Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabus

M.E. COMPUTER SCIENCE and ENGINEERING

SEMESTER I to IV

REGULATIONS 2014

DR MAHALINGAM MCET

COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
2014 REGULATION
Curriculum for M.E Computer Science and Engineering
From Semester I to IV

SEMESTER I

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CP0101	Advanced Computer Architecture	3	1	0	4	100
140CP0102	Advanced Data Structures and Algorithms	3	1	0	4	100
140CP0104	Database Technology	3	0	0	3	100
140CP0105R	Human Computer Interaction	3	0	0	3	100
140CP0106	Mathematics for Computing	3	1	0	4	100
140CP0108	Data Communication and Networking	3	0	0	3	100
PRACTICAL						
140CP0107R	Data Structures and Networks Laboratory	0	0	4	2	100
	TOTAL	**18**	**3**	**4**	**23**	**700**

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CP0201	Advanced Operating Systems	3	0	0	3	100
140CP0202	Security in Computing	3	0	0	3	100
140CP0203	Text and Web Mining	3	0	0	3	100
140CP0204R	Web Engineering	3	0	0	3	100
XXXX	Elective I	3	1	0	4	100
XXXX	Elective II	3	0	2	4	100
PRACTICAL						
140CP0207	Software Design Laboratory	0	0	4	2	100
ONE CREDIT COURSE						
140CP5111	Basics of Research Methodologies	0	0	2	1	100
	TOTAL	**18**	**1**	**8**	**23**	**800**

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SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
XXXX	Elective III	3	0	2	4	100
XXXX	Elective IV	3	0	2	4	100
XXXX	Elective V	3	1	0	4	100
PRACTICAL						
140CP0307	Project Work Phase I	0	0	12	6	200
	TOTAL	**9**	**1**	**16**	**18**	**500**

SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
PRACTICAL						
140CP0407	Project Work Phase II	0	0	24	12	400
	TOTAL	**0**	**0**	**24**	**12**	**400**

ELECTIVES

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
140CP9111	Advanced Compiler Design	3	1	0	4	100
140CP9112R	Cloud Computing	3	1	0	4	100
140CP9114	Object Oriented Software Engineering	3	0	2	4	100
140CP9115	Open Source Software	3	0	2	4	100
140CP9116	Parallel Computing	3	0	2	4	100
140CP9117	Software Quality Assurance and Testing	3	1	0	4	100
140CP9128	Digital Image Processing	3	1	0	4	100
140CP9129	Mobile Application Development	3	0	2	4	100

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SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
140CP9119	Big Data and Analytics	3	0	2	4	100
140CP9120	Cyber Security & Computer Forensics	3	1	0	4	100
140CP9121	Information Retrieval Techniques	3	0	2	4	100
140CP9122	Information Visualization	3	0	2	4	100
140CP9123	Machine Learning Techniques	3	0	2	4	100
140CP9124	Social Network Analysis	3	0	2	4	100
140CP9125	Soft Computing	3	0	2	4	100
140CP9126R	Software Project Management	3	1	0	4	100
140CP9127	Wireless Security	3	1	0	4	100
140CP9130	Natural Language Processing	3	0	2	4	100
140CP9131	Internet of Things	3	0	2	4	100
140CP9132	Optimization Techniques	3	1	0	4	100

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SEMESTER I

Course Code: 140CP0101	**Course Title:** Advanced Computer Architecture	
Core	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Comprehend computer design principles
CO2. Illustrate the various memory technologies
CO3. Appreciate the various aspects of Instruction level parallelism
CO4. Apply the significant aspects of Data level parallelism
CO5. Describe advanced topics like thread level parallelism, embedded systems and interconnection systems

UNIT I FUNDAMENTALS OF COMPUTER DESIGN 9+3

Classes of Computers – Computer Architecture – Trends – Dependability – Measuring, Reporting, and Summarizing Performance – Quantitative Principles of Computer Design – Instruction Set Principles and Examples – Classifying Instruction Set Architectures – Memory Addressing –Type and Size of Operands – Operations in the Instruction Set – Instructions for Control Flow – Encoding an Instruction Set.

UNIT II MEMORY HIERARCHY DESIGN 9+3

Introduction – Advanced Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – The Design of Memory Hierarchies – Case Study – Cache Performance – Six Basic Cache Optimizations – Virtual Memory – Protection and Examples of Virtual Memory.

UNIT III INSTRUCTION-LEVEL PARALLELISM 9+3

Pipelining Concepts – Pipeline Hazards – Implementation of Pipelining – ILP : Concepts and Challenges – Basic Compiler Techniques for Exposing ILP – Advanced branch Prediction – Dynamic Scheduling – Hardware-Based Speculation – Exploiting ILP – Advanced Techniques for Instruction Delivery and Speculation – Limitations of ILP.

UNIT IV DATA-LEVELPARALLELISM 9+3

Vector Architecture – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units –Detecting and Enhancing Loop-level parallelism – Warehouse Scale Computers: Programming Models, Workloads and Architecture – Physical Infrastructure and costs.

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UNIT V THREAD-LEVEL PARALLELISM **9+3**

Centralized Shared Memory Architectures – Performance of Symmetric Shared Memory Multiprocessors – Distributed Shared Memory and Directory Based Coherence – Synchronization – Models of Memory Consistency – Case Study: Multi-core Processors and their Performance – Storage Systems – Embedded Systems – Interconnection Networks.

References:

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann, Fifth Edition, 2012.
2. Richard Y. Kain, "Advanced Computer Architecture - A Systems Design Approach", Prentice Hall, 2011.
3. Kai Hwang, Naresh Jotwani, "Advanced Computer Architecture", Tata McGraw-Hill, Second Edition, 2010.

