# ORDINANCE No. V (42A) (B1)
# Master of Technology (M.Tech)
# Computer Science & Engineering
## (Syllabus Effective From 2023-24)


SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(FACULTY OF ENGINEERING AND TECHNOLOGY)

Swami Vivekanand Subharti University Meerut, Uttar Pradesh
(Established under the UP Act No. 29 of 2008 & approved under Section 2 (f) of UGC Act, 1956)

# SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

## EVALUATION SCHEME

---

# M.TECH
# (Computer Science & Engineering)

---

## W.E.F. SESSION 2023-24

SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING
Subhartipuram, NH-58 Delhi-Haridwar Bypass Road,
Meerut -250005 (UP)
www.subharti.org

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**M.Tech Ist Year/2nd Semester (Computer Science & Engineering)**
**w.e.f academic Session 2023-24**

| SEMESTER II | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S No. | Course Code | Course Name | Course Type | Periods | | | CCA | | | | ESE | | Total | Credit |
| | | | | L | T | P | CT | AT | Total | PS | TE | PE | | |
| 1 | MCSE-201 | Program Core III - Advance Algorithms | PCC-4 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | MCSE-202 | Program Core IV - Soft Computing | PCC-5 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 3 | MCSE-211 to MCSE-213 | Program Elective III – Data Preparation and Analysis/Secure Software Design &Enterprise Computing/ Computer Vision | PEC-4 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | MCSE-221to MCSE-223 | Program Elective IV –Human and Computer Interaction/GPU Computing/ Digital Forensics | PEC-5 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 5 | METC-211 to METC-218 | Audit Course-2 | MC-3 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 0 |
| 6 | MCSE-251 | Advance Algorithms Lab | PCC-6 | 0 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 2 |
| 7 | MCSE-252 | Laboratory 4 (Based on Electives) | PEC-6 | 0 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 2 |
| 8 | MCSE-253 | Mini Project with Seminar | PROJ | 2 | 0 | 0 | - | - | - | 50 | - | 50 | 100 | 2 |
| Total | | | | | | | | | | | | | 700 | 18 |

## B.Tech. (Computer Science & Engineering) TOTAL CREDITS – 68

### COURSE TYPE NOMENCLATURE

| Course Code | Definitions |
|---|---|
| PCC | Professional core courses |
| PEC | Professional Elective Courses |
| OEC | Open Elective Courses |
| MC | Mandatory courses |
| PROJ | Project |
| CCA | Continuation Comprehensive Assessment |
| ESE | End Semester Examination |
| L | Lecture |
| T | Tutorial |
| P | Practical |
| CT | Class Test |
| AT | Attendance |
| PS | Practical Sessional |
| TE | Theory Exam |
| PE | Practical Exam |

### PROFESSIONAL CORE COURSES (PCC)
### [COMPUTER SCIENCE & ENGINEERING]

| Sr. No | Course Code | Course Title |
|---|---|---|
| 1 | MCSE-101 | Program Core I- Mathematical foundations of Computer Science |
| 2 | MCSE-102 | Program Core II-Advanced Data Structures |
| 3 | MCSE-152 | Advanced Data Structures Lab |
| 4 | MCSE-151 | Distributed Systems Lab |
| 5 | MCSE-201 | Program Core III - Advance Algorithms |
| 6 | MCSE-202 | Program Core IV - Soft Computing |
| 7 | MCSE-251 | Advance Algorithms Lab |
| 8 | MCSE-252 | Laboratory 4 (Based on Electives) |
| 9 | MCSE-253 | Mini Project with Seminar |
| 10 | MCSE-351 | Dissertation-I /Industrial Project |
| 11 | MCSE-451 | Dissertation-II |

The program offers several elective courses, focusing on different aspects of Computer Science and Engineering. A student can choose to do any course from given program elective set.

**Program Outcomes of CSE (M.Tech.) program:**

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

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

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

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

Understanding and ability to use advanced computing techniques and tools.

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

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

An understanding of professional and ethical responsibility.

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

An ability to learn independently and engage in life¬long learning.

An understanding of the impact of IT related solutions in an economic, social and environment context.

**Audit course 1 & 2**

English for Research Paper Writing

Disaster Management

Sanskrit for Technical Knowledge

Value Education

Constitution of India

Pedagogy Studies

Stress Management by Yoga

Personality Development through Life Enlightenment Skills.

**Syllabus, course objective and course outcomes for various post graduation courses**

| | |
|---|---|
| **Course Code** | MCSE-102 |
| **Course Name** | Advanced Data Structures |
| **Credits** | 3 |
| **Pre-Requisites** | UG level course in Data Structures |

Total Number of Lectures:48

## COURSE OBJECTIVE

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

**Unit 1**

**Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation ofDictionaries.
**Hashing:** General Idea, Hash Function,Review of Hashing, Hash Function, Collision Resolution Techniquesin Hashing, Separate Chaining, Open Addressing, LinearProbing, QuadraticProbing, Double Hashing, Rehashing, Extendible Hashing.

**Unit 2**

Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.
**Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search andUpdate Operations on Skip Lists, Probabilistic Analysis of Skip Lists,Deterministic Skip Lists

**Unit 3**

**Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees,Splay Trees Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree.

