# Department of Computer Science & Engineering
# MATS University
**Aarang, Raipur (C.G.)**

## Syllabus Scheme of M. Tech. in Computer Science & Engineering

**I – Semester**

| S. No. | Code | Subject | Periods Per Week | | | Scheme of Marks | | Total Credit |
|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ESE | IM | |
| 1. | MTCSE120 | Mobile Communication | 4 | - | - | 70 | 30 | 4 |
| 2. | MTCSE121 | Advanced Computer Architecture | 4 | - | - | 70 | 30 | 4 |
| 3. | MTCSE122 | Data Structures and Algorithms | 4 | - | - | 70 | 30 | 4 |
| 4. | MTCSE123 | Object Oriented Software Engineering | 4 | - | - | 70 | 30 | 4 |
| 5. | MTCSE124 | Computer Network and Management | 4 | - | - | 70 | 30 | 4 |
| 6. | MTCSE125 | Data Structures Lab | 1 | - | 2 | 30 | 20 | 2 |
| 7. | MTCSE126 | Networking Lab | 1 | - | 2 | 30 | 20 | 2 |
| 8. | MTCSE127 | Software Engineering Lab | 1 | - | 2 | 30 | 20 | 2 |
| **Total** | | | **23** | **0** | **6** | **440** | **210** | **26** |

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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### MOBILE COMMUNICATION (MTCSE120)

**Course Objective:**

1. To familiar with the fundamentals of Mobile Communication Systems.
2. To learn how to choose mobile communication system according to the complexity, installation cost, speed of transmission, channel properties etc.
3. To identify the requirements of mobile communication as compared to static communication
4. As a prerequisite for the course in Wireless Systems.

**UNIT – I WIRELESS COMMUNICATION FUNDAMENTALS**

Introduction, Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread spectrum, MAC, Cellular Wireless Networks.

**UNIT – II TELECOMMUNICATION SYSTEMS**

GSM, System Architecture, Protocols, Connection Establishment, Frequency Allocation, Routing , Handover, Security, GPRS.

**UNIT – III WIRELESS NETWORKS**

Wireless LAN, IEEE 802.11 Standards, Architecture, Services, HIPERLAN, Adhoc Network, Blue Tooth, Future Wireless Network, Case study on 4G, Architecture of Wireless Network, Wireless ATM.

**UNIT – IV NETWORK LAYER**

Mobile IP, Dynamic Host Configuration Protocol, Routing Protocols.

**UNIT – V TRANSPORT AND APPLICATION LAYERS**

TCP over Wireless Networks, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission, Transaction Oriented TCP, WAP, WAP Architecture, WDP,WTLS,WTP,WSP,WML, WML Script, WAE,WTA.

**Text Books:**


1. Mobile Communications, Jochen Schiller, Second Edition, Pearson Education, 2003.
2. Wireless Communications and Networks, William Stallings, Pearson Education, 2002.


**Reference Books:**


1. Principles of Wireless Networks, Kaveh Pahlavan, Prasanth Krishnamoorthy, First Edition, Pearson Education, 2003.
2. Principles of Mobile Computing, Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Springer, 2003.
3. AdHoc Mobile Wireless Networks, C.K.Toh, First Edition, Pearson Education, 2002.
4. Pervasive Computing, Burkhardt, First Edition, Pearson Education, 2003.


**Course Outcome:**

After completion of the course study, students will be able

1. To explain fundamentals of mobile communication systems.
2. To choose mobile communication system according to the complexity, installation cost, speed of transmission, channel properties etc.
3. To identify the requirements of mobile communication as compared to static communication.

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### ADVANCED COMPUTER ARCHITECTURE (MTCSE121)

**Course Objective:**

1. To endow with in detail coverage of current and budding trends in computer architectures, focusing on performance and the hardware/software interface.
2. To analyze basic issues in architecture design and their impact on application performance.

**UNIT – I FUNDAMENTALS OF COMPUTER DESIGN AND PIPELINING**

Fundamentals of Computer Design, Measuring and reporting performance, Quantitative principles of computer design, Instruction set principles, Classifying ISA, Design issues, Pipelining, Basic concepts, Hazards, Implementation, Multicycle operations.

**UNIT – II INSTRUCTION LEVEL PARALLELISM WITH DYNAMIC APPROACHES**

Concepts, Dynamic Scheduling, Dynamic hardware prediction, Multiple issue, Hardware based speculation, Limitations of ILP, Case studies.

**UNIT – III INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES**

Compiler techniques for exposing ILP, Static branch prediction, VLIW, Advanced compiler support, Hardware support for exposing more parallelism, Hardware versus software speculation mechanisms, Case studies.

**UNIT – IV MULTIPROCESSORS AND MULTICORE ARCHITECTURES**

Symmetric and distributed shared memory architectures, Performance issues, Synchronization issues, Models of memory consistency, Software and hardware multithreading, SMT and CMP architectures, Design issues, Case studies.

