COURSE STRUCTURE FOR M. TECH. DEGREE PROGRAMME

FIRST YEAR

FIRST SEMESTER								
		Theory				Practical		
Code	Course name	Hours/Week (L/T)	Credit Theory	University Marks	Internal Evaluation	Hours / Week (L)	Credit Practical	Marks
MCSPC1010	Internet of Things	3-1	4	70	30	-	-	-
MCSPC1020	Advanced Data Structure and Algorithm	3-1	4	70	30	-	-	-
MCSPC1030	Applied Probability and Statistics	3-1	4	70	30	-	-	-
MCSPE1041	Advanced Computer Architecture	3-0	3	70	30	-	-	-
MCSPE1042	Parallel Computing							
MCSPE1043	J2EE							
MCSPE1044	Information Extraction and Retrieval							
MCSPE1051	Data ware housing & Data Mining	3-0	3	70	30	-	-	-
MCSPE1052	Cryptography							
MCSPE1053	Graph Theory							
MCSPE1054	Embedded System							
MCSES1160	Advanced Laboratory					8	4	100
	TOTAL	**15-3**	**18**	**350**	**150**	**8**	**4**	**100**
	TOTAL MARKS: 600							
	TOTAL CREDITS: 22							

SECOND SEMESTER								
		Theory				Practical		
Code	Course name	Hours/Week (L/T)	Credit Theory	University Marks	Internal Evaluation	Hours / Week (L)	Credit Practical	Marks
MCSPC2010	Data Analytics	3-1	4	70	30	-	-	-
MCSPC2020	Advanced Database and Advanced Operating System	3-1	4	70	30	-	-	-
MCSPE2031	Mobile Computing	3-0	3	70	30	-	-	-
MCSPE2032	Compiler Optimization Techniques							
MCSPE2033	Digital Image Processing							
MCSPE2034	Design and Analysis of Parallel Algorithms							
MCSPE2041	Soft Computing Methods and Techniques	3-0	3	70	30	-	-	-
MCSPE2042	Advanced Machine Learning							
MCSPE2043	Bio Informatics							
MCSPE2044	Software Quality Assurance							
MCSPE2051	Mobile Application Development	3-0	3	70	30	-	-	-
MCSPE2052	Robotics							
MCSPE2053	Medical Image Processing							
MCSPE2054	Embedded Software Development							
MCSES2160	Specialized Laboratory	-	-	-	-	8	4	100
MCSES2170	Seminar I					4	2	100
	TOTAL	**15-3**	**17**	**350**	**150**	**12**	**6**	**200**
	TOTAL MARKS:700							
	TOTAL CREDITS: 23							

THIRD SEMESTER								
		Theory				Practical		
Code	Course name	Hours/Week (L/T)	Credit Theory	University Marks	Internal Evaluation	Hours / Week (L)	Credit Practical	Marks
MCSOE3011	Software Process and Project Management	3-0	3	70	30	-	-	-
MCSOE3012	Wireless Sensor Network							
MCSOE3013	Computational Finance							
MCSOE3014	Sensing Techniques and Sensors							
MCSES3120	THESIS I	-	-	-	-	8	18	100
MCSES4130	Seminar I I	-	-	-	-	4	2	100
	TOTAL	**3-0**	**3**	**70**	**30**	**12**	**20**	**200**
	TOTAL MARKS:300							
	TOTAL CREDITS: 23							

FOURTH SEMESTER								
		Theory				Practical		
Code	Course name	Hours/Week (L/T)	Credit Theory	University Marks	Internal Evaluation	Hours / Week (L)	Credit Practical	Marks
MCSOE3011	THESIS I I	-	-	-	-	8	18	100
MCSES3120	Seminar I I I	-	-	-	-	2	2	100
MCSES4130	Comprehensive Viva Voce					2	2	100
	TOTAL	**-**	**-**	**-**	**-**	**12**	**22**	**300**
	TOTAL MARKS:300							
	TOTAL CREDITS: 22							

Gandhi Institute of Engineering & Technology, Gunupur

(AUTONOMOUS)

M.Tech (Computer Science & Engineering) Syllabus

FIRST SEMESTER

Subject: Internet of Things

Subject code:MCSPC1010
L-T-P - 3-1-0

Credit: 3-1-0

Total Number of Hours: 48

Internet of Things

UNIT I [14 Hours]

lntroduction to lnternet of Things:
lntroduction-Definition & Characteristics of loT , Physical Design of loT- Things in loT , loT Protocols, Logical Design of loT- loT Functional Blocks, loT Communication Models, loT Communication APls , loT Enabling Technologies- Wireless Sensor Networks , Cloud Computing, Big Data Analytics , Communication Protocols , Embedded Systems, loT Levels & Deployment Templates.