**Unit 4**

**Text Processing:** Sting Operations, Brute-Force Pattern Matching, The Boyer-MooreAlgorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries,Suffix Tries, The Huffman Coding Algorithm, The Longest Common SubsequenceProblem (LCS), Applying Dynamic Programming to the LCS Problem.
Graphs Algorithms – Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

**Unit 5**

**Computational Geometry:** One Dimensional Range Searching, TwoDimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

## COURSE OUTCOMES

After completion of course, students would be able to:
1.Understand the implementation of symbol table using hashing techniques.
2.Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3.Develop algorithms for text processing applications.
4.Identify suitable data structures and develop algorithms for computational geometry problems.

**References:**

Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

**References:**

"Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.

"The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.

"Algorithm Design" by Kleinberg and Tardos.

| | |
|---|---|
| **Course Code** | MCSE-202 |
| **Course Name** | Soft Computing |
| **Credits** | 3 |
| **Pre-Requisites** | Basic knowledge of mathematics |

Total Number of Lectures:48

**COURSE OBJECTIVE**

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

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

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

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

**Unit 1**

**INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:** Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques. Evolutionary Computing, Soft computing versus Hard computing

**Unit 2**

**FUZZY LOGIC:** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making. Applications of Fuzzy Logic.

**Unit 3**

**NEURAL NETWORKS:** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks, Comparative analysis of Supervised, Unsupervised and Reinforcement Learning.

**Unit 4**

**GENETIC ALGORITHMS:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function,

**Unit 5**

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

**Unit 6**

Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

**COURSE OUTCOMES**

After completion of course, students would be able to:

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

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

Apply genetic algorithms to combinatorial optimization problems.

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

**References:**

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

George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications , Prentice Hall, 1995.

MATLAB Toolkit Manual

| | |
|---|---|
| **Course Code** | MCSE-112 |
| **Course Name** | Wireless Sensor Networks |
| **Credits** | 3 |
| **Pre-Requisites** | Wireless Communication |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

Architect sensor networks for various application setups

Devise appropriate data dissemination protocols and model links cost.

Understanding of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.

Evaluate the performance of sensor networks and identify bottlenecks.

**Unit 1:**

**Introduction to Wireless Sensor Networks:** Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors **Network Architecture:** Traditional layered stack, Cross-layer designs, Sensor Network Architecture Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio.

**Unit 2:**

**Introduction to ns-3: I**ntroduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.

**Unit 3:**

**Medium Access Control Protocol design:** Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled **Introduction to Markov Chain:** Discrete time Markov Chain definition, properties, classification and analysis**MAC Protocol Analysis:** Asynchronous duty-cycled. X-MAC Analysis(Markov Chain)

**Unit 4: Security**:

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks

**Unit 5:**

**Routing protocols:** Introduction, MANET protocols **Routing protocols for WSN**: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast **Opportunistic Routing Analysis**: Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.

**Unit 6:**

**ADVANCED TOPICS**

Recent development in WSN standards, software applications.

**COURSE OUTCOMES**

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

Describe and explain radio standards and communication protocols for wireless sensor networks.

Explain the function of the node architecture and use of sensors for various applications.

Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.

**References:**

W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks –Theory and Practice", Wiley 2010

KazemSohraby, Daniel Minoli and TaiebZnati, "wireless sensor networks -Technology, Protocols, and Applications", Wiley Interscience 2007

Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, "Wireless Sensor Network Technologies for the Information Explosion Era", springer 2010

| | |
|---|---|
| **Course Code** | MCSE-121 |
| **Course Name** | Data Science |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures:48

**COURSE OBJECTIVE**

Provide you with the knowledge and expertise to become a proficient data scientist.
Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
Produce Python code to statistically analyse a dataset;
Critically evaluate data visualisations based on their design and use for communicating stories from data;

**Unit 1:**

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

**Unit 2:**

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

**Unit 3:**

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

**Unit 4:**

Data visualisation:Introduction, Types of data visualisation,Data for visualisation:Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings. Technologies for Visualisation, Recent Trends in Various Data Collection and Analysis Techniques. Application Development Methods of Used in Data Science.

**Unit 5:**

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

**Unit 6:**

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

**COURSE OUTCOMES**

**On completion of the course the student should be able to**

Explain how data is collected, managed and stored for data science;
Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;
Implement data collection and management scripts using MongoDB

**References:**

Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.

Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press

| | |
|---|---|
| **Course Code** | MCSE-123 |
| **Course Name** | Advanced Wireless and Mobile Networks |
| **Credits** | 3 |
| **Pre-Requisites** | Computer Networks |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

The students should get familiar with the wireless/mobile market and the future needs and challenges.
To get familiar with key concepts of wireless networks, standards, technologies and their basic operations

To learn how to design and analyse various medium access
To learn how to evaluate MAC and network protocols using network simulation software tools.
The students should get familiar with the wireless/mobile market and the future needs and challenges.

**Unit 1:**

**INTRODUCTION:**

Overview and Applications/types of Wireless and Mobile Networks; Evolution and Challenges of Wireless Networks ; The Electromagnetic Spectrum; Spread Spectrum; Frequency Reuse; Radio Propagation Mechanisms, Signals, Antennas; Characteristics of Wireless Channels; Modulation Techniques and Multiple Access Techniques for Wireless Systems.

