GOVT. COLLEGE OF ENGINEERING, AMRAVATI

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

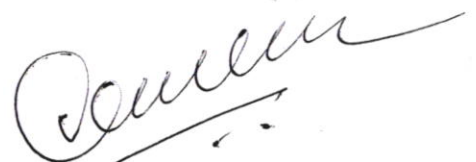## CURRICULUM

For

M. TECH. (Computer Science and Engineering)

2020- 2021

PROGRAM OBJECTIVES
1. Learn to research under supervision of professor in Computer Sciences and allied areas
2. Novel and significant contribution to Knowledge through continuous learning and research
3. To strengthen ethical principles for working in team to become successful Entrepreneur

PROGRAM OUTCOMES (POs):

The main outcomes of the CSE (M.Tech.) program are given here. At the end of the program a student is expected to have:

1. An understanding of the theoretical foundations and the limits of computing.

2. An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.

3. An ability to design, develop and evaluate new computer based systems for novel applications which meet the desired needs of industry and society.

4. Understanding and ability to use advanced computing techniques and tools.

5. An ability to undertake original research at the cutting edge of computer science & its related areas.

6. An ability to function effectively individually or as a part of a team to accomplish a stated goal.

7. An understanding of professional and ethical responsibility.

8. An ability to communicate effectively with a wide range of audience.

9. An ability to learn independently and engage in lifelong learning

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M. Tech. (Computer Science and Engineering)

SEM I

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Total	Credits
			Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			
							MSE	TA	ESE	ICA	ESE		
PC	CSP121	Mathematical foundations of Computer Science	3	-	-	3	30	10	60	-	-	100	3
PC	CSP122	Advance Data structures	3	-	-	3	30	10	60	-	-	100	3
PC	CSP123	Machine Learning	3	-	-	3	30	10	60	-	-	100	3
PE	CSP124	Program Elective I	3	-	-	3	30	10	60	-	-	100	3
PL	CSP125	Computer Laboratory-I	-	-	6	6	-	-	-	50	50	100	3
PS	CSP126	Seminar I	-	-	4	4	-	-	-	50	-	50	2
AC	SHP121	Audit Course	-	-	-	-	-	-	60	-	-	60	0
		Total	12	-	10	22	120	40	300	100	50	610	17

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I (CSP124)

A) Wireless Sensor Networks

B) Introduction to Intelligent Systems

C) Distributed Systems

D) Data Preparation and Analysis

LIST OF AUDIT COURSES

AUDIT COURSES (SHP121)

(A) English for Research Paper Writing

(B) Disaster Management

(C) Sanskrit for Technical Knowledge

(D) Value Education

(E) Pedagogy Studies

(F) Stress Management by Yoga

(G) Personality Development through Life Enlightenment Skills.

(H) Constitution of India

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SEM II

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical		Total			
							MSE	TA	ESE	ICA	ESE				
PC	CSP221	Advance Algorithms	3	-	-	3	30	10	60	-	-	100	3
PC	CSP222	Soft Computing	3	-	-	3	30	10	60	-	-	100	3
PC	CSP223	Data Science	3	-	-	3	30	10	60	-	-	100	3
PE	CSP224	Program elective II	3	-	-	3	30	10	60	-	-	100	3
MC	SHP221	Research Methodology	2	-	-	2	30	10	60	-	-	100	2
PL	CSP225	Computer Laboratory II	-	-	6	6	-	-	-	50	50	100	3
PS	CSP226	Seminar II	-	-	4	4	-	-	-	50	-	50	2
		Total	14	00	10	24	150	50	300	100	50	650	19

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE II(CSP224)
A)Advance Wireless and Mobile Networks
B)Secure Software Design & Enterprise Computing
C)Computer Vision
D)Human and Computer Interaction

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SEM III*

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
			Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical		Total	
							MSE	TA	ESE	ICA	ESE		
PE	CSP321	Program Elective III	3	-	-	3	30	10	60	-	-	100	3
OE	SHP321	Open Elective	3	-	-	3	30	10	60	-	-	100	3
PD	CSP322	Dissertation Stage I	-	-	20	20	-	-	-	100	-	100	10
		Total	06	00	20	26	60	20	120	100	-	300	16

*Students going for Industrial Project/Thesis will complete these courses through MOOCs.

LIST OF PROGRAM ELECTIVES

LIST OF OPEN ELECTIVES

PROGRAM ELECTIVE III (CSP 321)

A) GPU Computing

B) Digital Forensics

C) Mobile Applications and Services

D) Compiler for HPC

E) Optimization Techniques

OPEN ELECTIVE (SHP321)

(A) Business Analytics (ME)

(B) Industrial Safety (ME)

(C) Operations Research (ME)

(D) Cost management of Engineering Projects (CE)

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(E) Composite Materials (ME)

(F) Waste to Energy (CE)

(G) Finance Management (EE)

(H) Project Management (EE)

(I) Data Structure and Algorithms(CS)

(J) Any other course approved by BOS

Note:-

Data Structure and Algorithms(CS) is not offered for

Computer Science and Engineering Students

ME :- Offered by Mechanical Engineering Department

CE:- Offered by Civil Engineering Department

EE:- Offered by Electrical Engineering Department

CE:- Offered by Computer Science and Engineering

Department

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SEM IV

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory		Practical		Total		
							MSE	ESE	ICA	ESE			
PP	CSP421	Dissertation Stage II	-	-	32	32	-	-	200	200	400	16
		Total	-	-	32	32	-	-	200	200	400	16

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Equivalence Scheme

Programme Name:- Computer Science & Engineering

Sr. No	Course code with Name of course(old)		Credit	Course code with Name of course (new)		Credit
	CSP 101	Real Time System	4		NO EQUIVALANCE	3
	CSP 102	Distributed Operating System	4		NO EQUIVALANCE	3
3	CSP 103	Advanced Algorithms	4	CSP 221	Advance Algorithms	3
4	CSP 104	Advanced Software Architecture	4		NO EQUIVALANCE	3
5	CSP 105 (A)	Elective- I Information Security	4		NO EQUIVALANCE	3
6	CSP 105 (B)	Elective- I High Performance Computing	4		NO EQUIVALANCE	3
7	CSP 105(C)	Elective- I Mobile Computing	4		NO EQUIVALANCE	3
8	CSP 106	Computer Lab.-I #	4		NO EQUIVALANCE	2
9	CSP 107	Seminar-I*	1	CSP 126	Seminar I	2