UNIT II [18 Hours] Domain Specific loTs: Home Automation: Smart Lighting, Smart Appliances, lntrusion Detection, Smoke/Gas Detectors,
Cities-Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response,
Environment-Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, Energy- Smart Grids, Renewable Energy Systems, Prognostics,
Retail-lnventory Management, Smart Payments, Smart Vending Machines
Logistics- Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics,
Agriculture- Smart lrrigation, Green House Control,
lndustry - Machine Diagnosis & Prognosis lndoor Air Quality Monitoring, Health & Lifestyle - Health & Fitness Monitoring, Wearable Electronics loT and M2M lntroduction, M2M-Difference between loT and M2M, SDN and NFV for loT- Software
Defined Networking, Network Function Virtualization loT Platforms Design Methodology
loT Design Methodology-Purpose & Requirements Specification ,Process Specification, Domain Model Specification, lnformation Model Specification , Ser vice Specifications , loT Level Specification, Functional View Specification , Operational View Specification , Device & Component lntegration , Application Developmnt,

UNIT III [16 Hours] Case Study on loT System for Weather Monitoring, Motivation for Using Python loT Physical Devices & Endpoints

Subject: Internet of Things

Subject code: MCSPC1010

L-T-P - 3-1-0

Credit: 4

Total Number of Hours: 48

What is an IoT Device-Basic building blocks of an IoT Device,
Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi , Raspberry Pi Interfaces - Serial, SPI , I2C , Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry Pi ,Interfacing a Light Sensor (LDR) with Raspberry Pi , Other IoT Devices- pcDuino, Beagle Bone Black , Cubieboard
IoT & Beyond : Use of Big Data and Visualization in IoT, Industry 4.0 Concepts. Overview of RFID, Low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data- intensive IoT for continuous recognition applications. Overview of Android / IOS App Development tools & Internet Of Everything

Text Book

1. Internet of Things, A Hands on Approach [Arshdeep Bahga & Vijay Maudisetti, University Press.]
2. **Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence** [Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2014]
3. **Rethinking the Internet of Things: A Scalable Approach to Connecting Everything,[** Francis daCosta, 1st Edition, Apress Publications, 2013**]**

Reference Book

1. **Getting Started with the Internet of Things [Cuno Pfisher, Maker Media, Inc,(O'Reilly)]**

Subject: Advanced Data Structure and Algorithm

L-T-P : 3-1-0

Subject code:MCSPC1020
Credit: 4

Total Number of Hours: 46

Advanced Data Structure and Algorithm

UNIT I [12 Hours]
Heap Structure: Min-Max heap, Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps, Lazy binomial heaps, Deap Data structure.

UNIT II [16Hours] Search and Multimedia Structure: Binary Search Tree, AVL Tree, 2-3 Tree, B-Tree, B+ Tree, Red-Black Tree, Segment Tree, k-d Tree, Point Quad Trees, R-Tree, TV- Tree.

UNIT III [18 Hours]
Asymptotic Notations, Dynamic Programming (LCS, Floyd-Warshall Algorithm, Matrix Chain Multiplication), Greedy Algorithm (Single Source Shortest Path, Knapsack problem, Minimum Cost Spanning Trees), Geometric Algorithm (Convex hulls, Segment Intersections, Closest Pair), Internet Algorithm (Tries, Ukonnen's Algorithm, Text pattern matching), Numerical Algorithm (Integer, Matrix
and Polynomial multiplication, Extended Euclid's algorithm) ,
Polynomial Time, Polynomial-Time Verification, NP Completeness & reducibility, NP Completeness proofs, Cook's theorem

Subject: Advanced Data Structure and Algorithm

L-T-P : 3-1-0

Subject code:MCSPC1020

Credit: 4

Total Number of Hours: 44

Text Book

1. **T. H. Cormen, C. E. Leiserson, and R. L. Rivest, "Introduction to Algorithms", PHI.**
2. **E. Horowitz, S. Sahani and Dinesh Mehta, Fundamentals of Data Structures in C++, 2nd Ed, University Press.**
3. **Mark Allen Weiss, "Data Structures & Algorithm Analysis in C/C++", Pearson Edu. India.**
4. **Adam Drozdex, Data Structures and algorithms in C++, Thomason learning.**

Subject: Applied Probability and Statistics

L-T-P : 3-1-0

Subject code: MCSPE1030

Credit: 4

Total Number of Hours: 46

Applied Probability and Statistics

UNIT I [12 Hours] ONE DIMENSIONAL RANDOM VARIABLES and TWO DIMENSIONAL RANDOM VARIABLES

Random variables - Probability function - Moments - Moment generating functions and their properties - Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions - Functions of a Random Variable.

Joint distributions - Marginal and Conditional distributions - Functions of two dimensional random variables - Regression Curve - Correlation.

UNIT II [14 Hours]

ESTIMATION THEORY and TESTING OF HYPOTHESES

Unbiased Estimators - Method of Moments - Maximum Likelihood Estimation - Curve fitting by Principle of least squares - Regression Lines.

Sampling distributions - Type I and Type II errors - Tests based on Normal, t,2 and F distributions for testing of mean, variance and proportions - Tests for Independence of attributes and Goodness of fit.

UNIT III [18 Hours]

MULTIVARIATE ANALYSIS

Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density and its properties - Principal components Population principal components - Principal components from standardized variables.