**WIRELESS LOCAL AREA NETWORKS:**

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

**Unit 2:**

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

**Unit 3:**

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview **WIRELESS SENSOR NETWORKS** Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

**Unit 4:**

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

**Unit 5:**

**SECURITY**

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

**Unit 6:**

**ADVANCED TOPICS** IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

**COURSE OUTCOMES**

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

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

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

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

**References:**


Schiller J., Mobile Communications, Addison Wesley 2000

Stallings W., Wireless Communications and Networks, Pearson Education 2005

Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002

| | |
|---|---|
| **Course Code** | MCSE-212 |
| **Course Name** | Secure Software Design and Enterprise Computing |
| **Credits** | 3 |
| **Pre-Requisites** | Computer Programming, Software Engineering |

Total Number of Lectures:48

**COURSE OBJECTIVE**

To fix software flaws and bugs in various software.

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

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

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

**Unit 1:**

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

**Unit 2:**

Security in Mobile Cellular Networks: Security issues in GSM, 3G and 4G networks, Authentication and encryption, Security concerns in 5G networks.

**Unit 3:**

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

**Unit 4:**

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

**Unit 5:**

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

**Unit 6:**

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

**COURSE OUTCOMES**

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

Differentiate between various software vulnerabilities.

Software process vulnerabilities for an organization.

Monitor resources consumption in a software.

Interrelate security and software development process.

**References:**

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

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

| | |
|---|---|
| **Course Code** | MCSE-221 |
| **Course Name** | Human and Computer Interection |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

Learn the foundations of Human Computer Interaction
Be familiar with the design technologies for individuals and persons with disabilities
Be aware of mobile Human Computer interaction.
Learn the guidelines for user interface.

**Unit 1:**

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Computer Systems: hardware, software, networking. Interaction: Models– frameworks – Ergonomics – styles – elements – interactivity- Paradigms.Human Factors: cognitive psychology, ergonomics, user experienceAccessibility: design for diverse abilities

**Unit 2:**

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.Heuristic Evaluation: Nielsen's heuristics, expert review, Emotional Models: affective computing, emotional design

**Unit 3:**

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

**Unit 4:**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.Artificial Intelligence (AI) and HCI), Human-Robot Interaction (HRI)

**Unit 5:**

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

**Unit 6:**

Recent Trends: Speech Recognition and Translation, Multimodal System

**COURSE OUTCOMES**

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

Understand the structure of models and theries of human computer interaction and vision.
Design an interactive web interface on the basis of models studied.

**References:**

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

Brian Fling, "Mobile Design and Development", First Edition , O Reilly Media Inc., 2009 (UNIT – IV)

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

| | |
|---|---|
| **Course Code** | MCSE-223 |
| **Course Name** | Digital Forensics |
| **Credits** | 3 |
| **Pre-Requisites** | Cybercrime and Information Warfare, Computer Networks |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.

Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.

Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools

E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

**Unit 1:**

**Digital Forensics** Science: Forensics science, computer forensics, and digital forensics. Digital Evidence: types, collection, preservation, Forensic Analysis: principles, methods, tools **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

**Unit 2:**

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

**Unit 3:**

**Evidence Management & Presentation:** Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.Hard Drive Forensics: imaging, analysis, recovery, Network Forensics: packet capture, analysis, reconstruction

**Unit 4:**

**Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.File System Analysis: NTFS, HFS, EXT, Email Forensics: email headers, content analysis

**Unit 5:**

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

**Unit 6:**

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence, Cloud Forensics: cloud storage, email, social media

**COURSE OUTCOMES**

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

Understand relevant legislation and codes of ethics

Computer forensics and digital detective and various processes, policies and procedures E-discovery, guidelines and standards, E-evidence, tools and environment.

Email and web forensics and network forensics

**References:**


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


Manoj Kapil

Ashima

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

| | |
|---|---|
| **Course Code** | MCSE-312 |
| **Course Name** | Compiler for HPC |
| **Credits** | 3 |
| **Pre-Requisites** | Data Structure, Compiler Design, Theory of Computation |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

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

**Unit1:**

Performance monitoring and analysis,Parallel programming models,LLVM,Development tools,Performance modeling.

**Unit2:**

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

**Unit3:**

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

**Unit4:**

**Concurrency Analysis:** Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers.

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

**Unit5:**

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

**Unit 6:**

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

**COURSE OUTCOMES**

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

Familiar with the structure of compiler.

Parallel loops, data dependency and exception handling and debugging in compiler.

**References:**

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

## OPEN ELECTIVES
### Business Analytics

**Teaching scheme**
**Lecture: - 3 h/week**

| | |
|---|---|
| **Course Code** | **MCSE-001** |
| **Course Name** | **Business Analytics** |
| **Credits** | **3** |

Total Number of Lectures: 48

**Course objective**

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

**Unit1:**

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

**Unit 2:**

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

**Unit 3:**

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, 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.

**Unit 4:**

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

**Unit 5:**

## OPEN ELECTIVES
## Industrial Safety

**Teaching scheme**

**Lecture: - 3 h/week**

| | |
|---|---|
| **Course Code** | **MCSE-002** |
| **Course Name** | **Industrial Safety** |
| **Credits** | **3** |

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

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

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

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

**Unit-V:** Periodic and preventive maintenance: Periodic inspection-concept and need,

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

**Reference:**

Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.

Maintenance Engineering, H. P. Garg, S. Chand and Company.

Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.

Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

## Open Elective

## Cost Management of Engineering Projects

**Teaching scheme**

Lecture: - 3 h/week

| | |
|---|---|
| **Course Code** | **MCSE-004** |
| **Course Name** | **Cost Management of Engineering Projects** |
| **Credits** | **3** |

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.

