EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishvavidyalaya (Sthapna Evam Sanchalana) Adhyadesh, 2020

SCHOOL OF ENGINEERING

SYLLABUS

COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Mathematical Foundations of Computer Science				
Subject Code		MCSCSE20S101				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. On completion of this course, students should be able to demonstrate their understanding of and apply methods of discrete mathematics in CS to subsequent courses in algorithm design and analysis, automata theory and computability, information systems, computer networks.
2. Students should be able to - use logical notation to define fundamental mathematical concepts such as sets, relations, functions and various algebraic structures, reason mathematically using such structures, and evaluate arguments that use such structures. - model and analyze a computation or communication process and construct elementary proofs based on such structures.

Course Outcomes:

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

CO1. To understand the basic notions of discrete and continuous probability.
CO2. To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
CO3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.
CO4. Ability to apply mathematical logic to solve problems.
CO5. Understand sets, relations, functions, and discrete structures.

Unit	Syllabus	Periods
UNIT-I	Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.	**10**
UNIT-II	Random samples, sampling distributions of estimators**,** Methods of Moments and Maximum Likelihood.	**15**
UNIT-III	Statistical inference**,** Introduction to multivariate statistical models: regression and classification problems, principal components analysis**,** The problem of overfitting model assessment.	**10**
UNIT-IV	Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems.	**15**
UNIT-V	Recent trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.	**10**

TEXT BOOKS:

1. K. Trivedi.Probability and Statistics with Reliability Queuing, and Computer Science Applications, Wiley

REFERENCE BOOKS:

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

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COMPUTER SCIENCE & ENGINEERING

Class		**M.Tech/CSE**	**L**	**T**	**P**	**Credit**
Semester/Year		**I/I**	**3**	**0**	**-**	**3**
Subject Name		**Advanced Data Structures**				
Subject Code		**MCSCSE20S102**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objectives:

1. Understand and apply linear data structures-List, Stack and Queue.
2. Understand the graph algorithms. Learn different algorithms analysis techniques.
3. Apply data structures and algorithms in real time applications.

Course Outcomes:

After completion of course, students would be able to:

CO1. Understand the implementation of symbol table using hasing techniques.
CO2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO3. Develop algorithms for text processing applications.
CO4. Identify suitable data structures and develop algorithms for computational geometry problems.
CO5. Able to analyze the efficiency of algorithm.

Unit	Syllabus	Periods
UNIT-I	**Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. **Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.	10
UNIT-II	**Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.	15
UNIT-III	**Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees, Recent trends in hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem.	10

UNIT-IV	**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.	15
UNIT-V	Computational Geometry: One Dimensional Range Searching, Two Dimensional Range, Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.	10

TEXT BOOKS:

1. Gilberg, Data structures Using C++, Cengage
2. Horowitz, Sahni, Rajasekaran, “Computer Algorithms”, Galgotia,
3. Tanenbaum A.S., Langram Y, Augestien M.J., ”Data Structures using C & C++”,Prentice Hall of India, 2002.

REFERENCE BOOKS :

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson P.
2. Aho, Hopcroft, Ullman, “Data Structures and Algorithms”, Pearson Education P.
3. Drozdek, Data Structures and algorithm in Jawa, Cengage (Thomson).

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Machine Learning				
Subject Code		MCSCSE20S103				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To develop skills of using recent machine learning software for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

After completion of course, students would be able to:

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

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

CO3. To mathematically analyse various machine learning approaches and paradigms.

CO4. Apply Dimensionality reduction techniques.

CO5. Design application using machine learning techniques.

Unit	Syllabus	Periods
UNIT-I	**Supervised Learning (Regression/Classification)** Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Nave 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.	10

UNIT-II	**Unsupervised Learning** Clustering K-means/KernelK-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).	15
UNIT-III	Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).	10
UNIT-IV	Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.	10
UNIT-V	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.	15

TEXT BOOKS:

1. K. Trivedi Probability and Statistics with Reliability Queuing, and Computer Science Applications. Wiley.

REFERENCE BOOKS :

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

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Wireless Sensor Networks				
Subject Code		MCSCSE20S104				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

The objective of this course is to make the students-

1. To Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology.
2. Understand the medium access control protocols and address physical layer issues.
3. Learn key routing protocols for sensor networks and main design issues.
4. Learn transport layer protocols for sensor networks, and design requirements.
5. Understand the Sensor management, sensor network middleware, operating systems.