Text Books:

1. **Jay L. Devore, "Probability and Statistics For Engineering and the Sciences",Thomson and Duxbury, 2002.**
2. **Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice –Hall , Seventh Edition, 2007.**
3. **Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Asia, Fifth Edition, 2002.**
4. **Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan an Sons, 2001.**
5. **Dallas E Johnson , "Applied Multivariate Methods for Data Analysis", Thomson an Duxbury press,1998.**

Subject: Advanced Computer Architecture

Advanced Computer Architecture

L-T-P : 3-0-0

Subject code: MCSPE1041

Credit: 3

Total Number of Hours: 46

UNIT I [12 Hours]

Principles of Processor Performance, RISC and CISC Architectures, Pipelining fundamentals, Pipeline Hazards, Superscalar Architecture, Super Pipelined Architecture, VLIW Architecture.

UNIT II [16Hours]

Basic Multiprocessor Architecture: Flynn's Classification, UMA, NUMA, Distributed Memory Architecture, Array Processor, Vector Processors, Associative Processor, Systolic architecture. Interconnection Networks: Static Networks, Network Topologies, Dynamic Networks.

UNIT III [18 Hours]

Hierarchical Memory Technology: Data and Instruction caches, Multi-level caches, Cache memory mapping policies, Cache Coherence, Cache Performance, Virtual memory, Page replacement techniques, Memory Inter leaving, Memory Management hardware.
Data Flow Computer Architecture: Static Data flow computer, Dynamic Data flow computer, Cluster computers, Distributed computing, Cloud computing.

Text Books:

1. **David A. Patterson and John L. Hennessy, Computer Organization and Design, Elsevier.**
2. **John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann**
3. **Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.**
4. **K. Hwang and F. A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill.**
5. **Computer Architecture: Parhami, Oxford University Press**

Subject: Parallel Computing

Parallel Computing

L-T-P : 3-0-0

Subject code: MCSPE1042

Credit: 3

Total Number of Hours: 46

UNIT I [12 Hours]

FUNDAMENTALS OF PARALLEL COMPUTING:
Need for Parallel Computing - Parallel Computer Models - ILP, TLP and Data Parallelism - Parallel Programming Overview - Processes, Tasks and Threads - Parallel Programming Models - Shared Memory Programming - Message Passing Paradigm - Interaction and Communication - Interconnection Networks.

UNIT II [16Hours]

CHALLENGES OF PARALLEL PROGRAMMING:
Identifying Potential Parallelism - Techniques for Parallelizing Programs - Issues - Cache Coherence issues - Memory Consistency Models - Maintaining Memory Consistency - Synchronization Issues - Performance Considerations.
SHARED MEMORY MODELS AND OPENMP PROGRAMMING
OpenMP Execution Model - Memory Model and Consistency - Open MP Directives - Run Time Library Routines - Handling Data and Functional Parallelism - Performance Considerations.

UNIT III [18 Hours]

MPI PROGRAMMING
The MPI Programming Model - MPI Basics - Circuit Satisfiability - Global Operations
- Asynchronous Communication - Collective Communication - Other MPI Features -
Performance Issues - Combining OpenMP and MPI. PROGRAMMING HETEROGENEOUS PROCESSORS
GPU Architecture - Basics of CUDA - CUDA Threads - CUDA Memories - Synchronization Handling - Performance Issues - Application Development. Introduction to OpenCL.

Text Books:

1. **John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 5th. Edition, 2012.**
2. **Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.**
3. **Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.**
4. **David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufmann, 2010.**

Reference Books:

1. **Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", Second Edition, Pearson Education Limited, 2003.**
2. **Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.**
3. **Ian Foster, "Designing and Building Parallel Programs: Concepts and Tools for Parallel oftware Engineering", Addison Wesley Longman Publishing Co., USA, 1995.**
4. **David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A hardware/ Software approach" , Morgan Kaufmann / Elsevier Publishers, 1999.**
5. **OpenMP Programmer's Manual.**
6. **MPI Programmer's Manual**

Subject: J2EE

L-T-P : 3-0-0

Subject code: MCSPE1043

Credit: 3

Total Number of Hours: 46

J2EE

UNIT I [12 Hours]

Enterprise Java Programming: Overview, Java EE 6 API, Web Applications, Java Servlet Technology: -Lifecycle of a Servelet,Servelet API, Servlet Packages, Types of servlets, Database Access, Stateless and Stateful protocols, Session Tracking. JSP Technology: -Architecture & Anatomy of JSP Page, JSP life cycle, JSP with MVC Architecture, Dynamic webpage Creation, Scripting Elements, Session Tracking, Database access, JSTL, JavaServer Faces (JSF) Technology, Facelets, Ajax.

UNIT II [18Hours]

Web Services: JAX P: SAX,DOM,, JAX B:XJC, Marshaling , Unmarshaling , WSDL, JAX-WS: Apache axis 2 implementation contract first, contract last, Building consumer , RPC
encoded , RPC literal , Document /Encoded , Document /Literal, Document/Wrapped , SOAP. JAX-RS
Advanced Technologies -Frameworks : Struts :Introduction, Features and Architecture,The MVC Design Pattern, Hibernate:Introduction to O-R Mapping, Hibernate Basics, Hibernate Architecture, Hibernate Configurations, POJO (Plain Old Java Classes) classes and O/R Mapping, Hibernate Query Language

UNIT III [16 Hours]

Spring :IOC, dependency Injection , Constructor injection, setter injection ,type, index ,name attributes , Collection injection , Bean inheritance, IDRef, Bean aliasing , Bean scopes , Automating, Nested bean factories, dependency Check, dependency On, Aware interface, static factory
method, Instance factory method, Factory Bean, Method replacement , look up method injection , Properties editors , Internationalizations(I18 N), Bean POST Processor , Bean factory POST Processor , Event Factory vs Application Context , Spring AOP, Spring Integration with Hibernate, Spring integration with Struts, Introduction to design pattern.