**References:**


Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi

Charles T. Horngren and George Foster, Advanced Management Accounting

Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting

Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher

N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

**Open Elective**

**Waste to Energy**

**Teaching scheme**

Lecture: - 3 h/week

| | |
|---|---|
| **Course Code** | **MCSE-006** |
| **Course Name** | **Waste to Energy** |
| **Credits** | **3** |

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

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

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

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

**Unit-V:** Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology andstatus - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction – biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications – Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

**References:**

Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.

Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

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

**AUDIT 1 and 2: DISASTER MANAGEMENT**

| | |
|---|---|
| **Course Code** | METC-112/METC-212 |
| **Course Name** | **DISASTER MANAGEMENT** |
| **Credits** | **0** |

**Course Objectives:** -Students will be able to:

Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives

Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

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

**Unit-I**

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

**Unit-II**

**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.

**Unit-III**

**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

**Unit-IV**

**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

**Unit-V**

**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.

**Unit-VI**

**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.

**SUGGESTED READINGS:**

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

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

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

## AUDIT 1 and 2: VALUE EDUCATION

| | |
|---|---|
| **Course Code** | METC-114/METC-214 |
| **Course Name** | **VALUE EDUCATION** |
| **Credits** | **0** |

***Course Objectives***

Students will be able to

Understand value of education and self- development

Imbibe good values in students

Let the should know about the importance of character

**Unit-I**

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

**Unit-II**

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

**Unit-III**

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

**Unit-IV**

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

***Suggested reading***

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

***Course outcomes***

Students will be able to

Knowledge of self-development

Learn the importance of Human values

Developing the overall personality

**AUDIT 1 and 2: PEDAGOGY STUDIES**

| | |
|---|---|
| **Course Code** | METC-116/METC-216 |
| **Course Name** | **PEDAGOGY STUDIES** |
| **Credits** | **0** |

**Course Objectives:**

Students will be able to:

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

Identify critical evidence gaps to guide the development.

**Unit-I**

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

**Unit-II**

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

**Unit-III**

Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance 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.

**Unit-IV**

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

**Unit-V**

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

**Suggested reading**


Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.

Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

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.

Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign. www.pratham.org/images/resource%20working%20paper%202.pdf.


**Course Outcomes:**

Students will be able to understand:

What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

How can teacher education (curriculum and practicum) and the school curriculum and guidance

materials best support effective pedagogy?

**AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT**

| | |
|---|---|
| **Course Code** | METC-118/METC-218 |
| **Course Name** | **PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT** |
| **Credits** | **0** |

**SKILLS** ***Course Objectives***

To learn to achieve the highest goal happily

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

To awaken wisdom in students

**Unit-I**

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)

**Unit-II**

Approach to day to day work and duties.

Shrimad BhagwadGeeta : Chapter 2-Verses41, 47,48

Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35

Chapter 18-Verses 45, 46, 48.

**Unit-III**

Statements of basic knowledge.

Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad BhagwadGeeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39

Chapter18 – Verses 37,38,63

***Suggested reading***

"Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata

Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

***Course Outcomes***

Students will be able to

Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life

The person who has studied Geeta will lead the nation and mankind to peace and prosperity

Study of Neetishatakam will help in developing versatile personality of students.

## MCSE-251(ADVANCE ALGORITHMS LAB)

1. Program to perform to Sort a given set of elements using bubble sort.
2. Program to Sort a given set of elements using the Heap Sort method.
3. Program to Sort a given set of elements using Merge Sort.
4. Program to Perform Selection Sort.
5. Program to Perform Matrix chain multiplication.
6. Program to Sort a given set of elements using Quick sort method.
7. Write a program to perform fast Fourier transform.
8. Study of Np-Complete Theory.
9. To Study Cook's theorem.
10. To Study Sorting Network

## MCSE-252(DATA PREPARATION AND ANALYSIS LAB)

**OBJECTIVES:**

- To collect the data various format.
- To understand and demonstrate data analysis.

**List of Experiments**

Apply understand data pre-processing and data visualization techniques
Apply a structured design process to merge the data into simple formats
Critically evaluate visualizations and suggest improvements and refinements
Use standalone visualization applications to quickly explore data
Conceptualize ideas and interaction techniques using sketching

# MCSE-151(Distributed Systems Lab)

1. Implement concurrent echo client-server application
2. Design a Distributed Application using RMI for remote computation
3. Simulate the Distributed Mutual Exclusion using 'JAVA'.
4. Implement Java RMI mechanism for accessing methods of remote system using 'JAVA'.
5. Design a Distributed Application using Message passing Interface for remote computation using 'JAVA'.
6. Implement RPC mechanism for a file transfer across a network using 'JAVA'.
7. Design a Distributed application which consist of a server and client using threads using 'JAVA'.
8. Design a Distributed application which consists of a stateless server using socket primitives using 'JAVA'
9. Implement a distributed Chat server using TCP sockets using 'JAVA'
10. Implement CORBA mechanism using 'JAVA'.

# MCSE-152(Advanced Data Structures Lab)

**Learning Objectives:**Data structures include: hashing, binary trees and abstract data types. Students develop knowledge of applications of data structures including the ability to implement algorithms for the data structure.

