

IK GUJRAL PUNJAB TECHNICAL UNIVERSITY

Scheme and Syllabus
of
Master of Technology
(Computer Science Engineering)

Batch 2015

By
Board of Studies CSE/IT/AMT

Semester –I								
Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
MTCS-101	Advanced Software Engineering	3	1	0	50	100	150	4
MTCS-102	Advanced Computer Architecture	3	1	0	50	100	150	4
MTCS-103	Information Security	3	1	0	50	100	150	4
MTCS-104	Advanced Database Systems	3	1	0	50	100	150	4
MTCS-105	Digital Image Processing	3	1	0	50	100	150	4
Total		15	5	0	250	500	750	20

MTCS-101 Advanced Software Engineering**Section- A**

Software Project Management: Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks-PERT/CPM, COCOMO-I, COCOMO-II, Risk Assessment- Probability Matrix, Risk Management. Agile Methodology- Scrum and XP.

Formal Methods: Basic concepts, mathematical preliminaries, Applying mathematical notions for formal specification, Formal specification languages, using Z to represent an example software component, the ten commandments Of formal methods, Formal methods- the road ahead.

Section- B

Component-Based Software Engineering: CBSE process, Domain engineering, Component-based development, Classifying and retrieving components and economics of CBSE.

Client/Server Software Engineering: Structure of client/server systems, Software engineering for Client/Server systems, Analysis modeling issues, Design for Client/Server systems, Testing issues

Section- C

Web Engineering: Attributes Of web-based applications, the WebE process, a framework for WebE. Formulating, Analysing web-based systems, design and testing for web-based applications, Management issues.

Reengineering: Business process reengineering, Software reengineering, Reverse reengineering, Restructuring, Forward reengineering, economics of reengineering.

Section- D

Software Quality: CASE tools, metrics, Standards, Certification and Assessment. TQM, Bootstrap methodology, The SPICE project, ISO-IEC 15504, Six Sigma Concept for Software Quality.

Computer-Aided Software Engineering: Building Blocks for CASE, taxonomy Of CASE tools, integrated CASE environments, Integration architecture, and CASE repository

Recommended Books

1. Software Engineering a Practitioners Approach, Roger S. Pressman, McGraw-Hill 8thEdition, 2014
2. Formal Specification and Documentation testing - A Case Study Approach, J.Bowan , International Thomson Computer Press, 2003
3. Software Engineering for Embedded Systems: Methods, Practical and Applications, Robert Oshana, Mark Kraeling, Newnes Publisher, 2013
4. Software engineering an engineering approach, James S. Peters, Witold Pedrycz, Wiley India, 2011.
5. Software Engineering Principles and Practice, Hans Van Vliet, Yd ed, 2015

MTCS-102 ADVANCED COMPUTER ARCHITECTURE**Section-A**

Fundamentals of Processors: Instruction set architecture; single cycle processors, hardwired and micro-coded FSM processors; pipelined processors, multi-core processors; resolving structural, data, control and name hazards; analyzing processor performance.

Section-B

Fundamentals of Memories: memory technology; direct-mapped, associative cache; write-through and write-back caches; single-cycle, FSM, pipe-lined cache; Analyzing memory performance.

Section-C

Advanced Processors: Superscalar execution, out-of-order execution, register renaming, memory disambiguation, dynamic instruction scheduling, branch prediction, speculative execution; multi-threaded, VLIW and SIMD processors.

Section-D

Advanced Memories: non-blocking cache memories; memory protection, translation and virtualization; memory synchronization, consistency and coherence.

Recommended Books:

1. Computer Architecture: A Quantitative Approach, by J.L Hennessy and D.A Patterson.
2. Digital Design and Computer Architecture, by D.M Harris and S.L Harris.

MTCS-103 INFORMATION SECURITY**Section -A**

Overview: Computer Security Concepts, Requirements, Architecture, Trends, Strategy, Edge/boundary Security: Firewalls, Intrusion Detection, Intrusion Prevention systems, Honeypots.