Text Books:

1. **Eric Jendrock, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, "The Java EE6 Tutorial", Volume-1, Fourth Edition, 2010, Pearson India, New Delhi. Chapters: 1, 3, 4, 5, 7, 9 to 12, 14 to 16, 17, 19, 23, 26, 27, 28.2.**
2. **Ralph Moseley, "Developing Web Applications", 2008, Wiley India, New Delhi.**
3. **Kongent S., "Java Server Programming (JEE 6) Black Book, Platinum Edition", 2008, Dreamtech / Wiley India Pvt. Ltd.**
4. **David Geary, Cay S. Horstmann, "Core JavaServer Faces", Second Edition, 2007, Pearson Education, Inc. New Delhi.**
5. **Java 7 JAX-WS Web Services by Deepak Vohra**
6. **Building a Restful Web Service with Spring by LudovicDewailly**
7. **Spring in Action by Craig Walls**
8. **Hibernate in Action by Christian Bauer Gavin King**

Subject: **Information Extraction and Retrieval**

L-T-P : 3-0-0

Subject code:MCSPE1044

Credit: 3

Total Number of Hours: 46

Information Extraction and Retrieval

UNIT I [12 Hours]

Introduction to Information Retrieval
The nature of unstructured and semi-structured text.Inverted index and Boolean queries. Text Indexing, Storage and Compression Text encoding: tokenization, stemming, stop words, phrases, index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf'sLaw.Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

UNIT II [18Hours]

Retrieval Models Boolean, vector space, TFIDF, Okapi, probabilistic, language modeling, latent semantic indexing.Vector space scoring.Thecosine measure Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio. Performance Evaluation Evaluating search engines.User happiness, precision, recall,
F-measure. Creating test collections: kappa measure, inter judge agreement.
Text Categorization and Filtering
Introduction to text classification. Naive Bayes models. Spam filtering. Vector space Classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.
Text Clustering Clustering versus classification. Partitioning methods. k-means clustering.
Mixture of gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.

UNIT III [16 Hours]

Advanced Topics Summarization, Topic detection and tracking, Personalization, Question answering, Cross language informtion retrieval Web Information Retrieval Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS. Retrieving Structured Documents XML retrieval, semantic web

Text books:

1. **Introduction to Information Retrieval Manning, Raghavan and Schutze, Cambridge University Press, draft.**
2. **Modern Information Retrieval Baeza-Yates and Ribeiro-Neto, Addison Wesley, 1999.**
3. **A comprehensive survey by Ed Greengrass Mining the Web, Soumen Charabarti, Morgan Kaufmann, 2002.**

Subject: **Data ware housing & Data Mining**

L-T-P : 3-0-0

Subject code: MCSPE1051

Credit: 3

Total Number of Hours: 46

Data ware Housing & Data Mining

UNIT I [12 Hours]

Introduction to Data Mining, Paradigm, Computing Paradigm, Business Paradigm, Business Problem Definition, Operational & informational Data stores, Data Warehouse Definition & characteristics, Data Warehouse Architecture, Client /Server Computing Model & Data Warehouse, Overviews of Client/server Architecture, Server specialization in client/server computing Environment, Server Function, Server H/W Architecture RISC verses CISC, Multiprocessor System, SMP implementation, Parallel Processors and Cluster Systems,

UNIT II [18Hours]

Distributed Memory Architecture, Cluster System, Advances in Multiprocessing Architecture, Server Operating System, Operating System Implementation Data Warehousing Component, Overall Architecture, Data Warehouse Database Sourcing, Acquisition, Cleanup &transformation Tools, Metadata, Access Tools, Data Marts, Data Warehouse Administration and Management, Information Delivery System, Business & Data Warehouse, Business Consideration :Return& Investment, Design Consideration, Implementation Consideration, Benefits of Data Warehousing, Mapping the Data Warehouse to Multi Processor Architecture, Database architecture for Parallel Processing, Shared Memory Architecture, Shared Disk Architecture, Shared Nothing Architecture, Combined Architecture

UNIT III [16 Hours]

Introduction to Data Mining, Measuring Data Mining effectiveness: Accuracy , speed & Cost, Embedding Data Mining into your Business Process, Discovery verses Prediction, Comparing the Technology, Business Score Card, Application Score Card, Algorithm Scorecard, Decision Tree, CART, CHAID, Growing the Tree, When does the Tree stop growing, Strength & Weakness, Algorithm Score Card, Neural Network, Different types of neural N/W, Kohonen feature maps, Nearest Neighbor and Clustering, Business Score Card Where to use clustering & nearest neighbor prediction, Clustering for clarity, Clustering for out layer analysis, Nearest Neighbor for prediction, Application Score Card

Text Books :