1. Program to implement Hashing.
2. Write a program to perform the following operations on singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.
3. WAP to implement Queue ADT using Linked list with the basic functions of Create(), IsEmpty(), Insert(), Delete() and IsFull() with suitable prototype to a functions.
4. WAP to transform BST into Threaded Binary Tree.
5. Programs to implement Tree Traversals on Binary Trees and Graphs Search Methods.
6. WAP to find the black height of any given node in Red-Black tree and find the black height of the Red-Balck tree.
7. Programs to implement operations on AVL Trees and Splay Trees.
8. To implement Pattern Matching Technique using Brute Force Algorithm.
9. WAP to perform string matching using Boyer-Moore algorithm.
10. WAP to perform string matching using Knuth-Morris-Pratt algorithm.

**Course Outcomes:**

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.

## AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

| | |
|---|---|
| **Course Code** | METC-117/METC-217 |
| **Course Name** | **STRESS MANAGEMENT BY YOGA** |
| **Credits** | **0** |

***Course Objectives***

To achieve overall health of body and mind

To overcome stress

**Unit-I**

Definitions of Eight parts of yog. ( Ashtanga )

**Unit-II**

Yam and Niyam. Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**Unit-III**

Asan and Pranayam

i)Various yog poses and their benefits for mind & body

ii)Regularization of breathing techniques and its effects-Types of pranayam

***Suggested reading***

'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur

"Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

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

Improve efficiency

## AUDIT 1 and 2: CONSTITUTION OF INDIA

| | |
|---|---|
| **Course Code** | METC-115/METC-215 |
| **Course Name** | **CONSTITUTION OF INDIA** |
| **Credits** | **0** |

**Course Objectives:**

Students will be able to:

Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

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.

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.

**Unit-I**

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

**Unit-II**

**Philosophy of the Indian Constitution:** Preamble, Salient Features

**Unit-III**

**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.

**Unit-IV**

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

**Unit-V**

**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: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**Unit-VI**

**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

***Suggested reading***

The Constitution of India, 1950 (Bare Act), Government Publication.

Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

***Course Outcomes:***

Students will be able to:

Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

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

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.

Discuss the passage of the Hindu Code Bill of 1956.

**AUDIT 1 and 2 SANSKRIT FOR TECHNICAL KNOWLEDGE**

| | |
|---|---|
| **Course Code** | METC-113/METC-213 |
| **Course Name** | **SANSKRIT FOR TECHNICAL KNOWLEDGE** |
| **Credits** | **0** |

***Course Objectives***

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

Learning of Sanskrit to improve brain functioning

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

enhancing the memory power

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

**Unit-I**

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

**Unit-II**

Order, Introduction of roots, Technical information about Sanskrit Literature

**Unit-III**

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

***Suggested reading***

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

"Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

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

***Course Output***

Students will be able to

Understanding basic Sanskrit language

Ancient Sanskrit literature about science & technology can be understood

Being a logical language will help to develop logic in students

**AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING**

**Course objectives:**

| | |
|---|---|
| **Course Code** | METC-111/METC-211 |
| **Course Name** | **ENGLISH FOR RESEARCH PAPER WRITING** |
| **Credits** | **0** |

Students will be able to:

Understand that how to improve your writing skills and level of readability

Learn about what to write in each section

Understand the skills needed when writing a Title

Ensure the good quality of paper at very first-time submission

**Unit-I:**

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

**Unit-II:**

Clarifying Who Did What, Highlighting Your Findings, Hedging and 4 Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

**Unit-III:**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

**Unit-IV:**

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,

**Unit-V:**

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 4 first- time submission

**Suggested Studies:**

Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .

Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**Open Elective**
**Composite Materials**

**Teaching scheme**

**Lecture: - 3 h/week**

| | |
|---|---|
| **Course Code** | **MCSE-005** |
| **Course Name** | **Composite Materials** |
| **Credits** | **3** |

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

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

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

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

**UNIT – V:** Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum straincriteria, 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.

TEXT BOOKS:

Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.

Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

**References:**

Hand Book of Composite Materials-ed-Lubin.

Composite Materials – K.K.Chawla.

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

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

## OPEN ELECTIVES

### Operations Research

**Teaching Scheme**
**Lectures: 3 hrs/week**

| | |
|---|---|
| **Course Code** | **MCSE-003** |
| **Course Name** | **Operations Research** |
| **Credits** | **3** |

**Course Outcomes: At the end of the course,** the student should be able to
Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
Students should able to apply the concept of non-linear programming
Students should able to carry out sensitivity analysis
Student should able to model the real world problem and simulate it.

**Unit 1**:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

**Unit 2**
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

**Unit 3**:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

**Unit 4**
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

**Unit 5**
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

**References:**


H.A. Taha, Operations Research, An Introduction, PHI, 2008

H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

Hitler Libermann Operations Research: McGraw Hill Pub. 2009

Pannerselvam, Operations Research: Prentice Hall of India 2010

Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

**Unit 6:**

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

## COURSE OUTCOMES

Students will demonstrate knowledge of data analytics.

Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

Students will demonstrate the ability to translate data into clear, actionable insights.

**Reference:**


Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

Business Analytics by James Evans, persons Education.

| | |
|---|---|
| **Course Code** | MCSE-313 |
| **Course Name** | Optimization Techniques |
| **Credits** | 3 |
| **Pre-Requisites** | Linear Algebra and Numerical Methods |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

The objective of this course is to provide insight to the mathematical formulation of real world problems.

To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems.

**Unit 1:**

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

**Unit 2:**

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

**Unit 3:**

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

**Unit 4:**

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

**Unit 5:**

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

**Unit 6:**

**Constrained optimization techniques** such as direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different technique.