Course Outcomes:

CO1. Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks.
CO2. Describe the MAC protocol issues of ad hoc networks.
CO3. Describe routing protocols for ad hoc wireless networks with respect to TCP design issues.
CO4. Explain the concepts of network architecture and MAC layer protocol for WSN .
CO5. Discuss the WSN routing issues by considering QoS measurements.

Unit	Syllabus	Periods
UNIT-I	Introduction and Overview - Overview of sensor network protocols, architecture, and applications, Challenges, Main features of WSNs; Research issues and trends Platforms- Standards and speci#cations-IEEE802.15.4/ Zigbee, Hardware: Telosb Micaz motes, Software: Overview of Embedded operating systems-Tiny OS, Introduction to Simulation tools- TOSSIM, OPNET, Ns-2.	10

UNIT-II	Wireless Communication Characteristics-Link quality, fadinge. ects, Shadowing, Localization, Connectivity and Topology - Sensor deployment mechanisms, Coverage issues, Node discovery protocols.	15
UNIT-III	Fundamentals of Medium access protocol-Medium access layer protocols-Energy efficiency, Power allocation and Medium access control issues.	10
UNIT-IV	Network layer protocols-Data dissemination and processing, multichip and cluster based routing protocols- Energy efficient routing- Geographic routing, Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols.	15
UNIT-V	Middleware and Application layer-Data dissemination, Data storage, Query processing, Security - Privacy issues, Attacks and Countermeasures.	10

TEXT BOOKS:

1. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocolsand
2. Bhaska Krishnamachari,"NetworkingWirelessSensors",CambridgeUniversityPress,2005.
3. C.SRaghavendra,KrishnaM.Sivalingam,Taiebznati,"WirelessSensorNetworks",Springer Science2004.

REFERENCE BOOKS:

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2007.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Intelligent Systems				
Subject Code		MCSCSE20S105				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Understanding of and apply Biological foundations to intelligent.
2. Study of Search Methods Basic concepts of graph and tree search.
3. Study of basic artificial intelligence techniques for.

Course Outcomes:

After completion of course, students would be:

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

CO2. Students will gain deep understanding of the basic artificial intelligence techniques.

CO3. Students will apply their knowledge to design solutions to different problems.

CO4. Students will have the ability to design and develop an intelligent system for a selected application.

CO5. Use artificial intelligence technique(s) to design and develop intelligent systems.

Unit	Syllabus	Periods
UNIT-I	Biological foundations to intelligent systems I: Artificial neural networks, Back- propagation networks, Radial basis function networks, and recurrent networks.	10
UNIT-II	Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.	15

UNIT-III	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.	10
UNIT-IV	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.	15
UNIT-V	Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.Recent trends in Fuzzy logic, Knowledge Representation.	10

TEXT BOOKS:

1. Artificial Intelligence – A Modern Approach (3rd Edition).
2. Introduction to Artificial Intelligence *by Philip C Jackson.*

REFERENCE BOOKS:

1. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6thedition.
2. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Data Science				
Subject Code		MCSCSE20S106				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Students will develop relevant programming abilities.
2. Students will demonstrate proficiency with statistical analysis of data.
3. Students will develop the ability to build and assess data-based models.
4. Students will execute statistical analyses with professional statistical software.
5. Students will demonstrate skill in data management.
6. Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.

Course Outcomes:

The students learning outcomes are designed to specify what the students will be able to perform after completion of the course:

CO1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

CO2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

CO4. Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

CO5. Ability to recognize and implement various ways of selecting suitable model parameters for Different machine learning techniques.