**UNIT – V MEMORY AND I/O**

Cache performance, Reducing cache miss penalty and miss rate, Reducing hit time, Main memory and performance, Memory technology, Types of storage devices, Buses, RAID –Reliability, availability and dependability, I/O performance measures, Designing an I/O system.

**Text/Reference Books:**


1. Computer Architecture, A Quantitative Aapproach, John L. Hennessey and David A. Patterson, Morgan Kaufmann / Elsevier, 4th Edition, 2007.
2. Parallel Computing Architecture: A Hardware/ Software Approach, David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
3. Computer Organization and Architecture–Designing for Performance, William Stallings, Pearson Education, Seventh Edition, 2006.
4. Computer Architecture, Behrooz Parhami, Oxford University Press, 2006.


**Course Outcome:**

After completion of the course study, students will be able

1. Confer the organization of computer-based systems and how a range of design choices are inclined by applications.
2. Differentiate diverse processor architectures and system-level design processes.
3. Recognize the components and operation of a memory hierarchy and the series of performance issues influencing its design.
4. Recognize the organization and operation of modern generation parallel computer systems, including multiprocessor and multi core systems.
5. Recognize the ethics of I/O in computer systems, counting feasible mechanisms for I/O and secondary storage organization.

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### DATA STRUCTURES AND ALGORITHMS (MTCSE122)

**Course Objective:**

1. To understand the data organization and basic concepts of data structure.
2. To study the classifications of data structures.
3. To study the memory representation of all types of data structures.
4. To implement the all kinds of data structures.

**UNIT – I COMPLEXITY ANALYSIS & ELEMENTARY DATA STRUCTURES**

Asymptotic notations, Properties of big oh notation, asymptotic notation with several parameters, conditional asymptotic notation, amortized analysis, NP, completeness, NP hard– recurrence equations, solving recurrence equations, arrays, linked lists, trees.

**UNIT – II HEAP STRUCTURES**

Min-Max heaps, Deaps, Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps, Lazy-binomial heaps.

**UNIT – III SEARCH STRUCTURES**

Binary search trees, AVL trees, 2-3 trees, 2-3-4 trees, Red, black trees, B trees, splay trees, Tries.

**UNIT – IV GREEDY & DIVIDE AND CONQUER**

Quicksort, Strassen's matrix multiplication, Convex hull, Tree-vertex splitting, Job sequencing with deadlines, Optimal storage on tapes.

**UNIT – V DYNAMIC PROGRAMMING AND BACKTRACKING**

Multistage graphs,0/1 knapsack using dynamic programming, Flow shop scheduling,8,queens problem, graph coloring, knapsack using backtracking

**Text/Reference Books:**


1. Fundamentals of Data structures in C++, E. Horowitz, S. Sahni and Dinesh Mehta, Galgotia, 1999.
2. Computer Algorithms / C++, E. Horowitz, S.Sahni and S. Rajasekaran, Galgotia, 1999.
3. Data Structures and algorithms in C++, Adam Drozdex, Second Edition, Thomson learning–vikas publishing house, 2001.
4. Algorithmics: Theory and Practice, G. Brassard and P. Bratley, Printice –Hall, 1988.
5. Introduction to Algorithms,Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, Second Edition, PHI 2003.


**Course Outcome:**

After completion of the course study, students will be able to

1. Have a comprehensive knowledge of the data structures and algorithms.
2. Understand the importance of data and identify the data requirements for an application.
3. Have in depth understanding and practical experience of algorithmic design and implementation.
4. Understand the issues involved in algorithm complexity and performance.

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### OBJECT ORIENTED SOFTWARE ENGINEERING (MTCSE123)

**Course Objective:**

1. To introduce notion of software.
2. To learn the different software processes & their uses.
3. To understand good coding practices, documentation, contracts, regression tests and daily builds.
4. To study ethical and professional issues and its concern to software engineers.
5. To understand how Software Engineering is concerned with theories, methods and tools for professional software development.

**UNIT – I INTRODUCTION**

System Concepts, Software Engineering Concepts, Development Activities, Managing Software Development, Unified Modeling Language, Project Organization, Communication.

**UNIT – II ANALYSIS**

Requirements Elicitation, Concepts, Activities, Management, Analysis Object Model, Analysis Dynamic Models.

**UNIT – III SYSTEM DESIGN**

Decomposing the system, Overview of System Design, System Design Concepts, System Design Activities, Addressing Design Goals, Managing System Design.

**UNIT – IV OBJECT DESIGN AND IMPLEMENTATION ISSUES**

Reusing Pattern Solutions, Specifying Interfaces, Mapping Models to Code, Testing.

**UNIT – V MANAGING CHANGE**

Rationale Management, Configuration Management, Project Management, Software Life.
Cycle

**Text/Reference Books:**


1. Bernd Bruegge, Alan H Dutoit, Object,Oriented Software Engineering, 2nd ed, Pearson Education, 2004.
2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
3. Stephen Schach, Software Engineering 7th ed, McGraw,Hill, 2007.