**COURSE OUTCOMES**

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

Formulate optimization problems.

Understand and apply the concept of optimality criteria for various types of optimization problems.

Solve various constrained and unconstrained problems in Single variable as well as multivariable.

Apply the methods of optimization in real life situation.

**References:**


Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.

Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.

An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.

Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.

John K. Karlof (2006). Integer programming: theory and practice.CRC Press. ISBN 978-0-8493-1914-3.

H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.

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.

Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.

| | |
|---|---|
| **Course Code** | MCSE-311 |
| **Course Name** | Mobile Applications and Services |
| **Credits** | 3 |
| **Pre-Requisites** | Wireless Communication and Mobile Computing |

Total Number of Lectures:48

**COURSE OBJECTIVE**

This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.

It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smartphones and tablets

It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile

**Unit 1:**

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

**Unit 2:**

More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, GSM- air interface, channel structure, Working, Overview of Wireless Telephony

**Unit 3:**

Introduction of Wireless, Wireless Networking, Wireless LAN, MAC issues, IEEE 802.11, Blue-tooth, Wireless Multiple Access Protocols, TCP over wireless, Wireless Applications, WAP- Architecture, Protocol Stack, Data Broadcasting, TCP,Mobile IP

**Unit 4:**

Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

**Unit 5:**

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

**Unit 6:**

Recent trends inCommunication protocols for IOT nodes, mobile computimng techniques in IOT, agents based communications in IOT

**COURSE OUTCOMES**

On completion of the course the student should be able to

Identify the target platform and users and be able to define and sketch a mobile application.

Understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and PhoneGap.

Design and develop a mobile application prototype in one of the platform (challenge project)

**References:**

| | |
|---|---|
| **Course Code** | MCSE-222 |
| **Course Name** | GPU Computing |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

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

**Unit 1:**

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

GPU-Accelerated Libraries: cuBLAS, cuFFT, OpenCL libraries

**Unit 2:**

**Memory**: GPU Memory Hierarchy: global, shared, local memory, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic. GPU Optimization Techniques: loop unrolling, thread coarsening, register blocking Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories

**Unit 3:**

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

**Unit 4:**

**Support**: Debugging GPU Programs. Profiling, Profile tools, Performance aspects **Streams**: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.

**Unit 5:**

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

**Unit 6:**

**Advanced topics**: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing

**COURSE OUTCOMES**

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

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

**References:**

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

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

| | |
|---|---|
| **Course Code** | MCSE-213 |
| **Course Name** | Computer Vision |
| **Credits** | 3 |
| **Pre-Requisites** | Linear algebra, vector calculus, Data structures and Programming |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

Be familiar with both the theoretical and practical aspects of computing with images.
Have described the foundation of image formation, measurement, and analysis.
Understand the geometric relationships between 2D images and the 3D world.
Grasp the principles of state-of-the-art deep neural networks.

**Unit 1:**

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

**Unit 2:**

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

**Unit 3:**

Segmentation, Morphological filtering, Fourier transform

**Unit 4:**

Adversarial search, Search for games, Alpha-Beta Pruing, Utility Theory, Resolution, Decision
Trees, Reinforcement learning

**Unit 5:**

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi- supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

**Unit 6:**

Recent trends inActivity Recognition, computational photography, Biometrics.

**COURSE OUTCOMES**

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

Developed the practical skills necessary to build computer vision applications.
To have gained exposure to object and scene recognition and categorization from images

**References:**

Computer Vision: Algorithms and Applications by Richard Szeliski.

Deep Learning, by Goodfellow, Bengio, and Courville.

Dictionary of Computer Vision and Image Processing, by Fisher et al.

| | |
|---|---|
| **Course Code** | MCSE-211 |
| **Course Name** | Data Preparation and Analysis |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

To prepare the data for analysis and develop meaningful Data Visualizations

**Unit1:**

**Data Gathering and Preparation:**Data Exploration as a Process, Data Preparation: Inputs, Outputs, Data Anomalies: Missing Value, Noise, Inconsistency, Incomplete, Modeling Tools and data preparation.

**Unit2:**

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

**Unit3:**

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

**Unit4:**

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

**COURSE OUTCOMES**

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

Able to extract the data for performing the Analysis

**References:**

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

| | |
|---|---|
| **Course Code** | MCSE-122 |
| **Course Name** | Distributed Systems |
| **Credits** | 3 |
| **Pre-Requisites** | Database Management Systems |

Total Number of Lectures: 48

**COURSE OBJECTIVE**

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

**Unit 1:**

**INTRODUCTION**

Introduction: Distributed Data processing, Distributed database system (DDBMS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs, Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data Languages, Relational DBMS

**Unit 2:**

**DISTRIBUTED DATABASE DESIGN**

Alternative design strategies; Distributed design issues; Fragmentation; Data allocation **SEMANTICS DATA CONTROL** View management; Data security; Semantic Integrity Control**QUERY PROCESSING ISSUES** Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data

**Unit 3:**

**DISTRIBUTED QUERY OPTIMIZATION** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms **TRANSACTION MANAGEMENT** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **CONCURRENCY CONTROL** Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management

**Unit 4:**

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

**Unit 5:**

**PARALLEL DATABASE SYSTEMS** Parallel architectures; parallel query processing and optimization; load balancing

**Unit 6:**

**ADVANCED TOPICS**

Mobile Databases, Distributed Object Management, Multi-databases

**COURSE OUTCOMES**

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

Design trends in distributed systems.