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Course Code: 140CP0102	Course Title: Advanced Data Structures and Algorithms	
Core	L : T : P : C	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	60

Course Outcomes:

At the end of the course the student should be able to:

CO1. Analyze the time complexity of recursive and non-recursive algorithms
CO2. Describe the organization and working of Balanced tree structures
CO3. Deploy Search data structures for efficient range searching and string matching
CO4. Illustrate the concepts of NP-Completeness and Randomized Algorithms
CO5. Deduce the working of Approximation Algorithms and Online Algorithms

UNIT I ALGORITHM ANALYSIS **9+3**

Computational Complexity – Asymptotic Notations – Best, Average and Worst Case Analysis – Amortized Complexity. Recursion: Recursive Calls – Types of Recursion – Backtracking.

UNIT II BALANCED TREES **9+3**

AVL Trees - Treaps – Multiway Search Trees: B-Trees – B* Trees – B+ Trees.

UNIT III SEARCH STRUCTURES **9+3**

k-d Trees – R-Trees – Tries – Suffix Trees and Arrays – String Matching: KMP and Boyer Moore algorithms.

UNIT IV NP-COMPLETENESS AND RANDOMIZED ALGORITHMS **9+3**

Theory of NP Completeness – Decision problems – Satisfiability problem – NP Problems – Cooks Theorem – NP Complete problems. Randomized Algorithms: Closest pairs problem – Primality Testing – Minimum Spanning Trees.

UNIT V APPROXIMATION AND ONLINE ALGORITHMS **9+3**

Approximation Algorithms: Node Cover – Euclidean TSP – Bin-packing – Polynomial Time Approximation Schemes: 0/1 Knapsack problem. Online Algorithms: Euclidean Spanning Tree – Convex Hull problem.

References:

1. Adam Drozdek, "Data Structures and Algorithms in Java", Cengage Learning, Fourth Edition, 2013.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T.Tsai, "Introduction to the Design and Analysis of Algorithms A Strategic Approach", Tata McGraw Hill, 2012.
3. Charles E. Leiserson, Ronald Rivest, Thomas H. Cormen, and Clifford Stein, "Introduction to Algorithms", Prentice Hall India, 2012.

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Course Code: 140CP0104	**Course Title:** Database Technology	
Core	**L : T : P : C**	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	**45**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Outline the database architecture and discuss the issues related to transaction and concurrency
CO2. Examine the issues in distributed & parallel database such as transaction processing and concurrency control mechanisms
CO3. Appreciate the usage and applications of Object based and XML databases
CO4. Analyse the issues and usage of mobile databases
CO5. Comprehend the concepts related to advanced, recent databases and applications

UNIT I DATABASE SYSTEM CONCEPTS **9**

Overview of Database systems and architecture – E-R Model – Transactions – Serializability – Concurrency control mechanisms – Deadlock Handling.

UNITII DISTRIBUTED AND PARALLEL DATABASES **9**

Centralized and C/S architectures – Server system architecture – Parallel and Distributed systems – Distributed transactions – Locking and Commit protocols – Distributed concurrency Control – Parallel databases.

UNITIII OBJECT-BASED DATABASES AND XML **9**

Complex data types – Structured types and Inheritance – Table Inheritance – Array, Multiset types –Object Identity and Reference types – Implementation – Persistent PL – XML: Structure – Document schema – querying – transformation – Storage – Applications.

UNITIV MOBILE DATABASES **9**

Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models – Concurrency Control – Transaction Commit Protocols – Mobile data recovery schemes.

UNIT V ADVANCED DATA MODELS **9**

Active database and Triggers –Introduction to Temporal database and spatial database – Multimedia databases – Geographic Information systems – Overview of Data mining – Data warehousing.

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References:

1. Abraham Silberschatz, Henry. F. Korth, S.Sudharsan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2010.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Addison Wesley, 2010.
3. Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, 2006.
4. C.J.Date, "An Introduction to Database system", Pearson Education, Eighth Edition, 2003.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill, 2003.

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Course Code:140CP0105R	Course Title: Human Computer Interaction	
Core	L : T : P : C	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	45

Course Outcomes:

At the end of the course the student should be able to:

CO1.Develop user interface layer with effective interaction using suitable development framework

CO2.Design universal mobile interface with appropriate information architecture and design elements

CO3.Apply collections and control flows in mobile based programming

CO4.Implement advanced programming concepts in mobile application development

CO5.Analyze research directions in computer interaction for real time applications

UNIT I DESIGN OF HCI **6**

Principles of HCI – HCI Guidelines – HCI Design – User Interface Layer – User Interface Evaluation

UNIT II MOBILE HCI **7**

Mobile Ecosystem – Mobile Applications – Mobile Information Architecture (MIA) – Mobile Design Elements – Mobile User Interface Building and Advances – Universal Design – Best Practices in Mobile UI

UNIT III MOBILE PROGRAMMING **12**

Basic Operators – Strings & Characters – Collection Types – Control Flow – Functions – Closures – Enumerations

UNIT IV ADVANCED CONTROLS **12**

Classes & Structures – Properties – Methods – Subscripts – Inheritance – Initialization – De-initialization – Automatic Reference Counting – Error Handling

UNIT V APPLICATIONS **8**

Speech and Language interfaces and Technologies – Multimedia User Interface Design – Multimodal interfaces – Decision-Support Systems – Online Communities – Privacy, Security, and Trust.