**Course Outcome:**

After completion of the course study, students will be able to

1. Select and implement different software development process models.
2. Extract and analyze software requirements specifications for different projects.
3. Define the basic concepts and importance of Software concepts like cost estimation, scheduling and reviewing the progress.
4. Apply different testing and debugging techniques and analyze their effectiveness.
5. Analyze software risks and risk management strategies.

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### COMPUTER NETWORKS AND MANAGEMENT (MTCSE124)

**Course Objective:**

1. Provide students with an improved foundation of knowledge in current and reflective practice necessary to hold up a career in indulging the different protocols, software, and network architectures.
2. Understanding theory of local area networks, their topologies, protocols and applications.
3. Computer networking at sophisticated professional level.

**UNIT – I HIGH SPEED NETWORKS**

Frame Relay Networks, Asynchronous transfer mode, ATM Protocol Architecture, ATM logical Connection, ATM Cell, ATM Service Categories–AAL, High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fiber Channel, Wireless LAN's.

**UNIT – II CONGESTION AND TRAFFIC MANAGEMENT**

Queuing Analysis, Queuing Models, Single Server Queues, Effects of Congestion, Congestion Control, Traffic Management, Congestion Control in Packet Switching Networks, Frame Relay Congestion Control.

**UNIT – III TCP AND ATM CONGESTION CONTROL**

TCP Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO back off, KARN's Algorithm, Window management, Performance of TCP over ATM. Traffic and Congestion control in ATM, Requirements, Attributes, Traffic Management Frame work, Traffic Control, ABR traffic Management, ABR rate control, RM cell formats, ABR Capacity allocations, GFR traffic management.

**UNIT – IV INTEGRATED AND DIFFERENTIATED SERVICES**

Integrated Services Architecture, Approach, Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services.

**UNIT – V PROTOCOLS FOR QoS SUPPORT**

RSVP, Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms, Multiprotocol Label Switching, Operations, Label Stacking, Protocol details, RTP, Protocol Architecture, Data Transfer Protocol, RTCP.

**Text Books:**

1. High Speed Networks And Internet, William Stallings, Pearson Education, Second Edition, 2002.

**Reference Books:**

1. High Performance Communication Networks, Warland & Pravin Varaiya, Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. MPLS and VPN architecture, Irvan Pepelnjk, Jim Guichard and Jeff Apcar, Cisco Press, Volume 1 and 2, 2003.

**Course Outcome:**

After completion of the course study, students will be able to

1. To classify and relate vital theorems and formulae for the information-theoretic basis of communication and the performance of TCP/IP network protocols
2. Depict the basis and organization of conceptually layered Network protocol model.

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### DATA STRUCTURES LAB (MTCSE125)

1. Write C/C++ programs to implement the following using an array.
    a) Stack ADT
    b) Queue ADT
2. Write a C/C++ program to perform Min Heap.
3. Write a C/C++ program to perform Min Deaps.
4. Write a C/C++ program to perform the following operations:
    a) Insert an element into a binary search tree.
    b) Delete an element from a binary search tree.
    c) Search for a key element in a binary search tree.
5. Write a C/C++ program to perform the following operations on B,Trees:
    a) Insertion
    b) Deletion
6. Write a C/C++ program to perform the following operations on AVL,Trees:
    a) Insertion
    b) Deletion
7. Write a C/C++ program to perform Tries.
8. Write a C/C++ program for sorting a given list of elements in ascending order using Quick sort method.
9. Write a C/C++ program to implement convex hull
10. Write a C/C++ program to perform 0/1 Knapsack using Dynamic Programming.
11. Write a C/C++ program to perform Graph coloring using backtracking.
12. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a C++ program that implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.

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**NETWORKING LAB (MTCSE126)**

1. WAP for implementation of Socket Programming Concepts.
2. WAP to implement TCP Sockets
3. WAP to implement UDP Sockets
4. WAP for implementation of Socket Applications.
5. WAP for Simulation of Sliding Window Protocol.
6. WAP for Simulation of Routing Protocols.
7. WAP for development of applications such as DNS/ HTTP/ E-mail/ Multi-user Chat.
8. WAP for simulation of Network Management Protocols.
9. Study of Network Simulator Packages-such as OPNET, NS-2 etc.

## SOFTWARE ENGINEERING LAB (MTCSE127)

Programs, assignments covering the need of Software Engineering (MTCSE123)

### CASE TOOLS

The student is expected to take up about five mini, projects and model them and produce Use Cases, Analysis documents-both Static and Dynamic aspects, Sequence Diagrams and State-Charts, Database Design using Rational Products.

1. Online Bookshop
2. Simulation of a small manufacturing Company
3. A Content Management System
4. Air traffic Simulation
5. Automated Community Portal
6. File Management System
7. Medical Imaging System