Unit	Syllabus	Periods
UNIT-I	Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.	10
UNIT-II	Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources	15
UNIT-III	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.	10
UNIT-IV	Data visualization: Introduction, Types of data visualization, Data for visualisation:Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.	15
UNIT-V	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.	10

TEXT BOOKS:

1. Think Python **By:** Allen B. Downey.
2. R for Data Science by Garret Grolemund and Hadley Wickham.

REFERENCE BOOKS :

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.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Distributed Systems				
Subject Code		MCSCSE20S107				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
2. The structure of distributed systems using multiple levels of software is emphasized.

Course Outcomes:

Upon Completion of the course, the students will be able to

CO1. Understand the principles of distributed systems.

CO2. Describe the problems and challenges associated with principles.

CO3. Understand Distributed Computing techniques, Synchronous and Processes.

CO4. Apply Shared Data access and Files concepts.

CO5. Design a distributed system that fulfills requirements with regards to key distributed systems properties.

Unit	Syllabus	Periods
UNIT-I	**Introduction** Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts. **Distributed Database Management System Architecture** Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.	10
UNIT-II	**Distributed Database Design** Alternative design strategies; Distributed design issues, Fragmentation; Data allocation. **Semantics Data Control** View management; Data security; Semantic Integrity Control **Query Processing Issues** Objectives of query processing; Characterization of query processors; Layers of query processing. Query decomposition; Localization of distributed data.	15
UNIT-III	**Distributed Query Optimization** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms. **Transaction Management** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **Concurrency Control** Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.	10
UNIT-IV	**Reliability** Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery.	15
UNIT-V	**Parallel Database Systems** Parallel architectures; parallel query processing and optimization; load balancing. **Advanced Topics** Mobile Databases, Distributed Object Management, Multi-databases.	10

TEXT BOOKS:

1. K. Trivedi. Probability and Statistics with Reliability Queuing, and Computer Science Applications. Wiley.

REFERENCE BOOKS:

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

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	3	0	0	3
Subject Name		Advanced Wireless and Mobile Networks				
Subject Code		MCSCSE20S108				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. This course provides a comprehensive overview and advanced knowledge of modern mobile and wireless communication systems.
2. Building on the prior knowledge on digital communications, students develop further understanding on the challenges and opportunities brought by the wireless medium in designing current and future wireless communication systems and networks.

Course Outcomes

After completion of course, students would be:

CO1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.

CO2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.

CO3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.

CO4. Design wireless networks exploring trade-offs between wire line and wireless links.

CO5. Develop mobile applications to solve some of the real world problems.

Unit	Syllabus	Periods
UNIT-I	**Introduction:** Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modeling, 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,	15

	Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues.	
UNIT-II	**Wireless Cellular Networks:** 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.	10
UNIT-III	WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22, Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview. **Wireless Sensor Networks** Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.	10
UNIT-IV	**Wireless Pans** Bluetooth and ZigBee, Introduction to Wireless Sensors. **Security** Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.	15
UNIT-V	**Advanced Topics** IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks.	10

TEXT BOOKS:

1. Kazem Sohraby, Daniel Manoli ,"Wireless Sensor networks- Technology, Protocols and
2. Bhaskar Krishnamachari,"Networking Wireless Sensors",Cambridge University Press,2005.
3. C.S Raghavendra, Krishna M.Sivalingam,Taiebznati,"Wireless Sensor Networks", Springer Science 2004.

REFERENCE BOOKS:

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks.
2. Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2007.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	0	0	4	2
Subject Name		Programming for Scientific Computing				
Subject Code		MCSCSE20S109				
Paper	English					
	Hindi					
Max. Marks		50				

Course Objectives:

1. To understand the Computational Complex Scientific Problem.
2. To understand the Python Environment for Scientific Computing.
3. To learn the Python Programming concept.
4. To understand the Object Oriented Concept in Python.
5. To learn python Framework Pandas, numPy, sciPy and Matplotlib etc.

Course Outcomes:

After completion of course, students would be able to:

CO1. Write computational programs at a high level of abstraction.

CO2. Use standard programming constructs like repetition, selection, functions, composition, modules, aggregated data.

CO3. Implement and evaluate the results of scientific computing problems, using established program libraries.

CO4. Design and develop Web Interface.