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Sr. No	Course code with Name of course(old)		Credit	Course code with Name of course (new)		Credit
	CSP 201	Pattern Recognition	4	NO EQUIVALANCE		
	CSP 202	Advanced DBMS	4	NO EQUIVALANCE		
	CSP 203	Data Warehousing and Data Mining	4	NO EQUIVALANCE		
	CSP 204	Soft Computing	4	CSP 222	Soft Computing	3
	CSP 205 (A)	Elective -II Advanced Computer Network	4	NO EQUIVALANCE		
	CSP 205 (B)	Elective -II Cloud Computing	4	NO EQUIVALANCE		
	CSP 205 (C)	Elective -II Information Retrieval	4	NO EQUIVALANCE		
	CSP 206	Computer Lab.-II #	4	NO EQUIVALANCE		
	CSP 207	Seminar-II*	1	CSP 226	Seminar II	2
	CSP 301	Dissertation (Phase I)	10	CSP 322	Dissertation Stage I	10
	CSP 401	Dissertation (Phase II)	30	CSP 421	Dissertation Stage II	16
10	NO EQUIVALANCE			CSP 121	Mathematical foundations of Computer Science	3
11	NO EQUIVALANCE			CSP 122	Advance Data structures	3
12	NO EQUIVALANCE			CSP 123	Machine Learning	3

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Sr. No	Course code with Name of course(old)	Credit	Course code with Name of course (new)		Credit
13	NO EQUIVALANCE		CSP 124 (A)	Program Elective I- Wireless Sensor Networks	3
14	NO EQUIVALANCE		CSP 124 (B)	Program Elective I-Introduction to Intelligent Systems	3
15	NO EQUIVALANCE		CSP 124 (C)	Program Elective I-Distributed Systems	3
16	NO EQUIVALANCE		CSP 124 (D)	Program Elective I-Data Preparation and Analysis	3
17	NO EQUIVALANCE		CSP 125	Computer Laboratory-I	3
18	NO EQUIVALANCE		SHP121(A)	Audit Course I- English for Research Paper Writing	0
19	NO EQUIVALANCE		SHP121 (B)	Disaster Management	0
20	NO EQUIVALANCE		SHP121 (C)	Sanskrit for Technical Knowledge	0
21	NO EQUIVALANCE		SHP121 (D)	Value Education	0
22	NO EQUIVALANCE		SHP121 (E)	Pedagogy Studies	0
23	NO EQUIVALANCE		SHP121 (F)	Stress Management by Yoga	0
24	NO EQUIVALANCE		SHP121 (G)	Personality Development through Life Enlightenment Skills	0
			SHP121 (H)	Constitution of India	0

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Sr. No.	Course code with Name of course(old)	Credit	Course code with Name of course (new)		Credit
34	NO EQUIVALANCE		CSP 223	Data Science	3
35	NO EQUIVALANCE		CSP 224 (A)	Program elective II- Advance Wireless and Mobile Networks	3
36	NO EQUIVALANCE		CSP 224 (B)	Program elective II- Secure Software Design & Enterprise Computing	3
37	NO EQUIVALANCE		CSP 224 (C)	Program elective II- Computer Vision	3
38	NO EQUIVALANCE		CSP 224(D)	Program elective II- Human and Computer Interaction	3
39	NO EQUIVALANCE		SHP221	Research Methodology and IPR	2
40	NO EQUIVALANCE		CSP 225	Computer Laboratory- II	3
42	NO EQUIVALANCE		CSP 321(A)	Program Elective III- GPU Computing	3
43	NO EQUIVALANCE		CSP 321(B)	Program Elective III- Digital Forensic	3
44	NO EQUIVALANCE		CSP 321(C)	Program Elective III- Mobile Applications and Services	3
45	NO EQUIVALANCE		CSP 321(D)	Program Elective III- Compiler For HPC	3
46	NO EQUIVALANCE		CSP 321(E)	Program Elective III- Optimization Techniques	3
47	NO EQUIVALANCE		SHP321 (A)	Open Elective- Business Analytics	3
48	NO EQUIVALANCE		SHP321 (B)	Open Elective- Industrial Safety	3

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Sr. No.	Course code with Name of course(old)	Credit	Course code with Name of course (new)		Credit
49	NO EQUIVALANCE		SHP321 (C)	Open Elective- Operations Research	3
50	NO EQUIVALANCE		SHP321 (D)	Open Elective- Cost Management of Engineering Projects	3
51	NO EQUIVALANCE		SHP321 (E)	Open Elective- Composite Materials	3
52	NO EQUIVALANCE		SHP321 (F)	Open Elective- Waste to Energy	3
53	NO EQUIVALANCE		SHP321 (G)	Open Elective- Finance Management (EE)	3
54	NO EQUIVALANCE		SHP321 (H)	Open Elective- Project Management (EE)	3

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CSP121 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Teaching Scheme: 03L   **Total: 03**   **Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE   **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.

Course Objective

I. To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning

II. 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

III. To study various sampling and classification problems

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

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

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

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

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

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

Books Recommended:

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

2. M. Mitzenmacher and E. Upfal.Probability and Computing: Randomized Algorithms and Probabilistic Analysis.

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3. Alan Tucker, Applied Combinatorics, Wiley

COURSE OUTCOMES
After completion of course, students would be able to:
CSP121.1. To understand the basic notions of discrete and continuous probability.
CSP121.2. To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
CSP121.3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

CSP122 ADVANCED DATA STRUCTURES

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

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

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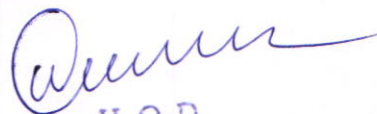
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing

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

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

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.

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

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

Books Recommended:

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 OUTCOMES
After completion of course, students would be able to:

CSP122.1 Understand the implementation of symbol table using hashing techniques.

CSP122.2 Develop and analyze algorithms for red-black trees, B-trees and Splay trees.

CSP122.3 Develop algorithms for text processing applications.

CSP122.4 Identify suitable data structures and develop algorithms for computational geometry problems.

CSP123 MACHINE LEARNING

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

COURSE OBJECTIVE

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

II. To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.

III. Explore supervised and unsupervised learning paradigms of machine learning.

IV. To explore Deep learning technique and various feature extraction strategies.

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

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

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

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

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

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

Books Recommended:

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) Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

COURSE OUTCOMES

After completion of course, students would be able to:

CSP123.1 Extract features that can be used for a particular machine learning approach in various IOT applications.

CSP123.2 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.

CSP123.3 To mathematically analyze various machine learning approaches and paradigms.

PROGRAM ELECTIVE- I

CSP124(A) WIRELESS SENSOR NETWORKS

Teaching Scheme: 03L	Total: 03	Credit: 03
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		Total Marks: 100
ESE Duration: 2 Hrs. 30 min.		

