Books 1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

Course Code		L	T	P	C	QP
Course Name	Compiler for HPC					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	The objective of this course is to introduce structure of compilers and high performance compiler design for students. Concepts of cache coherence and parallel loops in compilers are included.

COURSE OUTCOMES	
CO1	Familiar with the structure of compiler.
CO2	Parallel loops, data dependency and exception handling and debugging in compiler.

CO-PO & PSO Mapping		
COs	PROGRAMME OUTCOMES	PSOs

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit1:
High Performance Systems, Structure of a Compiler, Programming Language Features, Languages for High Performance.

Unit2:
Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.
Scalar Analysis with Factored Use-Def Chains: Constructing Factored Use-Def Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains,Constant Propagation with FUD Chains, Data Dependence for Scalars. Data Dependence Analysis for Arrays.

Unit3:
Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis.
Loop Restructuring: Simple Transformations, Loop Fusion, Loop Fission,Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations.
Optimizing for Locality: Single Reference to Each Array, Multiple References,General Tiling, Fission and Fusion for Locality.

Unit4:
Concurrency Analysis: Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers.
Vector Analysis: Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers.

Unit5:
Message-Passing Machines: SIMD Machines, MIMD Machines, Data Layout, Parallel Code for Array Assignment, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics.
Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.

Unit 6:
Recent trends in compiler design for high performance computing and message passing machines and scalable shared memory machine.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books

Ref. Books
1. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson

Course Code		L	T	P	C	QP
Course Name	Optimization Techniques					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	The objective of this course is to provide insight to the mathematical formulation of real world problems. To optimize these mathematical problems using nature based algorithms. And the solution is useful especially for NP-Hard problems.					

COURSE OUTCOMES	
CO1	Formulate optimization problems.
CO2	Understand and apply the concept of optimality criteria for various types of optimization problems.
CO3	Solve various constrained and unconstrained problems in Single variable as well as multivariable.
CO4	Apply the methods of optimization in real life situation

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit 1:
Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

Unit 2:
General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Unit 3: Branches of Mathematical Programming: Optimization using calculus,Graphical Optimization, Linear Programming, Quadratic Programming,Integer Programming, Semi Definite Programming.
Unit 4: Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.
Unit 5: Real life Problems and their mathematical formulation as standard programming problems.
Unit 6: Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Ref. Books: 1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9. 2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou. 3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak. 4. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5. 5. John K. Karlof (2006). Integer programming: theory and practice.CRC Press. ISBN 978-0-8493-1914-3. 6. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9. 7. Michael Jünger; Thomas M. Liebling; Denis Naddef; George Nemhauser; William R. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art. Springer. ISBN 978-3-540-68274-5. 8. Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.

Course Code		L	T	P	C	QP
Course Name	Business Analytics					
COURSE EDUCATIONAL OBJECTIVES						
CEO1	Understand the role of business analytics within an organization.					
CEO2	Analyze data using statistical and data mining techniques and understand relationships					

	between the underlying business processes of an organization
CEO3	To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
CEO4	To become familiar with processes needed to develop, report, and analyze business data.
CEO5	Use decision-making tools/Operations research techniques.
CEO6	Mange business process using analytical and management tools.
CEO7	Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.
COURSE OUTCOMES	
CO1	Students will demonstrate knowledge of data analytics
CO2	Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO3	Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
CO4	Students will demonstrate the ability to translate data into clear, actionable insights.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

Unit1:
Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:
Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3:

Organization Structures of Business analytics, Team management,Management Issues, Designing Information Policy, Outsourcing, EnsuringData Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.
Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series,Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.
Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information,Utility and Decision Making.
Unit 6: Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
Reference Books: 1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. 2. Business Analytics by James Evans, persons Education.

Course Code		L	T	P	C	QP
Course Name	Industrial Safety					
COURSE EDUCATIONAL OBJECTIVES						
CEO1						
CEO2						
CEO3						
CEO4						

COURSE OUTCOMES	
CO1	
CO2	

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

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

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

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

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

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

Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services. 2. Maintenance Engineering, H. P. Garg, S. Chand and Company. 3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication. 4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Course Code		L	T	P	C	QP
Course Name	Operations Research					
COURSE EDUCATIONAL OBJECTIVES						
CEO1						
CEO2						
CEO3						
CEO4						
COURSE OUTCOMES						
CO1	Students should able to apply the dynamic programming to solve problems of discreet and continuous variables					
CO2	Students should able to apply the concept of non-linear programming					
CO3	Students should able to carry out sensitivity analysis					
CO4	Student should able to model the real world problem and simulate it.					

CO-PO & PSO Mapping															
COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
Avg.															
SYLLABUS															

Unit 1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
Unit 2 Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming
Unit 3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT
Unit 4 Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming
Unit 5 Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation
Teaching Methods: Chalk& Board/ PPT
Text Books:
Reference Books: 1. H.A. Taha, Operations Research, An Introduction, PHI, 2008 2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982. 3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008 4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009 5. Pannerselvam, Operations Research: Prentice Hall of India 2010 6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Course Code		L	T	P	C	QP
Course Name	Composite Materials					
COURSE EDUCATIONAL OBJECTIVES						
CEO1						
COURSE OUTCOMES						
CO1						
Course Code						
CO-PO & PSO Mapping						

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															
Avg.															

SYLLABUS

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

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of 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 diffusion technique,Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

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

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

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

Reference Books:

1. Hand Book of Composite Materials-ed-Lubin.

2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

Course Code		L	T	P	C	QP
Course Name	Waste to Energy					

COURSE EDUCATIONAL OBJECTIVES	
CEO1	

COURSE OUTCOMES	
CO1	

Course Code

CO-PO & PSO Mapping

COURSE EDUCATIONAL OBJECTIVES	
CEO1	

COURSE OUTCOMES	
CO1	

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1														-	
CO2															
CO3															
CO4															
Avg.															

SYLLABUS

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

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

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

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

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books:
References: 1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990. 2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983. 3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991. 4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

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