CO5. Use standard framework of statistic programming.

List of Experiments

1. Write a Python program to find all prime numbers within a given range.
2. Write a Python program to print ‘n terms of Fibonacci series using iteration.
3. Write a Python program demonstrate use of slicing in string.
4. Write a Python program to demonstrate use of list & related Functions.
5. Write a Python program to demonstrate use Dictionary& related functions.
6. Write a Python program to read and write from a file.
7. Write a Python program copy a file.
8. Write a Python program to demonstrate working of classes and objects.
9. Write a Python program to demonstrate class method & static method.
10. Write a Python program to demonstrate inheritance.
11. Write a Python program to demonstrate aggregation/compositions.

12. Write a NumPy program to create a 3x3 matrix with values ranging from 2 to 10.
13. Write a NumPy program to convert a list of numeric value into a one-dimensional NumPy array.
14. Write a Pandas program to create and display a DataFrame from a specified EMP dictionary data.
15. Write a Pandas program to display a summary of the basic information about a specified EMP DataFrame and its data.
16. Write a Pandas program to display all the records of Emp file
17. Write a Python programming to display a bar chart of the popularity of programming Languages.
Programming languages: Java, Python, PHP, JavaScript, C#, C++.
Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7
18. Write a Python program to draw a scatter plot comparing two subject marks of Mathematics and Science. Use marks of 10 students.
Data:
math_marks = [88, 92, 80, 89, 100, 80, 60, 100, 80, 34]
science_marks = [35, 79, 79, 48, 100, 88, 32, 45, 20, 30]
marks_range = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100]
19. Write a python program to perform linear algebraic operation using scipy.
Write a python program to perform Calculus and Integration mathematics operation using scipy.

TEXT BOOKS:

1. Hemant Kumar Mehta, Mastering Python Scientific Computing, Packt Publishing Limited.

REFERENCE BOOKS:

1. Hans Petter Langtangen, A Primer on Scientific Programming with Python (Link).
2. Claus Fuhrer, Jan Erik Solem, Olivier Verdier, Scientific Computing with Python 3, Packt Publishing Limited.
3. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education.
4. Sergio J. Rojas G., Erik A. Christensen, Francisco J. Blanco-Silva, Learning SciPy for Numerical and Scientific Computing, Packt Publishing Limited.

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COMPUTER SCIENCE & ENGINEERING

Class		**M.Tech/CSE**	**L**	**T**	**P**	**Credit**
Semester/Year		**I/I**	**2**	**0**	**0**	**0**
Subject Name		**English for Research Paper Writing**				
Subject Code		**MCSER20S110**				
Paper	**English**					
	Hindi					
Max. Marks						

Course Objectives:

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

Course Outcomes:

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

CO1. Students will heighten their awareness of correct usage of English grammar in writing and speaking.

CO2. Students will improve their speaking ability in English both in terms of fluency and comprehensibility.

CO3. Students will give oral presentations and receive feedback on their performance.

CO4. Students will increase their reading speed and comprehension of academic articles.

CO5. Students will improve their reading fluency skills through extensive reading.

Unit	Syllabus	Periods
UNIT-I	Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	10
UNIT-II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.	15
UNIT-III	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	10
UNIT-IV	key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction, skills needed when writing a Review of the Literature, skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills are needed when writing the Conclusions.	15
UNIT-V	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	10

TEXT BOOKS:

1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
2. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011.

REFERENCE BOOKS:

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.

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SCHOOL OF ENGINEERING

SYLLABUS

COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	2	0	0	2
Subject Name		Research Methodology and IPR				
Subject Code		MMAT20S111				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To explain various research designs and their characteristics. methods of data collections. To explain several parametric tests of hypotheses and Chi-square test.
2. To explain the art of interpretation and the art of writing research reports.

Course Outcomes:

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

CO1. Understand research problem formulation.

CO2. Analyze research related information.

CO3. Follow research ethics.