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References:

1. Gerard Jounghyun Kim, "Human Computer Interaction: Fundamentals and Practice", CRC Press, 2015.
2. Brian Fling, "Mobile Design and Development", O'Reilly Media Inc., First Edition, 2009.
3. Julie A.Jacko, "The Human Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications", Third Edition, CRC Press, 2012.
4. "The Swift Programming Language – Swift 3.0.1", Apple Inc – Swift Programming series, 2016.

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Course Code: 140CP0106	**Course Title:** Mathematics for Computing	
Core	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:
At the end of the course the student should be able to:

CO1. Understand the basics of random variables and standard distributions
CO2. Apply Estimation theory and regression analysis
CO3. Apply testing of hypothesis to infer outcome of experiments
CO4. Understand Graph Structures and their applications
CO5. Solve counting problems

UNIT I RANDOM VARIABLES **9+3**

Random variables – Bernoulli Trials: Binomial, Poisson, Exponential, Erlang and Normal distributions – Function of a Random variable - Moments, Moment generating function.

UNIT II ESTIMATION THEORY **9+3**

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation – Curve fitting by Principle of least squares.

UNIT III TESTING OF HYPOTHESIS **9+3**

Sampling distributions, Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion, ANOVA, One way and Two way classification, LSD, RDD.

UNIT IV GRAPH STRUCTURES **9+3**

Graph representations – Regular graph structures – Random graphs – Connectivity – Cycles – Graph Coloring – Cliques, Vertex Covers, Independent sets – Spanning Trees – Network flows – Matching.

UNIT V COMBINATORICS **9+3**

Basics of counting – Counting arguments – Pigeonhole principle – Permutations and Combinations –Recursion and Recurrence relations – Generating functions.

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References:

1. Johnson, R.A. Miller and Freund's, "Probability and Statistical for Engineers", Prentice Hall of India Pvt., Ltd., New Delhi, Seventh Edition, 2005.
2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, Seventh Edition, 2009.
3. Murray R.Spiegel, Jhon J Schiller, R. AluSrinivasan, "Schaum's Outlines Probability & Statistics", Tata McGraw Hill, New Delhi, 3rd Edition, 2010.
4. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Fifth Edition, Tata McGraw Hill, 2003.
   Edgar G. Goodaire, Michael M. Parmenter, "Discrete Mathematics with Graph Theory", Pearson Education, 3rd Edition, 2003.

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Course Code: 140CP0108	**Course Title:** Data Communication and Networking	
Core	**L : T : P : C**	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	**45**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Differentiate the concepts of various TCP congestion control techniques in wired and wireless networks

CO2. Design wired/ wireless network with suitable IP addressing using manual and auto-configuration appropriately

CO3. Evaluate the performance of a network after applying virtualization concepts and network management protocols

CO4. Analyse various tools and advanced queuing policies used for improving quality of service in a network

CO5. Analyse the characteristics of quality of service offered in various real time applications

UNIT I RELIABLE SERVICES **9**

Packet Switched Network – Congestion Issues and TCP – Managing Congestion – Measuring Network Congestion – Source Based Congestion Control Mechanisms – Congestion Control for Wireless and Multimedia Networks– Fluid Flow Model Congestion Control

UNIT II INTERNETWORKING **9**

Internet Addressing – IPv4 and IPv6 Addressing scheme – IPv6 Transition – Datagram Delivery –Error and Control Messages: ICMPv6 – Bootstrap and Auto-configuration – DHCP – IPv6 Neighbour Discovery Protocol – Mobility and Mobile IP

UNIT III VIRTUALIZATION AND MANAGEMENT **9**

Network Virtualization – Virtual Private Networks – Tunneling and Encapsulation – Network Address Translation – Overlay Networks – Software Defined Networks – Architecture – Open flow Technology. Network Management – Architecture – MIB for IPv6 – SNMP and Security

UNIT IV QUALITY OF SERVICE **9**

QoS Tools – Challenges – Classifiers – Policing and Shaping – Queuing and Scheduling – Queuing Disciplines – Advanced Queuing Concepts – Random Early Discard.

UNIT V QOS IN REAL TIME TRAFFIC **9**

Case Studies – QoS in Virtual Private LAN Service: Classes of Service – Admission Control – Queues and Schedules; QoS in Data Center – Traffic Model – Causes of Congestion; IP RAN and Mobile Backhaul QoS – Network Components and Traffic in 2G/3G and LTE Networks.

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References:

1. Christos N Houmkozlis, George A Rovithakis, "End-to-End Adaptive Congestion Control in TCP/IP Networks", CRC Press, 2012.
2. Douglas E. Comer, "Internetworking with TCP/IP: Principles, Protocol and Architecture Volume I", Sixth Edition, Pearson Education, 2014.
3. Miguel Barreiros, Peter Lundqvist, "QoS Enabled Networks: Tools and Foundations", Second Edition, John Wiley & Sons, 2016.
4. James F. Kurose, Keith W. Ross, "Computer Networking – A top down Approach Featuring the Internet", Seventh Edition, Pearson Education, 2016.

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Course Code: 140CP0107R	**Course Title:** Data Structures and Networks Laboratory	
Core	**L : T : P : C**	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Design efficient algorithms for searching, comparison using suitable data structures and solve real time problems using Online Algorithm design strategy
CO2. Design network using congestion control and network management protocols
CO3. Develop interactive applications using appropriate data structures and controls
CO4. Apply Schema Design, Model representation and Normalization for developing database applications

AREA OF EXPERIMENTS:

Data Structures

- Balanced Tree Structures
- Range Search Data Structures
- String Matching Algorithms
- Solving problems using Online Algorithms

Computer Networks

- Performance evaluation of TCP congestion control
- Network Design and Testing using Simulation tools
- Demonstration of SNMP Monitor and Slave stations

Human Computer Interaction

- Create a simple arithmetic calculator using subscripts to operate with Integers.
- Design a Server application that allows authenticated clients alone for access..