COURSE OBJECTIVE

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

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

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

Hardware Platforms: Motes, Hardware parameters

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

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

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

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

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

ADVANCED TOPICS : Recent development in WSN standards, software applications

Books Recommended:

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 OUTCOMES
After completion of course, students would be able to:

CSP124(A).1 Describe and explain radio standards and communication protocols for wireless sensor networks.

CSP124(A).2 Explain the function of the node architecture and use of sensors for various applications.

CSP124(A).3 Be familiar with architectures, functions and performance of wireless sensor

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networks systems and platforms.

PROGRAM ELECTIVE- I
CSP124(B) INTRODUCTION TO INTELLIGENT SYSTEMS

Teaching Scheme: 03L   Total: 03   Credit: 03
Evaluation Scheme: 30MSE + 10 TA + 60 ESE   Total Marks: 100
ESE Duration: 2 Hrs. 30 min.

Course Objective
I.   To introduce 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.
II.   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
III. To demonstrate good knowledge of basic theoretical foundations of the following common intelligent systems methodologies: Rule-based systems, fuzzy inference, artificial neural networks, evolutionary computation, case-based reasoning, and probabilistic reasoning.
IV. To determine which type of intelligent system methodology would be suitable for a given type of application problem.
V.   To demonstrate in the form of a major project work, the ability to design and develop an intelligent system for a selected application.
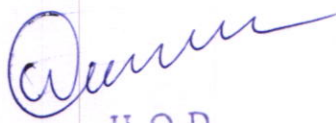
Biological foundations to intelligent systems I: Artificial neural networks, Back- propagation networks, Radial basis function networks, and recurrent networks

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

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.

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.

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

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Recent trends in Fuzzy logic, Knowledge Representation

Books Recommended:

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 OUTCOMES
After completion of course, students would be:

CSP124(B).1 Able to Demonstrate knowledge of the fundamental principles of intelligent sys and would be able to analyze and compare the relative merits of a variety of AI problem

Solving techniques.

CSP124(B).2 Students will gain deep understanding of the basic artificial intelligence techniques.

3. Students will apply their knowledge to design solutions to different problems.

4. Students will have the ability to design and develop an intelligent system for a selected application.

PROGRAM ELECTIVE- I
CSP124(C) DISTRIBUTED DATABASE SYSTEMS

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

COURSE OBJECTIVE

    I.   To enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems

    II.   To introduce basic principles and implementation techniques of distributed database systems

    III.   To expose active and emerging research issues in distributed database systems and application development

    IV.   To apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.
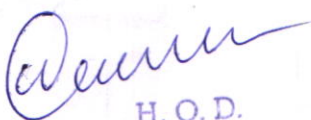
Introduction Distributed data processing; what is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts

Distributed Database Management System Architecture

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

Distributed Database Design Alternative design strategies; Distributed design issues;

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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

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

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

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

Mobile Databases, Distributed Object Management, Multi-databases

Books Recommended:

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 OUTCOMES

After completion of course, students would be:

CSP124(C).1 Familiar with the currently available models, technologies for and approaches to building distributed database systems and services.

CSP124(C).2 Developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case.

CSP124(C).3 Aware of the current research directions in the field and their possible outcomes

CSP124(C).4 Able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions.

CSP124 (C).5 Able to apply learned skills to solving practical database related tasks.

CSP124 (D) DATA PREPARATION AND ANALYSIS

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

Course Objective

I. To prepare meaningful data for analysis and develop explanatory data for visualization.

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II.   To provide insight into method and tools for analysis and processing of the data generated by modern information system.

III.   To learn about various data mining function such as cleaning, classification and clustering

IV.   To understand the detail view of visual perception and visual data.

V.   To learn how to compute the standard deviation for a given set of data.

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

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

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

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

Books Recommended:

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

COURSE OUTCOMES
After completion of course, students would be:
CSP124(D).1 Able to extract the meaningful data for performing the Analysis.
CSP124(D).2 Able to perform all operations such as cleaning, classification and clustering on the given set of data.
CSP124(D).3 Able to demonstrate various data visualization techniques.

CSP125 COMPUTER LABORATORY -I

Teaching Scheme: 06P	**Total: 04**	**Credit: 03**
Evaluation Scheme: 50ICA +50 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

It is representative list of Practical's. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

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Minimum 08 experiments should be performed

- Implementation of Dictionaries.
- Hash Function
- Double Hashing
- Search and Update Operations on Skip Lists
- Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees
- Brute-Force Pattern Matching
- The Huffman Coding Algorithm
- One Dimensional Range Searching,   Two Dimensional Range Searching,
- Trees
- Quadtrees, k-D Trees
- Distance-based methods, Nearest-Neighbours
- Linear Regression, Logistic Regression
- K-means/Kernel K-means
- PCA and kernel PCA
- Modeling Sequence/Time-Series Data
- various learning techniques of machine learning and classification methods for IOT applications
- Introduction to Network Simulator 3 (ns-3) and simulation example
- Resource-aware routing, Data-centric, Geographic Routing
- Radial basis function networks, and recurrent networks
- Data collection and APIs
- SVM, Naive Bayes
- Data for visualization
- Fragmentation; Data allocation
- Query decomposition; Localization of distributed data
- parallel query processing and optimization; load balancing
- Tiny OS Overview
- Correlations and connections

CSP126 SEMINAR-I

Teaching Scheme: 04L	**Total: 04**	**Credit: 02**
Evaluation Scheme: 50ICA		**Total Marks: 50**

1) Student shall select a topic for seminar which is not covered in curriculum. Student shall complete the conceptual study of the selected topic and expected to know functional and technical details of selected topic

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2) **Before end of semester students shall deliver a seminar and submit seminar report in proper format consisting of**
- Literature survey
- Concept
- Functional and Technical detail
- Present status
- Future scope
- Application
- Comparison with similar technique
- References

3) **Student shall deliver a seminar on report submitted which shall be assessed by two examiner (one should be guide) appointed by HOD**

AUDIT COURSE-I

SHP121 (A) ENGLISH FOR RESEARCH PAPER WRITING

Teaching Scheme: 00L   Total: 00   Credit: 00
Evaluation Scheme: 60 ESE   Total Marks: 60
ESE Duration: 2 Hrs. 30 min.

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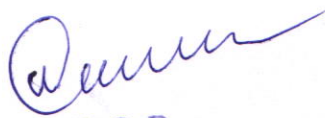
Students will be able to:
- I. Understand that how to improve your writing skills and level of readability
- II. Learn about what to write in each section
- III. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

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

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

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Books Recommended:

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

AUDIT COURSE-I

SHP121 (B) DISASTER MANAGEMENT

Teaching Scheme: 00L	**Total: 00**	**Credit: 00**
Evaluation Scheme: 60 ESE		**Total Marks: 60**
ESE Duration : 2 Hrs. 30 min.		