CO4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

Unit	Syllabus	Periods
UNIT-I	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	10

UNIT-II	Effective literature studies approaches, analysis, Plagiarism, Research ethics.	15
UNIT-III	Effective technical writing, how to write report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	10
UNIT-IV	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.	15
UNIT-V	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.	10

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students.
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction".
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step-by Step Guide for beginners".

REFERENCE BOOKS:

1. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age",2016.
2. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,2008.

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SYLLABUS

COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		I/I	-	0	4	2
Subject Name		Advanced Data Structures				
Subject Code		MCSCSE20S112				
Paper	English					
	Hindi					
Max. Marks		50				

List of Experiments

1. Write a program that implements stack and Queue operations using
   a. Arrays b. linked list
2. Write a program to perform the following operations on singly linked list and doubly linked list
   a. Creation b. Insertion c. Deletion d. Traversal.
3. Implement recursive and non recursive i) Linear search ii) Binary search
4. Study and Implementation of Different sorting algorithms and Find Time and Space complexities.
5. Implement Recursive functions to traverse the given binary tree in
   a. Preorder b. Inorder c. Postorder
6. Study and Implementation of different operations on
   a. Binary Search Tree. b. AVL tree. c. Red Black Tree
7. Perform the following operations
   a. Insertion into a B-tree
   b. Deletion from a B-tree
8. Implement Different Collision Resolution Techniques.
9. Study and Implementation of Following String Matching algorithms:
   a. Rabin-Karp algorithm
   b. Knuth-Morris-Pratt algorithm
   c. Boyer-Moore algorithm
10. Implement the following using java:
    1. Single Source Shortest Path algorithms
    2. All pairs shortest path algorithms
    3. Minimal Spanning Tree algorithms
    4. String and Pattern matching algorithms
    5. Maximum Flow/ Minimum cut algorithms

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	-	3
Subject Name		Advance Algorithms				
Subject Code		MCSCSE20S201				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Develop student's algorithmic thinking and their ability to analyses the efficiency of algorithms.
2. Enable students to find different approaches for dealing with challenging computational problems;
3. Provide insight into cutting-edge research-led teaching in modern subfields of algorithms theory.

Course Outcomes:

After completion of course, students would be able to:

CO1. Analyze the complexity/performance of different algorithms.
CO2. Determine the appropriate data structure for solving a particular set of problems.
CO3. Categorize the different problems in various classes according to their complexity.
CO4. Students should have an insight of recent activities in the field of the advanced data structure.
CO5. Apply genetic algorithms to combinatorial optimization problems.

Unit	Syllabus	Periods
UNIT-I	**Sorting:** Review of various sorting algorithms, topological sorting **Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	10

UNIT-II	**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.	15
UNIT-III	**Flow-Networks:** Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.	10
UNIT-IV	**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.	15
UNIT-V	**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 Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	10

TEXT BOOKS:

1. Algorithm Design by Kleinberg & Tardos. Introduction to Algorithms: A Creative Approach.

REFERENCE BOOKS :

1. Introduction to Algorithms" by Cormen, Leiserson, Rivest,Stein.
2. "The Design and Analysis ofComputer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos Satyanarayana, E-Government, PHI.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Soft Computing				
Subject Code		MCSCSE20S202				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

Course Outcomes:

Upon completion of the course, the student are expected to:

CO1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

CO2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.

CO3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations

CO4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.

CO5. Reveal different applications of these models to solve engineering and other problems.

Unit	Syllabus	Periods
UNIT-I	**Introduction to Soft Computing and Neural Networks:** Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.	10
UNIT-II	**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.	15

UNIT-III	**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.	10
UNIT-IV	**Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.	15
UNIT-V	**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 Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.	10

TEXT BOOKS:

1. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications , Prentice Hall,1995.
2. MATLAB Toolkit Manual.

REFERENCE BOOKS:

1. Jyh: Shing Roger Jang, Chuen: Tsai Sun, Eiji Mizutani, Neuro: Fuzzy and Soft Computing , Prentice: Hall of India,2003.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Data Preparation and Analysis				
Subject Code		MCSCSE20S203				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Provide insight into methods and tools for analysis and processing of the data generated by modern information systems.