Database Technology

Design and develop Packages for any one of the following suggested topics. Requirements:

a) Schema Design b) E-R Model representation c) Normalization of Relational Database d) Graphical User Interface

- Payroll Management for ABC Corporation.
- Inventory Control System
- Income Tax calculation
- University Grade Sheet Preparation

END OF SEMESTER I

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SEMESTER II

Course Code: 140CP0201	**Course Title:** Advanced Operating Systems	
Core	**L : T : P : C**	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	**45**

Course Outcomes:

At the end of the course the student should be able to:

CO1.Describe the fundamentals of Operating Systems
CO2.Illustrate Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
CO3. Gain insight on distributed resource management components viz. the algorithms for implementation of distributed shared memory and Load distribution
CO4.Illustrate the components and management aspects of Real time systems
CO5.Analyse process scheduling and memory management for Linux based systems

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Processes – Process Scheduling – Deadlocks – Memory Management Techniques: Paging –Segmentation – Virtual Memory.

UNIT II DISTRIBUTED OPERATING SYSTEM 9

Design Issues in Distributed Operating System – Communication Primitives – Distributed Coordination –Event Ordering-Mutual Exclusion – Atomicity – Concurrency Control – Deadlock Handling – Election Algorithms – Reaching Agreement.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues – Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory – Memory Coherence protocols – Issues in Load Distributing – Components – Load Distribution Algorithms – Task Migration.

UNIT IV REAL TIME SYSTEMS 9

Basic Model of Real Time Systems – Characteristics – Applications of Real Time Systems – Real Time Task Scheduling – Handling Resource Sharing.

UNIT V CASE STUDIES 9

Linux System: Design Principles – Kernel Modules – Process Management Scheduling – Memory Management – Distributed Systems: Amoeba.

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References:

1. Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", Eighth Edition, John Wiley & Sons, 2009.
3. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
4. Andrew.S.Tanenbaum, "Distributed Operating Systems", Pearson Education India, Third Edition, 2009.
5. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.

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Course Code: 140CP0202	Course Title: Security in Computing	
Core	L : T : P : C	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	45

Course Outcomes:

At the end of the course the student should be able to:

CO1.Illustrate the basic concepts involved in Cryptography and symmetric ciphers
CO2.Analyze the working of Public Key Encryption and Hash Functions
CO3.Comprehend about various types of security like Program Security, Database and Data Mining Security
CO4.Gain awareness about issues related to Administering Security
CO5.Relate to legal and ethical issues in computer security and privacy in computing

UNIT I SYMMETRIC CIPHERS 9

Introduction – Security Attacks – Security Services – Security Mechanisms – Symmetric Ciphers: Classical Encryption Techniques – Block Ciphers and the Data Encryption Standard – Advanced Encryption Standard.

UNIT II PUBLIC KEY ENCRYPTION AND HASH FUNCTIONS 9

Asymmetric Ciphers: Mathematical Concepts – Public-Key Cryptography and RSA – Other Public-Key Cryptosystems – Message Authentication and Hash Functions: Authentication Requirements –Authentication Functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs.

UNIT III PROGRAM, DATABASE AND DATA MINING SECURITY 9

Secure Programs – Non-malicious Program Errors – Viruses and Other Malicious Code – Targeted Malicious Code – Controls Against Program Threats – Database Security Requirements – Reliability and Integrity – Sensitive Data – Inference – Multilevel Databases – Proposals for Multilevel Security – Data Mining.

UNITIV SECURITY IN NETWORKS AND ADMINISTERING SECURITY 9

Network Concepts – Threats in Networks – Network Security Controls – Firewalls – Security Planning –Risk Analysis – Organizational Security Policies – Physical Security.

UNIT V ISSUES IN COMPUTER SECURITY 9

Privacy Concepts – Privacy Principles and Policies – Authentication and Privacy – Privacy on the Web – E-mail Security – Impacts on Emerging Technologies – Protecting Programs and Data – Information and the Law – Rights of Employees and Employers – Redress for Software Failures – Computer Crime – Ethical Issues in Computer Security.

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References:

1. W. Stallings, "Cryptography and Network Security", Fifth Edition, Prentice Hall, 2010.
2. Charles.P.Pfleeger and Shari Lawrence Pfleeger, "Security in computing", Fourth Edition, Pearson Education, 2007.
3. Behrouz A Forouzan & Debdeep Mukhopadhyay, "Cryptography and Network Security", Second Edition, Tata McGraw Hill Education Pvt Ltd Publication, 2010.
4. Marjie T. Britz, "Computer Forensics and Cyber Crime-An Introduction", Third Edition, Pearson Education, 2013.
5. Bernard L. Menezes,"Network Security and Cryptography", First Edition, Cengage Learning India, 2010.

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Course Code: 140CP0203	**Course Title:** Text and Web Mining	
Core	**L : T : P : C**	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	**45**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Apply text mining task to convert text to numerical vectors
CO2. Differentiate text classification and clustering techniques
CO3. Illustrate the various stages in web content mining process
CO4. Analyze the working of web link mining approaches
CO5. Apply web usage mining principles in real time applications

UNIT I TEXT MINING **8**

Text Mining Tasks – Converting Text to Numerical Vectors: Document standardization – Tokenization –Lemmatization – Vector Generation – POS Tagging – Word Sense Disambiguation – Phrase and named entity recognition – Parsing – Feature generation.