Course Objectives: -Students will be able to:

I. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
II. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
III. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
IV. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

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

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

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

Disaster Preparedness and Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological

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And Other Agencies, Media Reports: Governmental and Community Preparedness

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

Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India

Books Recommended:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi

AUDIT COURSE-I

SHP121(C) SANSKRIT FOR TECHNICAL KNOWLEDGE

Teaching Scheme: 00L	**Total: 00**	**Credit: 00**
Evaluation Scheme: 60 ESE		**Total Marks: 60**
ESE Duration: 2 Hrs. 30 min		

Course Objectives

I. To get a working knowledge in illustrious Sanskrit, the scientific language in the world

II. Learning of Sanskrit to improve brain functioning

III. Learning of Sanskrit to develop the logic in mathematics, science & other subjects

IV. enhancing the memory power

V. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Order Introduction of roots Technical information about Sanskrit Literature

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Books Recommended:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

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2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

SHP121(C).1 Understanding basic Sanskrit language

SHP121(C).2 Ancient Sanskrit literature about science & technology can be understood

SHP121(C).3 Being a logical language will help to develop logic in students

AUDIT COURSE-I

SHP 121 (D) VALUE EDUCATION

Teaching Scheme: 00L   Total: 00   Credit: 00
Evaluation Scheme: 60 ESE   Total Marks: 60
ESE Duration: 2 Hrs. 30 min

Course Objectives

Students will be able to

I.   Understand value of education and self- development

II. Imbibe good values in students

III. Let the should know about the importance of character

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

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

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

Character and Competence –Holy books vs Blind faith.Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

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Books Recommended:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course outcomes

Students will be able to

SHP121(D).1 Knowledge of self-development

SHP121(D).2 Learn the importance of Human values Developing the overall personality

<center>

Audit Course I
SHP121 (E) PEDAGOGY STUDIES

</center>

Teaching Scheme: 00L   Total: 00   Credit: 00
Evaluation Scheme: 60 ESE   Total Marks: 60
ESE Duration: 2 Hrs. 30 min

Course Objectives:

Students will be able to:

I.   Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.

II.   Identify critical evidence gaps to guide the development

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

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

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

Professional development: alignment with classroom practices and follow- up support Peer support, Support from the head teacher and the community. Curriculum and assessment
Barriers to learning: limited resources and large class sizes

Research gaps and future directions Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact

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Books Recommended:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

SHP121(E).1 What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

SHP121(E).2 What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

SHP121(E).3 How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Audit Course I
SHP121 (F) STRESS MANAGEMENT BY YOGA

Teaching Scheme: 00L	**Total: 00**	**Credit: 00**
Evaluation Scheme: 60 ESE		**Total Marks: 60**
ESE Duration: 2 Hrs. 30 min		
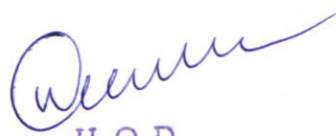
Course Objective

I. To achieve overall health of body and mind

II. To overcome stress

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Definitions of Eight parts of yog. (Ashtanga)

Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

san and Pranayam i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types of pranayam

Books Recommended:

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

SHP121(F).1 Develop healthy mind in a healthy body thus improving social health also

SHP121(F).1 Improve efficiency

Audit Course I
SHP 121(G) PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Teaching Scheme: 00L	**Total: 00**	**Credit: 00**
Evaluation Scheme: 60 ESE		**Total Marks: 60**

ESE Duration: 2 Hrs. 30 min

Course Objectives

I. To learn to achieve the highest goal happily

II. To become a person with stable mind, pleasing personality and determination

III. To awaken wisdom in students

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

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

Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

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Books Recommended:

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

Course Outcomes

Students will be able to

SHP121(G).1 Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life

SHP121(G).2 The person who has studied Geeta will lead the nation and mankind to peace and prosperity

SHP121(G).3 Study of Neetishatakam will help in developi

Audit Course I
SHP 121(H) CONSTITUTION OF INDIA

Teaching Scheme: 00L	**Total: 00**	**Credit: 00**
Evaluation Scheme: 60 ESE		**Total Marks: 60**

ESE Duration : 2 Hrs. 30 min

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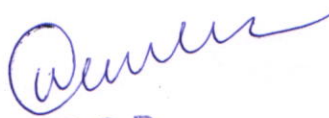
I. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
II. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the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

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features

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

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

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Transfer of Judges, Qualifications, Powers and Functions

Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role,

Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning, Chief Election, Commissioner and Election Commissioners. State Election Commission: Role and Functioning.

Institute and Bodies for the welfare of SC/ST/OBC and women.

Books Recommended:

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.

Course Outcomes:

Students will be able to:

SHP121(H).1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

SHP121(H). Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

SHP121(H). Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

SHP121(H). Discuss the passage of the Hindu Code Bill of 1956.

CSP 221 ADVANCED ALGORITHMS

Teaching Scheme: 03L   **Total: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE
ESE Duration : 2 Hrs. 30 min.

Credit: 03
Total Marks: 100

COURSE OBJECTIVE

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I. To introduce students to the advanced methods of designing and analysing algorithms
II. The student should be able to choose appropriate algorithms and use it for a specific problem
III. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems
IV. To understand different classes of problems concerning their computation difficulties.

Sorting: Review of various sorting algorithms, topological sorting

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

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

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

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

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

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

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

Books Recommended:

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

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COURSE OUTCOMES

After completion of course, students would be able to:

CSP221.1 Analyze the complexity/performance of different algorithms.

CSP221. Determine the appropriate data structure for solving a particular set of problems.

CSP221. Categorize the different problems in various classes according to their complexity.

CSP221. Have an insight of recent activities in the field of the advanced data structure.

CSP222 SOFT COMPUTING

Teaching Scheme: 03L   Total: 03   Credit: 03

Evaluation Scheme: 30MSE + 10 TA + 60 ESE   Total Marks: 100

ESE Duration : 2 Hrs. 30 min.

COURSE OBJECTIVE

I. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.

II. To implement soft computing based solutions for real-world problems.

III. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.

IV. To provide student hand-on experience on MATLAB to implement various strategies.

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

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

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

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

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

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

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Implementation of recently proposed soft computing techniques

Books Recommended:

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 OUTCOMES

After completion of course, students would be able to:

CSP222.1 Identify and describe soft computing techniques and their roles in building intelligent machines

CSP222.2 Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

CSP222.3 Apply genetic algorithms to combinatorial optimization problems.