Course Outcomes:

CO1. Explain basic terms in the area of Information Systems development and management, group database management systems according to their purpose,.
CO2. Give an insight into the statistical methods of data analysis and prediction.
CO3. Explain methods of data analysis in a company, define business situations in which data processing methods are applicable, and define scope of use of different types of data base management systems.
CO4. Demonstrate use of SQL for extracting and preparing data.
CO5. Create SQL queries for extracting and grouping data from different types of database management systems.

Unit	Syllabus	Periods
UNIT-I	**Data Gathering and Preparation:** Data formats, parsing and transformation, Scalability and real-time issues.	10
UNIT-II	**Data Cleaning:** Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.	10

UNIT-III	**Exploratory Analysis:** Descriptive and comparative statistics, Clustering and association, Hypothesis generation.	**8**
UNIT-IV	**Visualization:** Designing visualizations, Time series, Geo located data, Correlations and connections, Hierarchies and networks, interactivity.	**10**
UNIT-V	**Ethics in the profession:** Cases in Computing Statics, and Communication.	**8**

TEXT BOOKS :

1. The Hundred-Page Machine Learning Book. Too Big to Ignore: The Business Case for Big Data.

REFERENCE BOOKS :

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

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Secure Software Design& Enterprise Computing				
Subject Code		MCSCSE20S204				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. The course takes a software development perspective to the challenges of engineering software systems that are secure.
2. This course addresses design and implementation issues critical to producing secure software systems.
3. The course deals with the question of how to make the requirements for confidentiality, integrity, and availability integral to the software development process from requirements gathering to design, development, configuration, deployment, and ongoing maintenance.

Course Outcomes:

After completion of course, students would be able to:

CO1. Differentiate between various software vulnerabilities.
CO2. Software process vulnerabilities for an organization.
CO3. Monitor resources consumption in a software.
CO4.Interrelate security and software development process.
CO5. Explain different security frameworks for different types of systems including electronic systems.

Unit	Syllabus	Periods
UNIT-I	**Secure Software Design** Identify software vulnerabilities and perform software security analysis, Master Security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.	10

UNIT-II	**Enterprise Application Development** Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.	**15**
UNIT-III	**Enterprise Systems Administration** Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).	**15**
UNIT-IV	Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.	**12**
UNIT-V	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.	**10**

TEXT BOOKS:

1. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

REFERENCES BOOKS:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Computer Vision				
Subject Code		MCSCSE20S205				
Paper	English					
	Hindi					
Max. Marks		100				

Course objectives:

1. To introduce students the fundamentals of image formation.
2. To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition.
3. To develop an appreciation for various issues in the design of computer vision and object recognition systems.
4. To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes:

After completing the course you will be able to:

CO1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision.
CO2. Describe known principles of human visual system.
CO3. Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
CO4. Suggest a design of a computer vision system for a specific problem.
CO5. Developed the practical skills necessary to build computer vision applications.

Unit	Syllabus	Periods
UNIT-I	Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.	10
UNIT-II	Edge detection, Edge detection performance, Hough transform, corner detection.	8
UNIT-III	Segmentation, Morphological filtering, Fourier transforms.	12

UNIT-IV	Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing.	**15**
UNIT-V	**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.	**10**

TEXT BOOKS:

1. Dictionary of Computer Vision and Image Processing, by Fisheretal
2. Computer Vision: Algorithms and Applications by RichardSzeliski.

REFERENCE BOOKS:

1. Deep Learning, by Goodfellow, Bengio, andCourville.

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Human and Computer Interaction				
Subject Code		MCSCSE20S206				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. For end-users, the interface is the system. So design in this domain must be interaction-focused and human-centered. Students need a different repertoire of techniques to address this objective.:
2. Provide an overview of the concepts relating to the design of human-computer interfaces in ways making computer-based systems comprehensive, friendly and usable.
3. Understand the theoretical dimensions of human factors involved in the acceptance of computer interfaces.

Course Outcomes:

CO1. Describe how technologies can be designed to change people's attitudes and behavior.

CO2. Consider which interface is best for a given application or activity. (MS -MEM B design ,)

CO3. Discuss how to plan and run a successful data gathering program.