UNIT II TEXT CATEGORIZATION AND CLUSTERING **10**

Text Categorization: Document Classification – Learning to Predict from Text – Performance Evaluation and Applications. Clustering: Document Similarity – Clustering Techniques – Applications and Performance Evaluation.

UNIT III WEB CONTENT MINING **9**

Information Retrieval Models – Relevance Feedback and Evaluation – Web Page Preprocessing – Inverted Index – Latent Semantic Indexing – Web Search – Meta Search – Spamming.

UNIT IV WEB LINK MINING **10**

Social Networks Analysis – Co-Citation and Bibliographic Coupling – Page Rank – HITS Algorithm – Community Discovery. Web Crawlers: Crawling Algorithm – Implementation Issues – Universal and Focused Crawlers – Evaluation and Ethics.

UNIT V WEB USAGE MINING **8**

Data Collection and Preprocessing – Data Modeling – Discovery and Analysis of Web Usage Patterns – Recommender Systems – Collaborative Filtering – Query Log Mining – Computational Advertising.

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References:

1. Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, "Fundamentals of Predictive Text Mining", Springer-Verlag London Limited, 2010
2. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Springer, Second Edition 2011.
3. Charu C. Aggarwal and Cheng Xiang Zhai, "Mining Text Data", Springer, 2012.

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Course Code: 140CP0204R	**Course Title:** Web Engineering	
Core	**L : T : P : C**	3 : 0 : 0 : 3
Type: Theory	Total Contact Hours:	**45**

Course Outcomes:
At the end of the course the student should be able to:

CO1. Outline Web Engineering Components, Principles and Practices
CO2. Analyze Web Engineering models and design Web Applications
CO3. Gain in-depth knowledge about Technologies and Tools for developing Web applications
CO4. Gain expertise in Web Programming Languages
CO5. Appreciate aspects of Web Project Management and Usability Engineering

UNIT I WEB ENGINEERING COMPONENTS **9**
Web Engineering – Framework- Principles – Components – Best Practices – Process Flow – Generic Action and Tasks – Web Communication and Collaboration – Planning and Building Web Engineering Team – Case Studies.

UNIT II WEB ENGINEERING MODELS **12**
Modeling Analysis – Modeling for Web Applications: Content Model , Interaction Model , Function Model and Configuration Model. Web Application Design – Interactive design – Information Design – Function Design – Case Studies.

UNIT III TECHNOLOGIES AND TOOLS **9**
Design Patterns – Technologies and Tools – Testing Web Applications – Change and Content management of Web Application – Construction and Deployment of Web Applications.

UNIT IV WEB PROGRAMMING **9**
HTML 5: Structural Elements –Figures, Captions and Text – Web Pages with WAI-ARIA – Forms. CSS3: Page Layout – CSS Box Model. JavaScript: Handling Scripts and Adding Embedded Script – DOM – Event Listener.

UNIT V USABILITY ENGINEERING **6**
Web Project Management – Objectives, Tasks and Challenges. Web Application Development Process: Requirements, Analysis and Programming. Usability – Characteristics – Design Guidelines – Engineering Methods and Trends.

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References:

1. GertiKappel, Brigit Proll, Siegfried Reich, Werner Retschitzegger , "Web Engineering", John Wiley & Sons Ltd., 2006.
2. Roger Pressman and David Lowe, "Web Engineering – A Practitioner's Approach", Tata McGraw Hill, First Edition, 2008.
3. Douglas Corner, "The Internet Book: Everything you need to know About Computer Networking and How the Internet Works", Prentice Hall, Fourth Edition, 2006.
4. Jennifer Niederst Robbins, "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics", O'Reilly, Fourth Edition, 2012

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Course Code: 140CP0207	**Course Title:** Software Design Laboratory	
Core	**L : T : P : C**	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1.Develop Web based interactive applications using advanced java functions
CO2.Implement encryption and decryption algorithms
CO3.Apply stored procedure for effective data retrieval from database
CO4.Design text and web mining applications using simple machine learning algorithms

Area of Experiments:

1. Networking applications using socket programming with necessary user interfaces using Java Swings.
2. Accessing web pages of a remote server using response redirection
3. Web Applications using Java Servlets.
4. Implementation of Wikis.
5. Execution of stored procedure in the database by using Callable Statement.
6. Encryption and Decryption Algorithms.
7. Text Mining Applications using Java
8. Web Mining Applications using Java

Suggested Text Mining Applications

- Named Entity Recognition
- Document Clustering
- Summarization
- Question Answering

Suggested Web Mining Applications

- Web Crawlers
- Spam Detection
- Link Prediction
- Recommender Systems

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SEMESTER II –ELECTIVES

Course Code: 140CP9111	**Course Title:** Advanced Compiler Design	
Elective	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Gain awareness on the working of various phases of the compiler and the specification and recognition of language tokens
CO2. Construct top-down and bottom-up parsers for simple grammars
CO3. Apply Syntax directed translation schemes for the generation of intermediate code
CO4. Describe run time memory management and code generation techniques
CO5.Apply optimization strategies to improve the code generated by compilers

UNIT I LEXICAL ANALYSIS **9+3**

Grammars and Languages – Structure of the Compiler – Applications of Compiler Technology. Lexical Analysis: Input Buffering – Specification of Tokens – Recognition of Tokens – Finite automata – Regular expression to finite automaton – Optimization of DFA – Based pattern matchers – Lexical Analyzer Generator – LEX.

UNIT II SYNTAX ANALYSIS **9+3**

Role of a parser – Context-free grammars – Top-down parsing – Bottom-up parsing – LR parser – Introduction to language for specifying parser – YACC – Implementation of parser using YACC.