1. **Data Warehousing, Data Mining & OLAP by Alex & Stephen, McGraw Hill.**

Subject: **Cryptography**

L-T-P : 3-0-0

Subject code:MCSPE1052

Credit: 3

Total Number of Hours: 46

Cryptography

UNIT I [12 Hours]

Introduction to Cryptography: Basics of Symmetric Key Cryptography, Basics of Assymetric Key Cryptography, Hardness of Functions Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption.
Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations

UNIT II [18Hours]

Formal Notions of Attacks: Attacks under Message Indistinguishability: Chosen Plaintext Attack(IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and INDCCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Interrelations among the attack model Random Oracles: Provable Security and asymmetric cryptography, hash functions
One-way functions: Weak and Strong one way functions Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudorandom Functions (PRF) Building a Pseudorandom Permutation: The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction Left or Right Security (LOR)

UNIT III [16 Hours]

Message Authentication Codes (MACs): Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing
Assumptions for Public Key Signature Schemes: One way functions Imply Secure One-time Signatures Shamir's Secret Sharing Scheme Formally Analyzing Cryptographic Protocols Zero Knowledge Proofs and Protocols

Text BOOKS:

1. **Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson, 2007.**
2. **Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India,2006.**
3. **XueBai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.**
4. **Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.**

Subject: **Graph Theory**

L-T-P : 3-0-0

Subject code:MCSPE1053

Credit: 3

Total Number of Hours: 46

Graph Theory

UNIT I [16 Hours]
Basic Concepts: Graphs and digraphs, incidence and adjacency matrices, isomorphism, the automorphism group; Trees: Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem, minimum spanning trees; Connectivity: Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger s theorem; Paths and Cycles: Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, girth, circumference, the Chinese Postman Problem, the Travelling Salesman problem, diameter and maximum degree, shortest paths

UNIT II [18Hours] Matchings: Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching (in both bipartitie and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f-factor theorem.

Extremal problems: Independent sets and covering numbers, Turan's theorem, Ramsey theorems; Colorings: Brooks theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number, Vizing's theorem; Graphs on surfaces: Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2-cell embeddings, graphs on other surfaces; Directed graphs: Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branchings.

UNIT III [12 Hours] Networks and flows: Flow cuts, Max flow min cut theorems, perfect square; Selected topics: Dominating sets, the reconstruction problem, intersection graphs, perfect graphs, random graphs.

Text Books:

1. **T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Prentice Hall of India, 3rd ed, 2006.**
2. **N. Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2004.**

Reference Books:

1. **D. B. West, Introduction to Graph Theory, 2nd Ed, Prentice Hall of India, 2007.**
2. **R. Diestel, Advanced Graph Theory, Springer Verlag Heidelberg, New York, 2005.**
3. **M. T. Goodrich and R. Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Wiley, 1st ed, 2001.**

Subject: **Embedded System**

Embedded System

L-T-P : 3-0-0

Subject code: MCSPE1054

Credit: 3

Total Number of Hours: 46

UNIT I [16 Hours]
Introduction: Features of Embedded systems, Design matrices, Embedded system design flow, SOC and VLSI circuit. ARM: An advanced Micro Controller, Brief history, ARM pipeline, Instruction Set Architecture ISA: Registers, Data Processing Instructions, Data Transfer Instructions, Multiplications instructions, Software interrupt, Conditional execution, branch instruction, Swap instruction, THUMB instructions. FPGA
Devices and device drivers, I/O devices, Serial peripheral interfaces, IIC, RS232C, RS422,
RS485, Universal serial bus, USB Interface, USB Connector IrDA, CAN, Bluetooth, ISA, PCI, PCI - X and advance busses, Device drivers.

UNIT II [18Hours] Real time operating system: Hard real time, firm real time, soft real time, Task periodicity: periodic task, sporadic task, aperiodic task, task scheduling, scheduling algorithms: clock driven scheduling, event driven scheduling.
Software and programming concept: Processor selection for an embedded system, State chart, SDL, PetriNets, Unified Modeling Language (UML).
Low power embedded system design: Dynamic power dissipation, Static power dissipation, Power reduction techniques, system level power management. UNIT III [12 Hours] Hardware and software partitioning: K-L partitioning, Partitioning using genetic algorithm, particle swarm optimization, Functional partitioning and optimization: functional partitioning, high level optimizations. Hardware software co-simulations

Text Books:

1. **"Embedded System Design " by SantanuChattopadhay, PHI**
2. **"Embedded system architecture, programming and design" By Raj Kamal, TMH**

Reference Books:

1. **"Hardware software co-design of Embedded systems" By Ralf Niemann, Kulwer Academic.**
2. **"Embedded real time system programming" By Sriram V Iyer, Pankaj Gupta, TMH.**

Subject: **Advanced Laboratory**

L-T-P : 0-0-8

Subject code: MCSPE1054

Credit: 4

Total Number of Hours: 20

Advanced Laboratory

(Advanced Data Structure and Algorithm + Internet of Things Lab)

This laboratory includes the Experiments from "Advanced Data Structure and Algorithm" and "Internet of Things Lab".

Subject: **Data Analytics**

L-T-P : 3-1-0

Subject code:MCSPC2010
Credit: 4

Total Number of Hours: 44

Data Analytics

Unit-01: [12 Hours]
Assessing Performance of a classification Algorithm (Z test, t-test, Chi-square test, Paired t test, paired F-test), Analysis of Variance, Creating data for analytics through designed Experiments.