CO4. Discuss the difference between qualitative and quantitative data and analysis.

CO5. Identify some of the common pitfalls in data analysis, interpretation, and presentation.

Unit	Syllabus	Periods
UNIT-I	Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	15
UNIT-II	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.	10

UNIT-III	Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.	**8**
UNIT-IV	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.	**10**
UNIT-V	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.	**12**

TEXT BOOKS:

1. Brian Fling, "Mobile Design and Development", First Edition , O®Reilly Media Inc., 2009 (UNIT–IV).
2. BillScottandTheresaNeil,"DesigningWebInterfaces",FirstEdition,O®Reilly,2009.(UNIT-V).

REFERENCE BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction",3rd Edition, Pearson Education, 2004 (UNIT I , II & III).

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		GPU COMPUTING				
Subject Code		MCSCSE20S207				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

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

Course Outcomes:

At the end of this course, you should be able to accomplish the objectives given below.

CO1. Define terminology commonly used in parallel computing, such as efficiency and speedup.
CO2. Describe common GPU architectures and programming models.
CO3. Implement efficient algorithms for common application kernels, such as matrix multiplication.
CO4. Given a problem, develop an efficient parallel algorithm to solve it.
CO5. Given a problem, implement an efficient and correct code to solve it, analyze its performance.

Unit	Syllabus	Periods
UNIT-I	**Introduction**: History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL / OpenACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wavefronts, Thread blocks / Workgroups, Streaming multiprocessors, 1D / 2D / 3D thread mapping, Device properties, Simple Programs.	15
UNIT-II	**Memory**: Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories.	10

UNIT-III	**Synchronization**: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU. **Functions**: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.	**8**
UNIT-IV	**Support**: Debugging GPU Programs. Profiling, Profile tools, Performance aspects **Streams**: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.	**10**
UNIT-V	**Case Studies**: Image Processing, Graph algorithms, Simulations, Deep Learning. **Advanced topics**: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing.	**12**

TEXT BOOKS:

1. Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-meiHwu; Morgan Kaufman; 2010 (ISBN:978-0123814722).

REFERENCE BOOKS:

1. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook ; Morgan Kaufman; 2012 (ISBN:978-0124159334).

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	3	0	0	3
Subject Name		Digital Forensic				
Subject Code		MCSCSE20S208				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. Digital forensics involves the investigation of computer-related crimes with the goal of obtaining evidence to be presented in a court of law.
2. In this course, you will learn the principles and techniques for digital forensics investigation and the spectrum of available in computer forensics tools.

Course Outcomes:

After completion of course, students would be able to:

CO1. Understand relevant legislation and codes of ethics.
CO2. Computer forensics and digital detective and various processes, policies and procedures.
CO3. E-discovery, guidelines and standards, E-evidence, tools and environment.
CO4. Email and web forensics and network forensics.
CO5. Report findings from digital forensic investigations.

Unit	Syllabus	Periods
UNIT-I	**Digital Forensics Science:** Forensics science, computer forensics, and digital forensics. **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics.	15
UNIT-II	**Cyber Crime Scene Analysis:** Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.	10

UNIT-III	**Evidence Management & Presentation:** Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.	**8**
UNIT-IV	**Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, and Complete a case, Critique a case. **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.	**10**
UNIT-V	**Mobile Forensics:** mobile forensics techniques, mobile forensics tools. **Legal Aspects of Digital Forensics:** IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.	**12**

TEXT BOOKS:

1. Fundamentals of Digital Forensics.
2. Digital Forensics with Kali Linux.

REFERENCE BOOKS:

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

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	0	0	4	2
Subject Name		Mini Project				
Subject Code		MCSCSE20S209				
Paper	English					
	Hindi					
Max. Marks		50				

Course Objectives:

1. The objective of this mini project is to let the students apply the programming knowledge into a real- world situation/problem.

Course Outcomes:

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

CO1. Identify **COMPUTER SCIENCE & ENGINEERING** problems reviewing available literature.

CO2. Use different techniques used to analyze complex Computer systems.

