

Faculty of Engineering & Technology

P.K. University

Shivpuri (MP)



**Evaluation Scheme & Syllabus for
Department Of Computer Science & Engg.**

M. Tech. (Computer Science & Engg.)

(I to IV Semester)

(Effective from session 2019-20)

EVALUATION SCHEME

M.Tech- Computer Science & Engg.						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
MTCS-101	Foundation of Computer Science	30	70	NA	NA	100
MTCS-102	Advanced Algorithm	30	70	25	25	150
MTCS-103	Software Requirements & Specifications	30	70	25	25	150
MTCS-104	Software Testing & Auditing	30	70	25	25	150
MTCS-105	Research Process & Methodology	30	70	25	25	150
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
MTCS-201	Multi Core Architecture and Programming	30	70	NA	NA	100
MTCS-202	Wireless Mobile Networks	30	70	25	25	150
MTCS-203	Cyber Security and Laws	30	70	25	25	150
MTCS-204	Software Project Planning & Management	30	70	25	25	150
MTCS-205	Digital Image Processing	30	70	NA	NA	100
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
MTCS-301	Dissertation phase-I	NA	NA	200	200	400
MTCS-302	Seminar-III	NA	NA	25	25	50
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
MTCS-401	Dissertation phase-II	NA	NA	300	300	600

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MTCS101-FOUNDATION OF COMPUTER SCIENCE LTP-3 1 0

UNIT-I:

DATA STRUCTURE- List, Stack, Queue, Tree, Hash Table, Graph, Search and Sorting Algorithms.

UNIT-II:

OPERATING SYSTEM- Scheduling Algorithm, Synchronization Technique, Paging and Segmentation, Virtual Memory.

UNIT-III:

AUTOMATA THEORY- Finite Automata, Regular Expression, Context Free Grammar, Push Down Automata, Turing Machine, P and NP Class.

UNIT-IV:

DATABASE SYSTEM -Concepts and Architecture; Data Model; Normalization; SQL Advanced Transaction Processing, Deadlock and Concurrency Control; Object Oriented and Object Relational Databases: Parallel and Distributed Databases; Backup and Recovery Concepts, Emerging Database Technologies.

REFERENCES:

1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Addison Wesley.
- 3.Dhamdhare, "Operating Systems", Tata Mc-GrawHill.
4. Aho, Ullman and Sethi, "Compiler Design", AddisonWesley.
5. Ramez Elmasri, Shamkant Navathe: Fundamentals of Database Systems, Fifth Edition, Pearson Education,2007.
6. Alexis Lcon, Mathews Leon, "Database Management Systems
7. AbrahamSilberschatz, HenryF.Korth, S.Sudarshan: Database Syst Concepts, Tata McGraw-Hill.

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MTCS102-ADVANCEDALGORITHM

LTP-3 1 2

UNIT-I

Algorithm Fundamentals: Basic Concept, Analysis of Algorithm, Growth of Functions, Master's Theorem.

UNIT-II

Analysis of sorting Algorithms: Overview, Merge sort, Quick sort, Heap sort, radix sort.

Advance Data Structure: Red-Black Trees, B/B+ Trees.

UNIT-III

Parallel Algorithm: Performance Measures of Parallel Algorithms, Parallel Merging/ Sorting Algorithms on CREW/EREW, Parallel searching algorithms.

UNIT-IV

Advance Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Branch and bound, Back Tracking.

Graph Algorithm: DFS and BFS algorithm.NP Complete Problem

REFERENCES:

1. Coreman, Rivest, Lisserson, "Algorithm",PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis",AddisionWesley.
3. Horowitz, Sahani, and Rajasekaran " Fundamental of ComputerAlgorithms", UniversitiesPress

LAB-II:ADVANCED ALGORITHM

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
3. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
4. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) In-order c)Post order.
5. Write Java programs for the implementation of bfs and dfs for a given graph.
6. Write Java programs for implementing the following sorting methods: a) Bubble sort b) Insertion sort c) Quick sort d) Merge sort e) Heap sort f) Radix sort g) Binary tree-sort
7. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in aB-tree
8. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning, tree.

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MTCS103-Software Requirement And Specifications

LTP-3 1 2

UNIT-I: Basics of requirements Engineering

1. Definition of requirements engineering.
2. Importance of requirements engineering.
3. Place of requirements engineering in development process.
4. Types of requirements: functional requirements, non-functional requirements, quality attributes.
5. Main requirements engineering activities, documents and processes.

UNIT-I: Requirements inception and elicitation

1. Product vision and project scope.
2. Traditional elicitation approaches (interviews, stakeholders study, workshops).
3. Scenario/use case approaches. Prototyping.
4. Requirements negotiation and risk management.

UNIT-III: Requirements analysis and specification - modeling techniques

1. Inception vs. specification.
2. Techniques for writing high-quality requirements.
3. Documentation standards (e.g., IEEE830-1998).
4. Goal-oriented modeling.
5. Structured analysis and other techniques.
6. UML v2 and URN notations.
7. External qualities management, contract specification.