CSP222.4 Evaluate and compare solutions by various soft computing approaches for a given problem.

CSP223 DATA SCIENCE

Teaching Scheme: 03L   **Total: 03**   **Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE   **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.
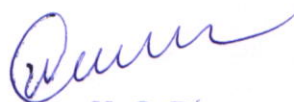
COURSE OBJECTIVE

I. To provide you with the knowledge and expertise to become a proficient data scientist.
II. To demonstrate an understanding of statistics and machine learning concepts that are vital for data science
III. Produce Python code to statistically analyze a dataset;
IV. Critically evaluate data visualizations based on their design and use for communicating stories from data;

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

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

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.

Data visualisation: Introduction, Types of data visualisation,Data for visualisation:Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings

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

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

Books Recommended:

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

COURSE OUTCOMES

On completion of the course the student should be able to

CSP223.1 Explain how data is collected, managed and stored for data science;
CSP223.2 Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists

CSP222.3 Implement data collection and management scripts using MongoDB

PROGRAM ELECTIVE-II

CSP224 (A) ADVANCED WIRELESS AND MOBILE NETWORKS

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

COURSE OBJECTIVE

I. The students should get familiar with the wireless/mobile market and the future needs and challenges.
II. To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
III. To learn how to design and analyze various medium access

IV. To learn how to evaluate MAC and network protocols using network simulation software tools.

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

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

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

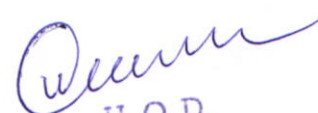**Wireless PANs** Bluetooth AND Zigbee, Introduction to Wireless Sensors

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

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

Books Recommended:

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 OUTCOMES

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After completion of course, students would be:

CSP224(A).1 Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.

CSP224(A).2 Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.

CSP224(A).3 Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.

CSP224(A).4 Develop mobile applications to solve some of the real world problems.

PROGRAM ELECTIVE-II
CSP224 (B) SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

Teaching Scheme: 03L	Total: 03	Credit: 03
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		Total Marks: 100
ESE Duration: 2 Hrs. 30 min.		

COURSE OBJECTIVE
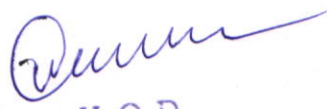
I. To fix software flaws and bugs in various software.

II. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic

III. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.

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

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

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

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)

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.

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

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

Books Recommended:

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 OUTCOMES

After completion of course, students would be able to:

CSP224(B).1 Differentiate between various software vulnerabilities.

CSP224(B).2 Software process vulnerabilities for an organization.

CSP224(B).3 Monitor resources consumption in a software.

CSP224(B).4 Inter relate security and software development process.

PROGRAM ELECTIVE-II
CSP224 (C) COMPUTER VISION

Teaching Scheme: 03L Total: 03 **Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE **Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.

COURSE OBJECTIVE

I. TO Be familiar with both the theoretical and practical aspects of computing with images.

II. To Have described the foundation of image formation, measurement, and analysis.

III. To Understand the geometric relationships between 2D images and the 3D world.

IV. To Grasp the principles of state-of-the-art deep neural networks.

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

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

Segmentation, Morphological filtering, Fourier transforms

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

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

Recent trends in Activity Recognition, computational photography, Biometrics

Books Recommended:

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 OUTCOMES
After completion of course, students would be able to:

CSP224(C). Demonstrate a thorough understanding of fundamental concepts in computer vision (camera and projection models, image formation, image features, calibration, stereo).

CSP224(C).2 able to design and conduct experimental validation for a computational approach to a computer vision problem, and interpret the results to assess the performance (accuracy, efficiency, robustness) of the method.

CSP224 (C).3 Students are familiar with methods used in various vision-based applications – image feature detection, camera calibration, 3-D reconstruction, segmentation

CSP224(C).4 Students are better prepared to analyze a problem and assess the strengths and weaknesses of different methods and techniques for solving it.

PROGRAM ELECTIVE-II
CSP224 (D) HUMAN AND COMPUTER INTERECTION

Teaching Scheme: 03L   Total: 03   Credit: 03
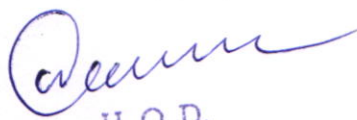Evaluation Scheme: 30MSE + 10 TA + 60 ESE   Total Marks: 100
ESE Duration: 2 Hrs. 30 min.

COURSE OBJECTIVE

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I. To Learn the foundations of Human Computer Interaction

II. To Be familiar with the design technologies for individuals and persons with disabilities

III. To Be aware of mobile Human Computer interaction.

IV. To Learn the guidelines for user interface

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

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

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

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

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

Recent Trends: Speech Recognition and Translation, Multimodal System

Books Recommended:

1. Alan Dix, Janet Finlay, Gregory Abowd, 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 OUTCOMES

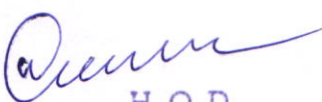**After completion of course, students would be:**

CSP224(D).1 Explain the capabilities of both humans and computers from the viewpoint of human information processing.

Describe typical human–computer interaction (HCI) models and styles, as well as various historic HCI paradigms.

Apply an interactive design process and universal design principles to designing HCI systems.

Analyse and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

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Analyse and discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and Word Wide Web-related environments.

SHP221 RESEARCH METHODOLOGY

Teaching Scheme: 02L   **Total: 02**   **Credit: 02**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE   **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.

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

Effective literature studies approaches, analysis, Plagiarism, Research ethics

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

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

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

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

Books Recommended:

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, 2 nd 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

Course Outcomes:

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

SHP221.1 Understand research problem formulation.

SHP221.2 Analyze research related information

SHP221.3 Follow research ethics

SHP221.4 Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

SHP221.5 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.

SHP221.6 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

CSP 225 COMPUTER LABORATORY -II

Teaching Scheme: 06P	Total: 06	Credit: 03
Evaluation Scheme: 50ICA +50 ESE		Total Marks: 100
ESE Duration : 3 Hrs..		