Unit 02: [16 Hours]
Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection , Ridge regression, Lasso regression , Linear Discriminant Analysis , Logistic regression , Perceptron learning algorithm. Bias, Variance, and model complexity, Bias-variance trade off.

Unit 03: [16 Hours]
Cross- validation, Boot strap methods Regression and classification trees, K-NN classification, SVM for classification, neural networks, Back propagation, Association rules, Cluster analysis, Principal Components, Random forests and analysis
Introduction to big data and Challenges for big data analytics.

Text Books:

1. **Trevor Hastie, Robert Tibshirani, Jerome Friedman , *The Elements of Statistical Learning-Data Mi***
2. **G.James,D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical learning with applications in R*,Springer,2013**

Subject: **Advanced Database and Advanced Operating System**

L-T-P : 3-1-0

Subject code:MCSPC2020

Credit: 4

Total Number of Hours: 46

Advanced Database and Advanced Operating System

Updated Soon

Mobile Computing

Subject: **Mobile Computing**

L-T-P : 3-0-0

Subject code: MCSPE2031

Credit: 3

Total Number of Hours: 46

UNIT I [18 Hours]

Cellular Communications : Introduction, Cell, Frequency Re-use, Channel Assignment Strategies Fixed and Dynamic Channel Assignment Strategies, Handoff Process, Factors affecting Handoff Process, Handoff Strategies, Few practical cases of Handoff Scenario, Interference and System Capacity, Co-channel Interference (CCI), Adjacent Channel Interference (ACI), Cell Splitting, Sectoring, Microcell Zone concept, Repeaters, Trunked Radio System.

Evolution of Modern Mobile Wireless Communication System - First Generation Wireless Networks, Second Generation (2G) Wireless Cellular Networks, Major 2G standards, 2.5G Wireless Networks, Third Generation 3G Wireless Networks, Wireless Local Area Networks (WLANs), Cellular –WLAN Integration, AllIP Network: Vision for 4G, Mobile Computing Architecture.

Mobile fundamentals and channels: Multiple access techniques like Frequency division multiple access (FDMA) ,Time division multiple access (TDMA) ,Code division multiple access (CDMA) ,Space division multiple access (SDMA).

UNIT II [18 Hours]

GSM: Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber

The General Packet Radio Services: (GPRS) - GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Logical Channel, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer Through GPRS Network and Rout, GPRS Location Management Procedures, GPRS Roaming, The IP Internetworking Model, GPRS Interfaces and Related Protocols, GPRS Applications. Spread – Spectrum Technology, Is – 95.

Overview of CDMA systems: IS-95 Networks

UNIT III [18 Hours]

3G – The Universal Mobile Telecommunication System (UMTS) - UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 5, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS downlink transport and physical channels, UMTS uplink transport and physical channels UMTS Time Slots, UMTS Network Protocol Architecture, Mobility Management for UMTS Network,

Signaling in the WCDMA system, WCDMA network features

4G mobile communication system : General introduction about OFDM, General introduction about MC-CDMA, MTC-MC-CDMA, General introduction about WiMAX, Overview of LTE

Overview Mobile Internet Protocol - Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Problems and Limitations of MIP, MIPv4 Route Optimization.

Subject: **Mobile Computing**

L-T-P : 3-0-0

Subject code: MCSPE2031

Credit: 3

Total Number of Hours: 46

Text Books:

1. **Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.**
2. **Dr. Sunilkumar, et al "Wireless and Mobile Networks: Concepts and Protocols", Wiley India.**
3. **Raj Kamal, "Mobile Computing", OXFORD UNIVERSITY PRESS.**

Reference Book:

1. **Asoke K Talukder, et al, "Mobile Computing", Tata McGraw Hill, 2008.**
2. **Matthew S.Gast, "802.11 Wireless Networks", SPD O'REILLY.**
3. **Ivan Stojmenovic, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2007.**
4. **Kumkum Garg, "Mobile Computing", Pearson. 5. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.**

Subject: **Compiler Optimization Techniques**

L-T-P : 3-0-0

Subject code: MCSPE2032

Credit: 3

Total Number of Hours: 46

Compiler Optimization Techniques

UNIT I [16 Hours]

INTRODUCTION

Language Processors - The Structure of a Compiler – The Evolution of Programming Languages- The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics - The Lexical Analyzer Generator -Parser Generator - Overview of Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Principle Sources of Optimization.

UNIT II **[18Hours]**

INSTRUCTION-LEVEL PARALLELISM

Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling –Global Code Scheduling – Software Pipelining.

OPTIMIZING FOR PARALLELISM AND LOCALITY-THEORY

Basic Concepts – Matrix-Multiply: An Example - Iteration Spaces - Affine Array Indexes – Data Reuse Array data dependence Analysis.

OPTIMIZING FOR PARALLELISM AND LOCALITY – APPLICATION

Finding Synchronization - Free Parallelism – Synchronization Between Parallel Loops – Pipelining– Locality Optimizations – Other Uses of Affine Transforms.