UNIT-IV: Requirements verification and validation

1. Detection of conflicts and inconsistencies, completeness.
2. Techniques for inspection, verification and validation.
3. Feature interaction analysis and resolution.

UNIT-V: Requirements management

1. Traceability, priorities, changes, baselines.
2. Tool support (e.g., DOORS).
3. Requirements for various types of systems: embedded systems, consumer. Systems, web-based systems, business systems, systems for scientists and other engineers.
4. Requirements engineering in RUP.
5. Requirements engineering in agile methods.

REFERENCES:

1. Ian K. Bray, An Introduction to Requirements Engineering, Addison Wesley,2002
2. Ian F. Alexander, Richard Stevens, Writing better requirements, Addison-Wesley,200

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MTCS-104 Software Testing and auditing LTP-3 1 2

UNIT-I:

TESTING BASICS

Testing as an engineering activity – Role of process in software quality – Testing as a process – Basic definitions – Software testing principles – The tester's role in a software development organization – Origins of defects – Defect classes – The defect repository and test design – Defect examples – Developer / Tester support for developing a defect repository.

UNIT-II:

TEST CASE DESIGN

Introduction to testing design strategies – The smarter tester – Test case design strategies – Using black box approach to test case design – Random testing – Equivalence class partitioning – Boundary value analysis – Other black box test design approaches – Black box testing and COTS – Using white box approach to test design – Test adequacy criteria – Coverage and control flow graphs – Covering code logic – Paths – Their role in white box based test design – Additional white box test design approaches – Evaluating test adequacy criteria.

UNIT-III: LEVELS OF TESTING

The need for levels of testing – Unit test – Unit test planning – Designing the unit tests – The class as a testable unit – The test harness – Running the unit tests and recording results – Integration tests – Designing integration tests – Integration test planning – System test – The different types – Regression testing – Alpha, beta and acceptance tests.

UNIT-IV:

TEST MANAGEMENT -CONTROLLING AND MONITORING

Basic concepts – Testing, debugging goals, policies – Test planning – Test plan components – Test plan attachments – Locating test items – Reporting test results – The role of three groups in test planning and policy development – Process and the engineering disciplines – Introducing the test specialist – Skills needed by a test specialist – Building a testing group. Defining terms – Measurements and milestones for controlling and monitoring – Status meetings – Reports and control issues – Criteria for test completion – SCM – Types of reviews – Developing a review program – Components of review plans – Reporting review results.

UNIT-V:

AUDITING: Software audit review, software audits Vs software peer reviews and software management reviews. Objectives and participants Initiator, Lead Auditor, Recorder, Auditors, Audited Organization.

REFERENCES:

1. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson 2012
2. Aditya P. Mathur, "Foundations of Software Testing", Pearson, 2008
3. Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge University Press, 2008

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MTCS201-MULTI-CORE ARCHITECTURE&PROGRAMMING LTP-3 1 0

UNIT-I: Introduction to Multi-core Architecture: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper-Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. **System Overview of Threading:** Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

UNIT-II: Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives.

UNIT- III: Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control-based Concepts, Fence, Barrier, Implementation-dependent Threading Features. Threading APIs :Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft .NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

UNIT-IV: Open MP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance.

UNIT-V: Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32, Data Organization for High Performance.

REFERENCES:

1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006
- 2 .Introduction to Parallel Processing ,SashiKumar,PHI
3. Parallel Programming, Wilkinson,Pearson
4. Elements of Parallel Computing,Rajaraman,PHI

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MTCS202-WIRELESS AND MOBILE NETWORKS

LTP-3 1 2

1. Introduction to Wireless and Mobile Networks
2. Wireless Transmission: Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum
3. Wireless Medium Access Control: Common Problems, SDMA, FDMA, TDMA, CDMA
4. Wireless Telecommunications Systems: GSM, DECT, TETRA, UMTS, IMT-2000, LTE
5. Satellite Systems: Introduction, Deficiencies of existing GEO/MEO/LEO Satellite Systems, Satellite Architectures, Satellite Routing, Satellite Channel Access, Satellite Handover, High Altitude Platforms, and Applications.
6. Wireless LAN: IEEE 802.11, Bluetooth, RFID, Security issues.
7. Mobile Network Layer I: Problems of IP in Wireless, Principles behind Mobile IP, Problems, Security issues, DHCP.
8. Mobile Network Layer II: Routing in Ad-hoc Networks, Wireless Sensor Networks
9. Mobile Transport Layer: Effects of mobility and wireless transmissions on reliable transport protocols such as TCP.
10. Support for Mobility: File Systems, databases, WWW and Mobility, WAP, Application layer for mobile networks.

REFERENCES:

1. J. Schiller, Mobile Communications, 2nd edition, Addison Wesley.
2. Wireless Communications and Networks, William Stallings, 2nd edition, Prentice Hall.