UNIT III SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION **9+3**

Syntax Directed Translation: Syntax-direct definitions – Evaluation Order – Applications and Schemes. Intermediate Code Generation: Intermediate languages – Types and Declarations – Expressions – Type-Checking – Control Flow – Backpatching – Switch statements - Procedures.

UNIT IV CODE GENERATION **9+3**

Run-time Environments: Storage Organization – Stack Allocation – Access to Non local data – Heap Management – Introduction to Garbage Collection. Code Generation: Issues in designing a code generator – Target machine – Basic blocks and flow graphs – Next-use information – A Simple code generator – Register allocation and assignment – Peephole optimization.

UNIT V CODE OPTIMIZATION **9+3**

Principal sources of optimization – Data Flow Analysis – Optimizing for Parallelism and Locality – Matrix Multiplication – Iteration Spaces – Affine Array Indexes – Data Reuse – Array Data-Dependence Analysis – Finding Synchronization free parallelism.

BoS Chairman

References:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers - Principles, Techniques and Tools", Second Edition, Addison- Wesley, 2006.
2. Kenneth.C.Louden, "Compiler Construction Principles and Practice", Vikas publishing House, 2003.
3. Andrew.W.Appel, "Modern Compiler Implementation in Java", Second Edition, Cambridge University Press, 2002.

BoS Chairman

Course Code: 140CP9112R	**Course Title:** Cloud Computing	
Elective	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Describe the evolutionary changes that have occurred in parallel, distributed and Cloud Computing

CO2. Outline the virtualization levels, Architecture, virtualized data centre design and automation in cloud computing

CO3. Illustrate the design principles, architectures and enabling technologies of cloud platform

CO4. Elucidate the implementation and application requirements in cloud

CO5. Explain the Security issues in Cloud computing

UNIT I CLOUD COMPUTING AND MODELS **9+3**

Cloud Computing: Cloud Types – Characteristics – Measuring Cloud Value and cloud computing cost- Cloud Architecture: Cloud Computing Stack – Cloud Services: IaaS – PaaS – SaaS – IDaaS –CaaS.

UNIT II VIRTUALIZATION **9+3**

Implementation Levels of Virtualization – Virtualization Structures, Tools and Mechanisms – Virtualization of CPU, Memory, I/O Devices – Virtual Clusters and Resource management – Virtualization for Data-Centre Automation

UNIT III CLOUD INFRASTRUCTURE **9+3**

Data-Centre Design and Interconnection Networks – Architectural Design of Compute and Storage Clouds – Public Cloud – Inter Cloud Resource Management

UNIT IV PROGRAMMING MODEL **9+3**

Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce –Hadoop Library from Apache- Programming support for Google App Engine – Programming GAE, GFS – Programming on Amazon AWS and Microsoft Azure

UNIT V CLOUD SECURITY **9+3**

Cloud computing security architecture: Architectural Considerations – Identity Management and Access control – Autonomic Security - Cloud computing security challenges: Virtualization security management.

BoS Chairman

References:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing, 2011.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", MorganKaufmann Publishers, 2012.
3. Ronald L. Krutz and Russell Dean Vines "Cloud Security", Wiley Publishing, 2010.
4. John W. Rittinghouse and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
5. TobyVelte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, APractical Approach", TMH, 2009.
6. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, "Cloud Computing for Dummies", Wiley India Edition, 2010.
7. Brian J.S. Chee and Curtis Franklin, Jr, "Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center", CRC Press, 2010.

BoS Chairman

Course Code: 140CP9114	**Course Title:** Object Oriented Software Engineering	
Elective	**L : T : P : C**	3 : 0 : 2 : 4
Type: Theory	Total Contact Hours:	**75**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Characterize the essence of object-oriented software processes and outline the usage of general purpose modeling language in the field of software Engineering
CO2. Analyze the functional requirements for a Object Oriented system
CO3. Apply OO Design concepts, processes, languages, databases, user interfaces, frameworks, and design patterns
CO4. Comprehend the principles of Testing and the strategies for generating system test cases and how object orientation impacts software testing
CO5. Appreciate the need for Configuration Management and gain awareness on SCM activities

UNIT I SOFTWARE ENGINEERING 9+6

Software related problems, software Engineering concepts, development activities, modelling: Concepts, Modelling with UML, Project Organization & Communication: Project Organization & communication concepts and their activities, ARENA Case Study.

UNIT II REQUIREMENT ANALYSIS 8+6

Requirements elicitation & its activities and managing requirements elicitation, Analysis: Analysis overview, concepts, activities and managing analysis, ARENA Case Study.

UNIT III SYSTEM DESIGN 12+6

Design overview, concepts, and activities, addressing design goals and managing system design, Object Design: Object reuse, its activities & managing reuse, Interface specification concepts & its activities, ARENA Case Study.

UNIT IV TESTING 8+6

Testing concepts: Faults, Erroneous States and Failures, Test cases, test Stubs and Drivers, Corrections, Testing Activities: Component Inspection, Usability Testing, Unit Testing, Integration Testing and System Testing, Managing Testing.

UNIT V SOFTWARE CONFIGURATION MANAGEMENT 8+6

Aircraft Example, Overview of Configuration Management, Configuration Management concepts, SCM Activities: SCI, Promotion Management, Release Management, Branch Management, Variant Management , Change Management and Managing Configuration Management.

BoS Chairman

References:

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education Asia, 2010
2. Timothy C. Lethbridge and Robert Laganiere, "Object-Oriented Software Engineering: Practical software development using UML and Java", McGraw-Hill Higher education, 2004.
3. Stephen R Schach, "An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process", Tata McGraw-Hill, 2008.