UNIT III [12 Hours]

INTERPROCEDURAL ANALYSIS

Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A Simple Pointer-Analysis Algorithm – Context Insensitive Interprocedural Analysis - Context-Sensitive Pointer-Analysis - Datalog Implementation by Binary Decision Diagrams..

Text Books:

1. **Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, "Compilers:Principles, Techniques and Tools", Second Edition, Pearson Education,2008.**

2. **Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Morgan Kaufmann Publishers, 2002.**

3. **Steven S. Muchnick, "Advanced Compiler Design and Implementation",Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.**

Subject: **Digital Image Processing**

L-T-P : 3-0-0

Subject code: MCSPE2033

Credit: 3

Total Number of Hours: 44

Digital Image Processing

UNIT I [10 Hours]

Digital image fundamentals Introduction: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception - Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations. Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

UNIT II **[18Hours]**

Image transforms and enhancements:

2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT-FFT – DCT - Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties And Examples. Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space and Frequency - Nonlinear Filtering-Use Of Different Masks.

Image restoration and construction

Image Observation And Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering - Generalized Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

UNIT III **[16 Hours]**

INTERPROCEDURAL ANALYSIS

Image compression & segmentation

Redundancy And Compression Models -Loss Less And Lossy. Loss Less-Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding. 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

C**olor and multispectral image processing**

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 Books:

1. **Digital Image Processing, Gonzalez.R.C & Woods. R.E., 3/e,Pearson Education, 2008.**
2. **Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India, 1989.**

Reference Books:

1. **Digital Image Processing, Kenneth R Castleman, Pearson Education,1995.**
2. **Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education ,2009. Pvt Ltd, NewDelhi 3 Image Processing, Sid Ahmed, McGraw Hill, New York, 1995.**

Subject: **Design and Analysis of Parallel Algorithms**

L-T-P : 3-0-0

Subject code: MCSPE2034

Credit: 3

Total Number of Hours: 44

Design and Analysis of Parallel Algorithms

UNIT I [10 Hours]

Structures and algorithms for array processors: SIMD Array Processors, Interconnection networks, Parallel algorithms for Array processors. Multiprocessor architecture- Interconnection networks, multiprocessor control and algorithms. Programming using the message passing paradigm: Principle of message – Passing programming, The building Blocks: Send and receive operations, MPI: message passing interface,

UNIT II [18 Hours]

Parallel algorithms for multiprocessors: Selection - broadcast- all sums-parallel selection. Merging - A network for merging - merging on PRAM models. Sorting on a linear array EREW, CREW and CRCW. SIMD models, MIMD Enumeration sort. Searching a random sequence, sorted sequence on PRAM models, Tree and Mesh.

UNIT III [16 Hours]

Generating permutations and combinations in Parallel- Matrix transpositions, matrix by vector multiplications, matrix by Matrix multiplication. Numerical problems: solving systems of linear equations, finding roots of non linear equations on PRAM models.
Graphs - Connected components, dense graphs and sparse graphs, minimum spanning tree. Single source shortest path, all pairs shortest Paths. Computing Prefix Sums –Applications -Job Sequencing with Deadlines –Knapsack Problem-The Bit Complexity of Parallel Computations

Text Books:

1 **Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall, New Jersey, 1989.**

2 **Joseph JaJa, "Introduction to Parallel Algorithms" Addison-Wesley, 1992**

3 **Introduction to Parallel Computing, Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar Person Education**

Reference Book:

1. **Michael J. Quinn, "Parallel Computing: Theory & Practice", Tata McGraw Hill Edition, 2003.**
2. **Justin R. Smith, "The Design and Analysis of Parallel Algorithms", Oxford University Press, USA , 1993**

Subject: **Soft Computing Methods and Techniques**

L-T-P : 3-0-0

Subject code: MCSPE2041

Credit: 3

Total Number of Hours: 45

Soft Computing Methods and Techniques

Updated Soon

Subject: **Fast Machine Learning**

L-T-P : 3-0-0

Subject code: MCSPE2042

Credit: 3

Total Number of Hours: 44

Fast Machine Learning

UNIT I [10 Hours]

Introduction/Basics: Learning Problems – Designing Learning systems, Perspectives and Issues, Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive Bias, Matrices, Random Variates, Distributions and Generation

UNIT II [16 Hours]

Classification and Regression : Decision Trees, Neural Networks and Back Propagation, Instance Based Learning(k-Nearest Neighbors), Support Vector Machines, Boosting (Ada Boost), Stochastic Models: Bayesian Learning, Genetic Algorithms, Document Similarity & Text Classification, Hidden Markov Models

UNIT III [18 Hours]

Unsupervised Learning: K-means, Hierarchical Clustering - Agglomerative, Divisive, Distance measures; Density based clustering – DBScan, Pattern & Association Rule Mining- Apriori Algorithm; Frequent Pattern-Growth Algorithm Dimensionality Reduction & Recent Trends in ML: Principal Component Analysis , Singular Value Decomposition, Deep Learning, Reinforcement Learning, CNNs and GAN

Text Books:

1. **"Machine Learning in Action" , Peter Harrington, Dreamtech Press (India), 2012.**
2. **"Machine Learning", Tom Mitchell, McGraw Hill Education (India), 2013.**
3. **"Pattern Recognition and Machine Learning", Christopher Bishop, (2nd printing) Springer, 2011.**
4. **"Introduction to Machine Learning", Ethem Alpaydin, 3rd Edition, PHI Learning, 2017**

Subject: **Bio Informatics**

L-T-P : 3-0-0

Subject code: MCSPE2043

Credit: 3

Total Number of Hours: 45

Bio Informatics

UNIT I [9 Hours]

INTRODUCTION

Need for Bioinformatics technologies –

Overview of Bioinformatics technologies – Structural bioinformatics – Data format and processing – secondary resources- Applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT II [18 Hours]

DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS

Bioinformatics data – Data ware housing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture- Applications in bioinformatics.