Apply network virtualization.

Apply remote method invocation and objects.

**References:**

Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991

Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992

| | |
|---|---|
| **Course Code** | MCSE-113 |
| **Course Name** | Introduction to Intelligent Systems |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures: 48

## COURSE OBJECTIVE

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

**Unit 1:**

Biological foundations to intelligent systems I: Artificial neural networks, Back- propagation networks, Radial basis function networks, and recurrent networks.

**Unit 2:**

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

**Unit 3:**

Search Methods Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill- climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.

**Unit 4:**

Expert System: Existing Systems (DENDRAL, MYCIN) domain exploration Meta Knowledge, Expertise Transfer, Self Explaining System.

**Unit 5:**

Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.

**Unit 6:**

Recent trends in Fuzzy logic, Knowledge Representation

## COURSE OUTCOMES

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

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.

**References:**

Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.

Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition

**Elective Subjects**

| | |
|---|---|
| **Course Code** | MCSE-111 |
| **Course Name** | Machine learning |
| **Credits** | 3 |
| **Pre-Requisites** | |

Total Number of Lectures:48

**COURSE OBJECTIVE**

To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
Explore supervised and unsupervised learning paradigms of machine learning.
To explore Deep learning technique and various feature extraction strategies.

**Unit 1:**

Basic concepts: Definition of learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

Types of Learning: Supervised learning and unsupervised learning. Overview of classification: setup, training, test, validation dataset, over fitting. Classification Families: linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbor..

**Unit 2:**

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

**Unit 3**

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

**Unit 4**

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

**Unit 5**

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

**Unit 6:**

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

**COURSE OUTCOMES**

After completion of course, students would be able to:
Extract features that can be used for a particular machine learning approach in various IOT applications.
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.
To mathematically analyse various machine learning approaches and paradigms.

**References:**

Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

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.

Asciime

| | |
|---|---|
| **Course Code** | METC-101 |
| **Course Name** | Research Methodology and IPR |
| **Credits** | 2 |

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

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

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

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

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

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

**Course Outcomes:**
At the end of this course, students will be able to
Understand research problem formulation.
Analyze research related information
Follow research ethics
Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
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.
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.

**References:**


Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Ranjit Kumar, 2 ndEdition , "Research Methodology: A Step by Step Guide for beginners"

Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

| | |
|---|---|
| **Course Code** | MCSE-201 |
| **Course Name** | Advanced Algorithms |
| **Credits** | 3 |
| **Pre-Requisites** | UG level course in Algorithm Design and Analysis |

Total Number of Lectures:48

**COURSE OBJECTIVE**

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

**Unit1**

**Sorting:** Review of various sorting algorithms, topological sorting **Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, performance analysis- Space complexity, Time Complexity, example of amortized analysis. Optimal binary search trees, 0/1 Knapsack problem.

**Unit 2**

**Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. **Graph Matching:** Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.Applications- n-queue problem.Travelling sales person problem, 0/1 Knapsack problem

**Unit 3**

**Flow-Networks:** Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations: Matrix chain multiplications by dynamic programming,** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

**Unit 4**

**Shortest Path in Graphs:** Disjoint set operations, Union and Find algorithms, AND/OR graphs, Connected components, Bi-connected components.Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.**Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

**Unit 5**

**Linear Programming:** Geometry of the feasibility region and Simplex algorithm **NP-completeness:** Examples, proof of NP-hardness and NP-completeness. **One or more of the following topics based on time and interest** Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

**Unit 6**

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

**COURSE OUTCOMES**

After completion of course, students would be able to:
Analyze the complexity/performance of different algorithms.
Determine the appropriate data structure for solving a particular set of problems.
Categorize the different problems in various classes according to their complexity.
Students should have an insight of recent activities in the field of the advanced data structure.

**Core Subjects:**

| | |
|---|---|
| **Course Code** | MCSE-101 |
| **Course Name** | Mathematical Foundation of Computer Science |
| **Credits** | 3 |
| **Pre-Requisites** | Discrete Mathematics |

Total Number of Lectures:48

## COURSE OBJECTIVE

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

2. To developthe understanding ofthe mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.

3. To study various sampling and classification problems.

**Unit 1**

Functional Logic: Proposition Logic, Resolution Proof system, Predicate logic. Probability mass,density, and cumulative distribution functions, Parametricfamilies of distributions, Expected value, variance, conditional expectation,Applications of the univariate and multivariate Central Limit Theorem,Probabilistic inequalities, Markov chains.

**Unit 2**

Random samples, sampling distributions of estimators, Methods of Momentsand Maximum Likelihood. Linear algebra: Vector Space, Basis, Matrices and Linear Transformations, Eigen values, Orthogonality.

**Unit 3**

Statistical inference, Introduction to multivariate statistical models: regressionand classification problems, principal components analysis, The problem ofoverfitting model assessment. Counting, Probability, Discrete random variable, Continuous random variable

**Unit 4**

Graph Theory: Isomorphism, Planar graphs, graph colouring, hamiltoncircuitsandeulercycles,Permutations and Combinations with and without repetition,Specialized techniques to solve combinatorial enumeration problems. Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula

**Unit 5**

**Computer science and engineering applications**

Data mining, Network protocols, analysis of Web traffic, Computer security,Software engineering, Computer architecture, operating systems, distributed,systems, Bioinformatics, Machine learning. Recent Trands in various distribution functions in mathmatical field of computer science for varying fields like bio informatic, soft computing, and computer vision

## COURSE OUTCOMES

After completion of course, students would be able to:

1. To understand the basic notions of discrete and continuous probability.
2. To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

**References:**

John Vince, Foundation Mathematics for Computer Science, Springer.