Section- B

User Authentication: Password, Password-based authentication, token based authentication, Biometric authentication, Remote User authentication. Access Control: Principles, Access Rights, Discretionary Access Control, Unix File Access Control, Role Based Access Control Internet Authentication Applications: Kerberos, X.509, PKI, Federated Identity Management.

Section-C

Cryptographic Tools: Confidentiality with symmetric encryption, Message Authentication & Hash Functions, Digital Signatures, Random and pseudorandom Numbers. Symmetric Encryption and Message Confidentiality: DES, AES, Stream Ciphers, Cipher Block Modes of Operation, Key Distribution.

Internet Security Protocols: SSL, TLS, IPSEC, S/ MIME.

Section- D

Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security

Malicious Software: Types of Malicious Software (Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload–Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealth–Backdoors, Rootkits

Suggested Readings

1. Computer Security: Principles and Practice, William Stallings & Lawrie Brown, 2008, Indian Edition 2010, Pearson
2. Chuck Easttom, “Computer Security Fundamentals” Pearson, 2011
3. M. Stamp, “Information Security: Principles and Practice,” 2nd Edition, Wiley, ISBN: 0470626399, 2011.
4. M. E. Whitman and H. J. Mattord, “Principles of Information Security,” 4th Edition, Course Technology, ISBN: 1111138214, 2011.
5. M. Bishop, “Computer Security: Art and Science,” Addison Wesley, ISBN: 0-201-44099-7, 2002.

MTCS-104 Advanced Database Systems**Section A**

Data Base Analysis and Design Techniques: Review of basic Database Concepts, Database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory. Database Implementation using UML: Introduction to UML, Structure diagrams, behavioral diagrams, object oriented analysis, class diagram.

Advanced Transaction Processing and Concurrency Control:

Transaction Concepts, Concurrency Control: Locking Methods, Timestamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.

Section B

Query Compiler: Introduction, parsing, generating logical query plan from parse tree.

Query Processing: Physical-Query-plan Operators. Operations: selection, sorting, join, project, set.

Query Evaluation: Introduction, Approaches to QE, Transformation of relational expressions in Query optimization, heuristic optimization, cost estimation for various operations, transformation rule.

Section C**Distributed Database**

Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed Data Storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management.

Object Oriented Database

Limitations of RDBMS, Need of Complex Datatype, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object-oriented database design. Comparison of ORDBMS and OODBMS.

Section D**Emerging Database Models, Technologies and Applications**

Multimedia database-Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies.

References

1. Advanced database management system by Rini Chkrabarti and Shibhadra Dasgupta, Dreamtech.
2. Distributed Databases by Ozsu and Valduriez ,Pearson Education.
3. Fundamentals of Database Systems by Ramez Elmasri, Shamkant Navathe, Pearson Education
4. Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw-Hill.

Section-A

Introduction: Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

Section-B

Image Transforms: Introduction to the Fourier Transform, The Discrete Fourier Transform, 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT- FFT – DCT - Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties and Examples.

Image Enhancement : Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Background, Smoothing Filters, Sharpening Filters, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency Domain Specifications.

Section-C

Image Restoration: Degradations Model - Definitions, Degradation Model for Continuous Functions, Diagonalization of Circulant and Block-Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration, Unconstrained Restoration, Constrained Restoration, Inverse Filtering – Formulation, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, Geometric Transformation.

Image Compression: Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models, Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding.

Section-D

Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing. Hit And Miss Algorithms Feature Analysis

Color and multispectral Image processing: Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models.Multispectral Image Analysis - Color Image Processing Three Dimensional Image Processing-Computerized Axial Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

Text Book:

1. Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 2/e Pearson Education, New Delhi - 2006

Reference Books:

1. W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. 2006

2. M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.

3. Digital Image Processing, Kenneth R Castleman, Pearson Education, 1995.

4. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education, 2009.

5. Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India, 1989.