It is representative list of Practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum 08 experiments should be performed

- various sorting algorithms
- Shortest path by BFS
- shortest path in edge-weighted case (Dijkasra's)
- Application to MST
- Algorithm to compute maximum matching
- Edmond's Blossom algorithm to compute augmenting path.
- Ford-Fulkerson Method to compute maximum flow
- Edmond-Karp maximum-flow algorithm
- Fast Fourier Transform algorithm.
- Fuzzy Relations, Membership Functions
- Fuzzy Inference Systems
- Supervised Learning Neural Networks
- Advances in Neural networks
- Genetic Algorithms (GA),
- Machine Learning Approach to Knowledge Acquisition.
- deep learning
- Data parsing and transformation

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- Data Transformation and segmentation
- Data comparative statistics
- Identify software vulnerabilities and perform software security analysis
- Research technologies available for the presentation, business and data tiers of an enterprise
- Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email)
- Image analysis, pre-processing and Binary image analysis
- Image Segmentation.
- Image Feature extraction, shape, histogram, color, spectral, texture, using CVIPtools
- Activity Recognition
- HCI in software process
- Speech Recognition and Translation
- Dynamic parallelism
- open-source security tools for network forensic analysis
- requirements for preservation of network data
- Text-to-Speech Techniques
- Wireless Connectivity and Mobile Apps
- agents based communications in IOT

CSP 226 SEMINAR-II

Teaching Scheme: 04P	**Total: 04**	**Credit: 02**
Evaluation Scheme: 50ICA		**Total Marks: 50**

1. Student shall select a topic for seminar which is not covered in curriculum. Student shall complete the conceptual study of the selected topic and expected to know functional and technical details of selected topic
2. Seminar II should be related to literature survey based on Dissertation topic
3. Before end of semester students shall deliver a seminar and submit seminar report in proper format consisting of
- Literature survey
- Concept
- Functional and Technical detail
- Present status
- Future scope
- Application
- Comparison with similar technique
- References

   Student shall deliver a seminar on report submitted which shall be assessed by two examiner (one should be guide) appointed by HOD

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Teaching Scheme: 03L	Total: 03	Credit: 03
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		Total Marks: 100
ESE Duration : 2 Hrs. 30 min.		

COURSE OBJECTIVE

I. To learn parallel programming with Graphics Processing Units (GPUs).
II. To Analyze the performance of GPU
III. To Understand the different function of GPU

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

Memory: Global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Ball Grids Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different Memories, Log files, Optimizing Memory, Latency, optimizing Latency, Instruction throughput, High bandwidth memory.

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, Auto-Tuning of GPU Kernels, Using libraries (such as Thrust, Fast Fourier transform library and Embedded- system graphic library), and developing libraries.

Support: Debugging GPU Programs, GPU test setup. Profiling, Profile tools, Reliability, quality and Performance aspects,.

Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.

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

Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing, OpenCL for Heterogeneous processing . NVIDIA GPU SDK 4.1 and AMD, Introduction to Chip on wafer on substrate (CoWoS) and Stacked Die

Books Recommended:

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)

3. https://nepp.nasa.gov/files/29564/NEPP-BOK-2018-Wyrwas-GPU-TN60884.pdf

COURSE OUTCOMES

After completion of course, students would be:

CSP321(A).1 Students would learn concepts in parallel programming, implementation of programs on GPUs, debugging and profiling parallel programs.

PROGRAM ELECTIVE-III
CSP321 (B) DIGITAL FORENSICS

Teaching Scheme: 03L	Total: 03	Credit: 03
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		Total Marks: 100
ESE Duration : 2 Hrs. 30 min.		

COURSE OBJECTIVE

I. To understand the basics of digital forensics and investigation
II. To understand and determine best acquisition tool and how to use them
III. To impart the technical know of digital evidences and forensics tools
IV. To understand the basics of Email, Social Media, Mobile, Cloud and IOT forensics

Understanding Digital forensics and Investigation- An Overview of Digital Forensics, A Brief History of Digital Forensics, Basic forensic methodology, computer forensics legal concerns and private issues, Preparing a Digital Forensics Investigation, Procedures for Private-Sector High-Tech Investigations, Understanding Data Recovery Workstations and Software, Conducting an Investigation

Data acquisition- Understanding storage formats and digital evidence, Determining the best acquisition method, Acquisition tools, Validating data acquisitions, Performing RAID data acquisitions, Remote network acquisition tools, Other forensics acquisitions tools.

File Systems- Understanding of Windows, Linux and Macintosh file structures and there forensics procedures

Processing crimes and incident scenes- Identifying Digital Evidence, Preparing for a Search, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing a case study.

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques.

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E-Mail and Social Media Investigations- Exploring the Role of E-mail in Investigations, Exploring the Roles of the Client and Server in E-mail, Investigating E-mail Crimes and Violations, Understanding E-mail Servers, Using Specialized E-mail Forensics Tools, Applying Digital Forensics Methods to Social Media Communications

Mobile Device Forensics and the Internet of Anything- Understanding Mobile Device Forensics, Understanding Acquisition Procedures for Mobile Devices, Understanding Forensics in the Internet of Anything, Introduction to Cloud Forensics

Report Writing for High-Tech Investigations- Understanding the Importance of Reports, Guidelines for Writing Reports, Generating Report Findings with Forensics Software Tools

Suggested Books

1. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 6th Edition, Cengage Learning
2. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications.

Course Outcome

Student would be able to

CSP321 (B).1 Computer forensics and digital detective and various processes, policies and procedures
CSP321 (B).2 Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
CSP321 (B).3 To be well-trained as next-generation computer crime investigators.

PROGRAM ELECTIVE-III
CSP321(C) MOBILE APPLICATIONS AND SERVICES

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.		

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COURSE OBJECTIVE

I. To apply the unique set of problems and challenges in developing mobile applications compared with desktop applications
II. To use the Android platform, tools, technology and process for developing mobile applications
III. To write applications and simulate their execution

Prerequisites
(Students should be familiar with Java programming before taking this course)
Introduction: Setting up an Android Studio Development Environment, Creating an Example Android App in Android Studio, A Tour of the Android Studio User Interface, Testing Android Studio Apps on a Physical Android Device, The Basics of the Android Studio Code Editor , An Overview of the Android Architecture , The Anatomy of an Android Application , Understanding Android Application and Activity Lifecycles , Handling Android Activity State Changes , Android Activity State Changes by Example

User Interface:
Saving and Restoring the State of an Android Activity, Understanding Android Views, View Groups and Layouts, A Guide to the Android Studio Layout Editor Tool, A Guide to the Android ConstraintLayout, A Guide to using ConstraintLayout in Android Studio, An Android Studio Layout Editor ConstraintLayout Tutorial, Manual XML Layout Design in Android Studio, Creating an Android User Interface in Java Code, An Overview and Example of Android Event Handling, Guide to using Instant Run in Android Studio 2, Android Touch and Multi-touch Event Handling, Detecting Common Gestures using the Android Gesture Detector Class, Implementing Custom Gesture and Pinch Recognition on Android