BoS Chairman

Course Code: 140CP9115	**Course Title:** Open Source Software	
Elective	**L : T : P : C**	3 : 0 : 2 : 4
Type: Theory	Total Contact Hours:	**75**

Course Outcomes:

At the end of the course the student should be able to:

CO1.Understand the concepts of Open Source Web Services
CO2.Design an Open Source database for any given application
CO3.Develop the Groovy code for an application
CO4.Implement MVC based Web application using Grails
CO5.Design the GUI for an application using X Windows

UNIT I INTRODUCTION **9+6**

Open sources – Need– Advantages–Application. Apache Web server – Installation – Working with Web Server – Configuring and using apache web services. MDA: Genesis of MDA – Meta Object Facility – UML – UML Profiles – MDA Applications.

UNIT II OPEN SOURCE DATABASE **9+6**

Open Source data bases – MySQL Introduction – MySQL workbench – Database Design &Modeling, Visual SQL Editor, Connection Management, Database Administration. NoSQL database : MongoDB – Schemaless Database, Collections, Documents, fields.

UNIT III OPEN SOURCE PROGRAMMING LANGUAGE: GROOVY **9+6**

Groovy as extension of Java – Data types, Control structures, Special loops& operators – List, Map, String, Date – Closure – Object Oriented groovy – Builders – Working with databases.

UNIT IV OPEN SOURCE PROGRAMMING FRAMEWORK: GRAILS **9+6**

Grails – commands – Web system evolution – Data Layer scaffolding – Injection Attacks – Plugin – Unit and integration testing – Service layer

UNIT V X WINDOWS DEVELOPMENT ENVIRONMENT **9+6**

X Window System – GTK+ and Supporting Libraries – Installing GTK+ – Basic Programs using Window, Label, Container, Layout, Events, Buttons – Dialog: Single Page, Multipage, Progress Bar – Glib Basics – Menus and Toolbars – Calendars – Printing Support – Recent Files.

BoS Chairman

References:

1. Stephen J. Mellor, Marc Balces, "Executable UMS: A foundation for MDA", Addison, 2002.
2. Vikram Vaswani, "MYSQL: The Complete Reference", Second Edition, Tata McGraw Hill, Indian Reprint, 2009.
3. Kristina Chodorow, Michael Dirolf, "MongoDB: The Definitive Guide Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publication, 2010.
4. Bashar Jawad, "Groovy and Grails Recipes", First Edition, APress Publication, 2008.
5. Jim Shingler, Joseph Faisal Nusairat, Christopher M. Judd, "Beginning Groovy and Grails: From Novice to Professional", APress, 2008.
6. Andrew Krause, "Foundations of GTK+ Development", APress , 2007.

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Course Code: 140CP9116	**Course Title:** Parallel Computing	
Elective	**L : T : P : C**	3 : 0 : 2 : 4
Type: Theory	Total Contact Hours:	**75**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Illustrate the working principles of parallel computing hardware and software architectures
CO2. Comprehend the models and issues related to parallel computing
CO3. Design and Analyze parallel algorithms
CO4. Develop parallel programs using the message passing paradigm
CO5. Develop Shared Memory programs using PThreads and OpenMP

UNIT I PARALLEL HARDWARE AND PARALLEL SOFTWARE 9+6

Need for Parallel Computing – Concurrency in computing – Von Neumann Architecture and modifications – Parallel Hardware – Parallel Software.

UNIT II PARALLEL ALGORITHM DESIGN 9+6

Task / Channel Model – Foster's Design Methodology – Examples – Adding Data Input – Performance Analysis – Speedup and Efficiency – Metrics and Laws.

UNIT III MESSAGE PASSING PARADIGM 9+6

MPI programming – MPI communicators – Single Program Multiple Data programs – Communication – Message matching – MPI I/O – Collective communication – Performance evaluation of MPI programs

UNIT IV SHARED MEMORY PROGRAMMING WITH PTHREADS 9+6

Processes, Threads and PThreads - Thread synchronization – Critical Sections – Busy-Waiting – Mutexes – Semaphores – Barriers and Condition variables – Read-Write locks – Cache coherence – Thread safety.

UNIT V SHARED MEMORY PROGRAMMING WITH OPENMP 9+6

OpenMP programming – Scope of variables – Reduction clause – Loops in OpenMP – Scheduling loops – Synchronization – Producer-Consumer problem – Cache issues – Thread safety in OpenMP.

BoS Chairman

References:

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.
2. M. J. Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
3. Kai Hwang and Zhi Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, 2003.

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Course Code: 140CP9117	**Course Title:** Software Quality Assurance and Testing	
Elective	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Analyze the various concepts, metrics, and models of Software Quality Assurance
CO2.Illustrate the components and frameworks of SQA
CO3.Apply project management standards and cost analysis in real world applications
CO4.Describe about basics of software testing and test generation strategies
CO5.Describe the need for test generation from Requirements and assess the adequacy in Testing

UNIT I SOFTWARE QUALITY ASSURANCE 8+3

Introduction to Software Quality – Challenges – Objectives – Quality factors – Components of SQA – Contract Review – Development and Quality plans – SQA Components in Project life cycle – SQA Defect Removal Policies – Reviews.

UNIT II SOFTWARE QUALITY ASSESSMENT 9+3

Hierarchical models of software quality – Software quality metrics – Function points – Software product quality – Software maintenance quality – Effect of case tools – Software quality infrastructure – Procedures – Certification – Configuration management – Documentation control

UNIT III PROJECT MANAGEMENT 9+3

Project progress control – Costs – Quality management standards – Project process standards – Management and its role in SQA –SQA unit

UNIT IV SOFTWARE TESTING 10+3

Principles of Testing strategies – White box and Black box approach – Integration testing – System and Acceptance testing – Performance Testing – Regression testing – Internationalization Testing – ad-hoc testing – Website testing – Usability testing – Accessibility testing.