CO3. Work on the solutions given.

CO4. Present solution by using his/her technique applying engineering principles.

CO5. Identify the requirements for the real world problems.

	Syllabus	
	• Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. • End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. • Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Departmental committee.	

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SCHOOL OF ENGINEERING

SYLLABUS

COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	0	0	4	2
Subject Name		Advance Algorithms				
Subject Code		MCSCSE20S210				
Paper	English					
	Hindi					
Max. Marks		50				

List of Experiments
1. Implement Recursive Binary search and Linear search and determine the time taken to search an element. 2. Sort a given set of elements using the Heap sort method and determine the time taken to sort the elements. 3. Sort a given set of elements using Merge sort method and determine the time taken to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versusn. 4. Sort a given set of elements using Selection sort and hence find the time required to sort elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. 5. Implement All Pair Shortest paths problem using Floyd's Algorithm . 6. Implement 0/1 Knapsack problem using dynamic programming. 7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. 8. Sort a given set of elements using Quick sort method and determine the time taken to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versusn. 9. Design, develop and run program in any language to implement the Bellman-Ford algorithm and determine its performance. 10. Design, develop and run a program in any language to implement a Edmond's Blossom algorithm to compute augmenting path. 11. Design, develop and run program in any language to implement Strassen's algorithm to compute matrix. 12. Design, develop and write program to compute maximum flow using Edmond-Karp maximum-flow algorithm.

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Estd. by Madhya Pradesh Niji Vishvavidyalaya (Sthapna Evam Sanchalana) Adhyadesh, 2020

SCHOOL OF ENGINEERING

SYLLABUS

COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	2	0	0	0
Subject Name		Stress Management by Yoga				
Subject Code		MCSCSE20S211				
Paper	English					
	Hindi					
Max. Marks						

Course Objectives:

1. Introduces the values and skills of Hatha yoga. Includes basic yoga philosophy and exercises for increased flexibility, improved health, relaxation, and reduced stress in daily living audit available.

Course Outcomes:

Students will be able to:

CO1. Develop healthy mind in a healthy body thus improving social health also.

CO2. Improve efficiency.

CO3. Identify and understand the signs and symptoms of stress.

CO4. Distinguish methods to control and/or reduce stress in their daily life.

CO5. Develop coping skills that will enable the student to control his/her level of stress.

Unit	Syllabus	Periods
UNIT-I	Definitions of Eight parts of yog. (Ashtanga).	15
UNIT-II	Yam and Niyam. Do`s and Don't'sinlife. i) Ahinsa, satya, astheya, bramh Acharya and aparigraha. ii) Shaucha, santosh, tapa, swadhyay,Ishwar pranidhan.	10
UNIT-III	Asanand Pranayam i) Various yog poses and their benefits for mind &body. ii)Regularization of breathing techniques and its effects-Types of pranayam.	15

TEXT BOOKS: 1. Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department),Kolkata. **REFERENCE BOOKS:** 1. 'YogicAsanasforGroupTarining-Part" :Janardan SwamiYoga bhyasiMandal, Nagpur	

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COMPUTER SCIENCE & ENGINEERING

Class		M.Tech/CSE	L	T	P	Credit
Semester/Year		II/I	0	0	4	2
Subject Name		Soft Computing				
Subject Code		MCSCSE20S212				
Paper	English					
	Hindi					
Max. Marks		50				

List of Experiments
1. To perform Union,Intersection and Complement operations.
2. To implement De-Morgan's Law.
3. To plot various membership functions.
4. To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality and service.
5. To implement FIS Editor.
6. Generate ANDNOT function using McCulloch-Pitts neural net.
7. Generate XOR function using McCulloch-Pitts neura net.
8. Hebb Net to classify two dimensional input patterns in bipolar with given targets.
9. Perceptron net for an AND function with bipolar inputs and targets.
10. To calculate the weights for given patterns using hetero associative neural net.
11. To store vector in an auto-associative net.Find weight matrix & test the net with input
12. To store the vector, find the weight matrix with no self-connection. Test this using a discrete Hopfield net.