Storage: An Overview of Android SQLite Databases, An Android TableLayout and TableRow Tutorial, An Android SQLite Database Tutorial, Understanding Android Content Providers, Implementing an Android Content Provider in Android Studio, Accessing Cloud Storage using the Android Storage Access Framework, An Android Storage Access Framework Example

Intents and Services: An Overview of Android Intents, Android Explicit Intents – A Worked Example, Android Implicit Intents – A Worked Example, Android Broadcast Intents and Broadcast Receivers

Threads and Communication: A Basic Overview of Threads and Thread Handlers, An Overview of Android Started and Bound Services, Implementing an Android Started Service – A Worked Example

Graphics and Animation: Animating User Interfaces with the Android Transitions Framework
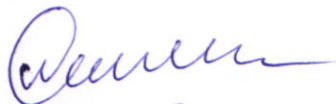**Security:** Security - OWASP top 10 Mobile Risks , Android Security

Books Recommended:

1. Neil Smyth, Android Studio Development Essentials- – Android 7 Edition, 1st edition, 2016, Create Space Independent Publishing Platform
2. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons
3. https://www.owasp.org/index.php/OWASP_Mobile_Security_Project#tab=Top_10_Mobile_Risks

COURSE OUTCOMES
On completion of the course the student should be able to

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CSP 321.1 define and sketch a mobile application
CSP 321.2 understand the fundamentals, frameworks, and development lifecycle of mobile application platforms
CSP 321.3 design and develop a mobile application prototype in one of the platform

PROGRAM ELECTIVE-III

CSP321 (D) COMPILER FOR HPC

Teaching Scheme: 03L   **Total: 03**   **Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE   **Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.

COURSE OBJECTIVE
I. Know the most common machine independent optimizations.
II. Know scheduling techniques and register allocation for exploiting Instruction Level Parallelism
III. Know the most common memory locality optimizations.
IV. Learn the concept and compiler techniques for exploiting fine-grained parallelism
V. Compiler techniques and tools for exploiting coarse-grained parallelism

Introduction: Review of Compiler structure, advanced issues, Importance of code optimization, Structure of optimizing compilers, Placement of optimizations in aggressive optimizing compilers, Target machines, Number Notations and Data Sizes.

Instruction-Level Parallelism: Processor Architectures, Data Dependence, Basic-Block Scheduling, Global Code Scheduling, Software Pipelining.

Memory Hierarchy Optimization: Impact of data and instruction cache, Instruction cache optimization, Scalar replacement of array elements, Data cache optimization, Scalar vs memory-oriented optimizations.

Fine-Grained Parallelism (Data-level): Introduction, Loop Interchange, Scalar Expansion, Scalar and Array Renaming, Node Splitting, Recognition of Reductions, Index-Set Splitting, Run-Time Symbolic Resolution, Loop Skewing, Putting It All Together, Complications of Real Machines, Case Studies

Coarse-Grained Parallelism (Thread-level): Introduction, Single-Loop Methods, Perfect Loop Nests, Imperfectly Nested Loops, An Extended Example, Packaging of Parallelism, Case Studies

COURSE OUTCOMES
CSP321(D).1 Familiar with the structure of compiler

CSP321(D).2 Parallel loops, data dependency and exception handling and debugging in compiler.

CSP321(D).3

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Books Recommended:

1. Steven S. Muchnick Advanced compiler design and implementation
2. Randy Allen Optimizing Compilers for Modern Architectures: A Dependence-based Approach 1st Edition
3. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson
4. Compilers: Principles, Techniques, and Tools (2nd Edition) [Aho, Alfred V

PROGRAM ELECTIVE-III
CSP321(E) OPTIMIZATION TECHNIQUES

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.		

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

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

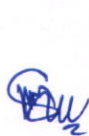**General Structure** of Optimization Algorithms, Constraints, The Feasible Region

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

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

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

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

Books Recommended:

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 OUTCOMES

After completion of course, students would be:

CSP321(E).1 Formulate optimization problems.

CSP321(E).2 Understand and apply the concept of optimality criteria for various types of optimization problems.

CSP321(E).3 Solve various constrained and unconstrained problems in Single variable as well as multivariable.

CSP321(E).4 Apply the methods of optimization in real life situation.

OPEN ELECTIVE
SHP321(A)   BUSINESS ANALYTICS

Teaching Scheme: 03L   **Total: 03**   **Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE   **Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.

Course Objective

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

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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.

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.

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

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SHP321 (B) INDUSTRIAL SAFETY

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration : 2 Hrs. 30 min.		

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

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.

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.

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Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

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.

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

Books Recommended:

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

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SHP321 (C) OPERATIONS RESEARCH

Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

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

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

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

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

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Competitive Models, Single and Multi-channel Problems, Sequencing Models,

Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Books Recommended:

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 Outcomes: At the end of the course, the student should be able to
SHP321(C).1 Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
SHP321(C).2 Students should able to apply the concept of non-linear programming
SHP321(C).3 Students should able to carry out sensitivity analysis
SHP321(C).4 Student should able to model the real world problem and simulate it

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SHP321 (D) COST MANAGEMENT OF ENGINEERING PROJECTS

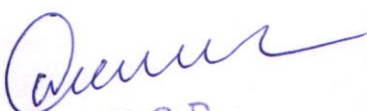|		
Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance

Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

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

Books Recommended:

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

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SHP321 (E) COMPOSITE MATERIALS

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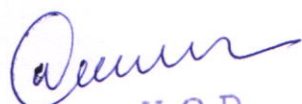|		
Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

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.

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

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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.

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.

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.

Books Recommended:

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.

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

4. Composite Materials – K.K.Chawla.3

5. Composite Materials Science and Applications – Deborah D.L. Chung.

6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

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SHP321 (F) WASTE TO ENERGY

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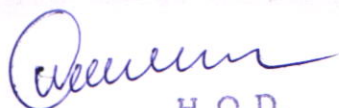|		
Teaching Scheme: 03L	**Total: 03**	**Credit: 03**
Evaluation Scheme: 30MSE + 10 TA + 60 ESE		**Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.		

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

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

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.

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Budgetary control and Variance analysis, Activity based costing (ABC). Biases in cash flow estimation.

Appraisal criteria: Net Present Value, benefit cost ratio, internal rate of returns urgency, payback period, accounting rate of returns, investment appraisal in practice

Analysis of Risk, Types and measure of risk , simple estimation of risk, sensitivity analysis, scenario analysis, Special decision situations: Choice between mutually exclusive projects of unequal life, optimal timing decision, determination of economic life, inter-relationships between investment and financing aspects, inflation and capital budgeting. Analysis of firm and market risk:

Portfolio theory and capital budgeting, Capital Asset Pricing Model.