UNIT V TEST GENERATION AND ADEQUACY 9+3

Test Generation from Requirement- Test Generation from Finite state models- Test Generation from Combinatorial Designs – Test Adequacy assessment using control flow and Data Flow.

BoS Chairman

References:

1. Daniel Galin, "Software Quality Assurance – From Theory to Implementation", Pearson Education, 2009.
2. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Second Edition, Pearson education, 2006.
3. AdityaMathur, "Foundations of Software Testing", Pearson Education, 2008.
4. Ron Patton, "Software Testing", Second Edition, Pearson education, 2007.

BoS Chairman

Course Code: 140CP9128	**Course Title:** Digital Image Processing	
Core	**L : T : P : C**	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	**60**

Course Outcomes:

At the end of the course the student should be able to:

CO1. Describe the theoretical foundation for image processing methods
CO2. Examine the categories of spatial processing with performing some operations such as image sharpening and smoothing
CO3. Model a specification of a coordinate, a subspace and mathematical framework within the system
CO4. Analyse an image by detecting the isolated points,edge and boundary parameters
CO5. Identify appropriate motion models and perform segmentation for video processing

UNIT I INTRODUCTION **9+3**

Introduction - Steps in Digital Image processing-Elements of visual perception, Image Sensing and Acquisition, Image Sampling and Quantization, Basic relationships between pixels: neighborhood, adjacency, connectivity, distance measures-Image Transforms: DFT, DCT, Hadamard, Haar, KL

UNIT II IMAGE ENHANCEMENT AND RESTORATION **9+3**

Gray level transformations-histogram equalization and specifications - smoothing filters: linear and Non-linear - pixel-domain sharpening filters: first and second derivative, frequency domain filters: low-pass and high-pass - Model of Image Degradation/Restoration Process-Noise Models.

UNIT III COLOR IMAGE AND MULTI RESOLUTION PROCESSING **9+3**

Color fundamentals-Color models–RGB, YUV, HSI; Color transformation: formulation, color complements, color slicing, tone and color corrections- Color image smoothing and sharpening-Color image Segmentation- Wavelet Transform and Multi-resolution Processing

UNIT IV IMAGE COMPRESSION AND SEGMENTATION **9+3**

Image Compression: Redundancies, Image compression standards, Lossy and Loss-less predictive coding-Image Segmentation: Detection of isolated points, Line, edge linking and boundary - Thresholding: global and adaptive – Region based segmentation.

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UNIT V VIDEO PROCESSING **9+3**

Introduction: Digital Video and its applications - 2D Apparent Motion Models and its Estimation – Video Compression standards: MPEG-1, MPEG-2 and H.26X - Video Segmentation: Change detection, Motion segmentation and tracking.

References:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 3rd Edition, Pearson Education 2013.
2. Anil K Jain, Fundamentals of Digital Image Processing, Edition, Prentice Hall of India, 1998.
3. Murat Tekalp , Digital Video Processing, Second Edition, Prentice Hall, 2015
4. Milan Sonka , Digital Image Processing and Computer Vision, Thomson publication, Second Edition.2007.

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Course Code: 140CP9129	**Course Title:** Mobile Application Development	
Elective	**L : T : P : C**	3 : 0 : 2 : 4
Type: Theory	Total Contact Hours:	**75**

Course Outcomes:

At the end of the course the student should be able to:

CO1 : Describe the requirements for mobile application design and development.
CO2 : Implement the simple application using basic concepts of Android.
CO3 : Design a mobile applications using effective UI elements.
CO4 : Build mobile applications using Graphics and sensors elements.
CO5 : Create an application using Android database concepts.

UNIT I Mobile Application Basics **9+6**

Mobile Strategies - Mobile Myths - Mobile Applications - Marketing - Mobile Application Users - Mobile Information Design - Mobile Platforms - Mobile Interface Design - Mobile Websites

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UNIT II Android Basics **9+6**

Android Features - Operating System - Google Play - Packages - Software Development Kit (SDK) - Object-Oriented Programming - Building Android Apps - Case Study : Tip Calculator

Unit III UI Design Elements **9+6**

Technologies-Creating an App - Android Studio Window - Layout Editor- Internationalizing - Fragments- Menus- Preferences- Explicit Intents- Handler- Asset Manager- Tweened Animations- Animators- Color State Lists- Layouts for Multiple Device Orientations- Debugging. Case Study: Flag Quiz App

Unit IV Graphics and Sensor Elements **9+6**

2D Graphics- Canvas- Bitmap- Accelerometer- Sensor Manager- Multitouch Events- MediaStore- Printing- Permissions- Gradle – Shared Preferences- Implicit Intents- Intent Choosers- Recycler View– Case Study : Twitter Searches App

Unit V Android Database **9+6**

Fragment Transactions-Fragment Back Stack- SQLite- Content Provider- Content Resolver- Loader- Loader Manager- Cursor and Styles – Case Study: Address Book App

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References:

1. Jeff McWherter, Scott Gowell, " Professional Mobile Application Development", Wrox Ltd., 2012.
2. Paul J. Deitel , Harvey Deitel , Alexander Wald , "Android 6 For Programmers An App-Driven Approach", Prentice Hall,2015.
3. Sunny Kumar Adithya, Vikash Kumar Karn,"Android SQLite Essentials", Packt Publishing Ltd,2014.
4. Jessica Thornsby,"Android UI Design", Packt Publishing Ltd,2016.

END OF SEMESTER II

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