K. Trivedi.Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
M. Mitzenmacher and E. Upfal.Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
Alan Tucker, Applied Combinatorics, Wiley

## PROFESSIONAL ELECTIVE COURSES (PEC)
## [Computer Science & Engineering]

| | S. No | Course Code | Course Title |
|---|---|---|---|
| **Elective-I** | 1 | MCSE-111 | Machine Learning |
| | 2 | MCSE-112 | Wireless Sensor Networks |
| | 3 | MCSE-113 | Introduction to Intelligent Systems |
| **Elective-II** | 4 | MCSE-121 | Data Science |
| | 5 | MCSE-122 | Distributed Systems |
| | 6 | MCSE-123 | Advanced Wireless and Mobile Networks |
| **Elective-III** | 7 | MCSE-211 | Data Preparation and Analysis |
| | 8 | MCSE-212 | Secure Software Design &Enterprise Computing |
| | 9 | MCSE-213 | Computer Vision |
| **Elective-IV** | 10 | MCSE-221 | Human and Computer Interaction |
| | 11 | MCSE-222 | GPU Computing |
| | 12 | MCSE-223 | Digital Forensics |
| **Elective-V** | 13 | MCSE-311 | Mobile Applications and Services |
| | 14 | MCSE-312 | Compiler for HPC |
| | 15 | MCSE-313 | Optimization Techniques |

## OPEN ELECTIVE COURSES (OEC)
## [Computer Science & Engineering]

| S. No | Code No. | Subject |
|---|---|---|
| 1 | MCSE-001 | Business Analytics |
| 2 | MCSE-002 | Industrial Safety |
| 3 | MCSE-003 | Operations Research |
| 4 | MCSE-004 | Cost Management of Engineering Projects |
| 5 | MCSE-005 | Composite Materials |
| 6 | MCSE-006 | Waste to Energy |

**MANDATORY COURSES (MC)**
**AUDIT COURSE I & II**

METC-101 : Research Methodology and IPR
METC-111/ METC-211: English for Research Paper Writing
METC-112/ METC-212: Disaster Management
METC-113/ METC-213: Sanskrit for Technical Knowledge
METC-114/ METC-214: Value Education
METC-115/ METC-215: Constitution of India
METC-116/ METC-216: Pedagogy Studies
METC-117/ METC-217: Stress Management by Yoga
METC-118/ METC-218: Personality Development through Life Enlightenment Skill

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**M.Tech 2nd Year/3rd Semester (Computer Science & Engineering)**
**w.e.f academic Session 2023-24**

| SEMESTER III | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course Name | Course Type | Periods | | | CCA | | | | ESE | | Total | Credit |
| | | | | L | T | P | CT | AT | Total | PS | TE | PE | | |
| 1 | MCSE-311 to MCSE-313 | Program Elective 5 –Mobile Applications and Services/Compiler for HPC/ Optimization Techniques | PEC-7 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | MCSE-001 to MCSE-006 | Open Elective– 1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy | OEC-1 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 3 | MCSE-351 | Dissertation-I /Industrial Project | PROJ | 0 | 0 | 20 | - | - | - | 50 | - | 100 | 150 | 10 |
| TOTAL | | | | | | | | | | | | | 350 | 16 |

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**M.Tech 2nd Year/4th Semester (Computer Science & Engineering)**
**w.e.f academic Session 2023-24**

| SEMESTER IV | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S.No. | Course Code | Course Name | Course Type | Periods | | | CCA | | | | ESE | | Total | Credit |
| | | | | L | T | P | CT | AT | Total | PS | TE | PE | | |
| 1 | MCSE-451 | Dissertation-II | PROJ | 0 | 0 | 32 | - | - | - | 100 | - | 300 | 400 | 16 |
| TOTAL | | | | | | | | | | | | | 400 | 16 |

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**M.TechIst Year/Ist Semester (Computer Science & Engineering)**
**w.e.f academic Session 2023-24**

| SEMESTER I | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Name | Course Type | Periods | | | CCA | | | | ESE | | Total | Credit |
| | | | | L | T | P | CT | AT | Total | PS | TE | PE | | |
| 1 | MCSE-101 | Program Core I- Mathematical foundations of Computer Science | PCC-1 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | MCSE-102 | Program Core II- Advanced Data Structures | PCC-2 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 3 | MCSE-111 to MCSE-113 | Program Elective I –Machine Learning/ Wireless Sensor Networks/ Introduction to Intelligent Systems | PEC-1 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | MCSE-121to MCSE-123 | Program Elective II –Data Science/ Distributed Systems/Advanced Wireless and Mobile Networks | PEC-2 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 5 | METC-101 | Research Methodology and IPR | MC-1 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 6 | METC-111 to METC-118 | Audit Course-1 | MC-2 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 0 |
| 7 | MCSE-152 | Advanced Data Structures Lab | PCC-3 | 0 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 2 |
| 8 | MCSE-151 | Laboratory 2 (Based on Electives) Distributed Systems Lab | PEC-3 | 0 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 2 |
| Total | | | | | | | | | | | | | 700 | 18 |