Books Recommended:

1. J Pandey I M., Financial Management, Vikas Publication,10th Edition 2013
2. Henry M. Stenier, "Engineering economics Principles", Mc Graw Hill Publication.
3. C. B. Gupta, "Fundamentals of Business", Sultan Chand & Company.
4. S. K. Basu, K.C. Sahu and Rajiv B, "Industrial Organisation and Management", PHI New Delhi, Nov 2012.

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SHP321 (H) PROJECT MANAGEMENT

Teaching Scheme : 03 L + 00 T   Total 03
Marking Scheme: 30 MSE +10 TA+ 60 ESE
Duration of ESE   : 2 Hrs.30 min.

Credit : 03
Total Marks :100

Introduction: Human Factors and Systems, Information Input and Processing, Visual Displays of Dynamic Information, Human Output and Control: Physical Work and Manual Materials Handling, Motor Skills, Human Control of Systems, Hand Tools and Devices.

Definition of Ergonomics and its significance in designing workplace layout and detailed motion plan of work, Man-Machine Symbiosis, Human Factors in design & manufacturing, Viz. pressure of the environment, temperature, humidity etc., Principles of motion economy, anthropometric condition, stability criterion etc. Biodynamic analysis for design of products & its concept of learning by man and machine;

Measurement of Learning Index and training for each job and each man, Product design – various aspects including ergonomic design and reliability based design.

Dynamic consideration in design of product using vibration stability in biomechanisms. Safety in manufacturing. Considerations of human stress. Allowable limit of stress, stress adjustment.

Estimation of human error and human reliability, combining various forms of human error by random number simulation, Human Error, Accidents and safety, Human Factors and the Automobile, Human Factors in Systems Design.

Dynamic consideration in project operations, leadership, requirement, communication process, motivating a diverse workflow, facilitating team decisions, resolving interpersonal conflicts, managing different people, strengthening team accountability

Books Recommended:

1. Sanders, M.M. & Mc Cormick, E.J., Human Factors in Engineering & Design, McGraw-Hill, 7th ed. (1993)
2. S. K. Basu, K.C. Sahu and Rajiv B, Industrial Organisation and Management –, PHI New Delhi, Nov 2012.

OPEN ELECTIVE
SHP321 (I) DATA STRUCTURE AND ALGORITHMS

Teaching Scheme: 03 L + 00 T   Total 03   Credit : 03
Marking Scheme: 30 MSE +10 TA+ 60 ESE   Total Marks :100
Duration of ESE : 2 Hrs.30 min.

Course Outcomes:
Students will be able to:

  I.   Write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.
  II. Think of all possible inputs to an application and handle all possible errors properly.
  III. Analyze clearly different possible solutions to a program and select the most efficient one.
  IV. Write an application requiring an effort of at least 1000 lines of code to demonstrate a good working solution.
  V.   Demonstrate the ability to write reusable code and abstract data types in C, using object-based way of thinking.

Introduction: Data. Data types. Object, data structure and abstract data types (ADT).Characteristics of an algorithm. Analyzing programs. Frequency count. Time and space complexity. Big 'O' and Ω notation. Best. average and worst cases. Dangling pointers and garbage memory.

Arrays. Files and Searching: Searching: linear and binary search algorithm. Hashing: hashing functions, chaining, overflow handling with and without chaining, open addressing:

linear. Quadratic Teaching Scheme: Examination Scheme: probing. Files handling: text and binary files, use of various libraries for handling files.

Stacks and Queues: Stack and queue as ADT. Operations on stack and queue. Implementations using arrays and dynamic memory allocation. Application of stack for expression evaluation, expression conversion. Recursion and stacks. Problems like maze and knight's tour.

Lists: List as ADT. Concept of linked organization of data against linked list. Singly linked list,doubly linked list, circular linked list. Representation & manipulations of polynomials/sets using linked lists. Dynamic memory management. Representation of sparse matrix. Addition and transpose of sparse matrix.

Trees and Graphs: Basic terminology. Binary trees and its representation. Binary tree traversals (recursive and non-recursive) and various operations. Insertion and deletion of nodes in binary search tree. Representation of graphs using adjacency matrix, adjacency list. Implementation of algorithms for traversals; implementing Kruskal's. Prim's algorithms. Single source shortest paths using Djkstra's algorithm. Applications of graphs and trees.

Time Complexity Analysis, Algorithm Design: Verification of programs, invariants, assertions, proof of termination. Best, Average and Worst case analysis of: binary search, quick sort, merge sort, insertion sort, hashing techniques, sparse matrix algorithms. Designing data structures for specific applications.

Books Recommended:

1. E. Horowitz, S. Sahni, S.Anderson-freed, "Fundamentals of Data Structures in C", Second Edition,University Press, ISBN 978-81-7371-605-8
2. B. Kernighan, D. Ritchie, "The C Programming Language", Prentice Hall of India, Second Edition,ISBN 81-203-0596-5
3. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C", Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1
4. Ellis Horowitz, S. Sahni, D. Mehta "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi 1995 ISBN 16782928
5. Jean-Paul Tremblay, Paul. G. Soresan, "An introduction to data structures with Applications",Tata Mc-Graw Hill International Editions, 2nd edition 1984, ISBN-0-07-462471-7

CSP 322 DISSERTATION STAGE –I

Teaching Scheme: 20P	**Total: 20**	**Credit: 10**
Evaluation Scheme: 100ICA		**Total Marks: 100**

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Dissertation (Phase I):

1. Student shall complete dissertation work in III, & IV semesters individually.

2. In III semester, student shall complete Literature survey and decide the dissertation topic. He/She shall complete conceptual study and design part of dissertation topic and submit the progress report in proper format.

3. Student has to deliver a seminar on the selected topic (covering 25% or more work).

It is to be evaluated internally by three member's panel of examiners headed by HOD wherein guide should be one of the members of the panel. Last date of submission of report shall be two weeks before the end of semester

CSP 401 DISSERTATION –II

Teaching Scheme: 32 P	Total: 32	Credit: 16
Evaluation Scheme: 200 ICA + 200 ESE		Total Marks: 200

Dissertation (Phase II):

1. Student shall complete dissertation work in IV semester, and submit a progress report in proper format.

2. Dissertation (Phase-II): Internal assessment of dissertation (complete work) is to be carried out by three members panel of examiners headed by HOD wherein guide should be one of the members of the panel, for 100 marks. The external assessment of dissertation work is to be carried out by panel of examiners consisting of internal (guide) and external examiner for 200 marks. Candidate shall present the entire work on Dissertation, followed by viva-voce. Last date of submission of dissertation will be the end of the semester. Please see Appendix-C of Rules & Regulation for Further information

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