Tools:

1. Wireshark
2. Cisco Packet Tracer
3. NS-2 / NS-3
4. OmNet++, OverSim

Lab Exercises:

1. The above mentioned tools can be used to experiment with Wireless Network.
2. Different protocols can be implemented and tested using the tools viz. AODV, DSR, DSDV etc.
3. Wireless topologies (WLAN) can be created for analysis and debugging purpose.
4. Test-beds can be developed for testing and performance analysis purposes.

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MTCS-203 Cyber Security and Laws

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UNIT-I:

Introduction: Review of TCP/IP and TCP, IP Header analysis, Introduction to Cyber World, Cyber attacks and cyber security, Information warfare and cyber terrorism, Types of cyber attacks, Cyber Crime and Digital Fraud, Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)

UNIT-II:

Issues in cyber security: Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, DataLoss.

UNIT-III:

Intellectual property rights: Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT-IV:

Procedural Issues Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT-V:

Legal aspects of cyber security: Ethics, Legal Developments, Late 1990 to 2000, Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

REFERENCES:

1. Jonathan Rosenoer, "Cyber Law: The law of the Internet", Springer-Verlag, 1997.
2. D. Bainbridge, Introduction to Computer Law, 5th Edition, Pearson Education, 2004.
3. P. Duggal, Cyber Law: The Indian Perspective, Saakshar Law Publications, 2005.
4. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006.
5. S.P. Tripathy, "Cyber security", Wiley Publications.

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MTCS-204 SOFTWARE PROJECT PLANNING & MANAGEMENT

LTP-3 1 2

UNIT-I:

Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools, **Software configuration management:** Introduction, Some Basic Definitions and terminology, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.

UNIT-II: Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. Project Planning and Tracking: Components of Project Planning and Tracking, The “What “ Part of a Project Plan, The “What Cost “ Part of a Project Plan, The “When “ Part of Project Planning, The “How “ Part of a Project Planning: Tailoring of Organizational Processes For the Project, The “ By Whom “ Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database. Project Closure: When Does Project Closure Happen?. Why Should We Explicitly do a Closure?, An Effective Closure Process, Issues that Get Discussed During Closure, Metrics for Project Closure, Interfaces to the Process Database.

UNIT-III: Software Requirements gathering: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, skill sets required during requirements phase, differences for a shrink-wrapped software, challenges during the requirements management phase, Metrics for requirements phase. Estimation: What is Estimation? when and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Translating size Estimate into effort Estimate, Translating effort Estimates into schedule Estimate, common challenges during Estimation , Metrics for the Estimation processes.

Design and Development Phases: Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices/ constraints, design to standards, design for portability, user interface issues, design for testability, design for diagnose ability, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development,

UNIT-IV:

Project management in the testing phase: Introduction, What is testing?, what are the activities that makeup testing?, test scheduling and types of tests, people issues in testing, management structures for testing in global teams, metrics for testing phase. **Project management in the Maintenance Phase:** Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skillsets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

UNIT-V:

Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. **Impact of the internet on project management:** Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. **People focused process models:** Growing emphasis on people centric models, people capability maturity model (P-CMM), other people focused models in the literature, how does an organization choose the models to use?

REFERENCES:

1. Ramesh Gopalaswamy: "Managing Global Projects ", Tata McGraw Hill, 2013.
2. Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
- Pankaj Jalote, "Software Project Management in practice", Pearson Education, New Delhi

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MTCS-205 DIGITAL IMAGE PROCESSING

LTP-3 1

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UNIT-I:

Introduction: Fundamental steps of image processing, components of an image processing of system, the image model and image acquisition, sampling and quantization, station ship between pixels, distance functions, scanner

UNIT-II:

Statistical and spatial operations: Grey level transformations, histogram equalization, smoothing & sharpening-spatial filters, frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering. FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation.

UNIT-III:

Morphological and other area operations: basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images. Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT-IV:

Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding. Basics of color image processing, pseudo color image processing, color transformation, color smoothing and sharpening, color segmentation, color image compression, compression standards

UNIT-V:

Image Transforms - Fourier, DFT, DCT, DST, Haar, Hotelling, Karhunen -Loeve, Walsh, Hadamard, Slant. Representation and Description - Chain codes, Polygonal approximation, Signatures Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, PCA.

REFERENCES:

1. Digital Image Processing – by Rafael.C.Gonzalez& Richard E.Woods, 3rd edition, Pearson Education, 2008.
2. Digital Image Processing, M.Anji Reddy, Y.Hari Shankar, BSPublications.
3. Fundamentals of Digital Image Processing – by A.K. Jain,PHI.
4. Digital Image Processing – William K, Part I - John Wileyedition.
5. Digital Image Processing using MATLAB – by Rafael.C.Gonzalez, Richard E.Woods, & Steven L.Eddins, Pearson Education,2006