MODELING FOR BIOINFORMATICS

Hidden markov modeling for biological data analysis – Sequence identification – Sequence classification – multiple alignment generation – Comparative modeling – Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling

UNIT II [18 Hours]

PATTERN MATCHING AND VISUALIZATION

Gene regulation – motif recognition and motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences

MICROARRAY ANALYSIS

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding , spot extraction , normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems– Cost Matrix – Evaluation model ,Benchmark , Tradeoffs

Text Books:

1. **Yi-Ping Phoebe Chen (Ed), "Bio Informatics Technologies", First Indian Reprint, Springer Verlag, 2007.**
2. **N.J. Chikhale and Virendra Gomase, "Bioinformatics- Theory and Practice", Himalaya Publication House, India, 2007**
3. **Zoe lacroix and Terence Critchlow, "Bio Informatics – Managing Scientific data", First Indian Reprint, Elsevier, 2004**
4. **Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.**

Subject: **Bio Informatics**

L-T-P : 3-0-0

Subject code: MCSPE2043

Credit: 3

Total Number of Hours: 45

5. **Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005**
6. **Burton. E. Tropp, "Molecular Biology: Genes to Proteins ", 4th edition, Jones and Bartlett Publishers, 2011**
7. **Dan Gusfield, "Algorithms on Strings Trees and Sequences", Cambridge University Press,1997.**
8. **P. Baldi, S Brunak , Bioinformatics, "A Machine Learning Approach ", MIT Press, 1998.**

Subject: **Software Quality Assurance**

L-T-P : 3-0-0

Subject code: MCSPE2044

Credit: 3

Total Number of Hours: 45

Software Quality Assurance

UNIT I [15 Hours]

SOFTWARE PRODUCT AND PROCESS

Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – System Engineering – Computer Based System – Business Process Engineering
Overview – Product Engineering Overview.

SOFTWARE REQUIREMENTS

Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary.

ANALYSIS, DESIGN CONCEPTS AND PRINCIPLES

Systems Engineering - Analysis Concepts - Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

UNIT II [15 Hours]

TESTING

Taxonomy of Software Testing – Types Of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based On Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques

UNIT III [15 Hours]

SOFTWARE QUALITY ASSURANCE

Process and Product Quality – Quality Assurance and Standards – Quality Planning and Control – Software Configuration Management – Process Improvement – Software configuration Management. CMM, Quality management standards: ISO 9001, 9003,Boot Strap Methodology,IEEE 1012 & 1028, Project Management Responsibility.
Software Metrics (Chidambaram and Kemerer), Metrics Estimation techniques through machine learning techniques ,Software quality cost, Classical quality cost ,Application of Cost Model, Software Reusability Metrics, Reusability prediction Models, Software Reusability Cost Estimation,

Text Books:

1. **Ian Sommerville, "Software engineering", Seventh Edition, Pearson Education Asia,2007.**
2. **Roger S. Pressman, "Software Engineering – A practitioner's Approach", Sixth Edition, McGraw-Hill International Edition, 2005.**

Subject: **Software Quality Assurance**

L-T-P : 3-0-0

Subject code: MCSPE2044

Credit: 3

Total Number of Hours: 45

Reference Book:

1. **Watts S.Humphrey,"A Discipline for Software Engineering", Pearson Education, 2007.**
2. **James F.Peters and Witold Pedrycz,"Software Engineering, An Engineering Approach", Wiley-India, 2007.**
3. **Stephen R.Schach, " Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.**
4. **S.A.Kelkar,"Software Engineering", Prentice Hall of India Pvt, 2007**

Subject: **Mobile Application Development**

L-T-P : 3-0-0

Subject code: MCSPE2051

Credit: 3

Total Number of Hours: 44

Mobile Application Development

UNIT I [16 Hours]

INTRODUCTION

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications.

BASIC DESIGN

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT II **[18Hours]**

ADVANCED DESIGN

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

TECHNOLOGY I - ANDROID

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment –Interaction with server side applications – Using Google Maps, GPS and Wifi –Integration with social media applications.

UNIT III [12 Hours]

TECHNOLOGY II - IOS

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

Text Books:

1. **"Professional Mobile Application Development",Jeff McWherter and Scott Gowell, Wrox, 2012.**
2. **"Android in Practice", Charlie Collins, Michael Galpin and Matthias Kappler, DreamTech, 2012.**
3. **"Beginning Objective C", James Dovey and Ash Furrow, Apress, 2012.**
4. **"Beginning iOS 6 Development: Exploring the iOS SDK",David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Apress, 2013.**

Reference Books:

1. **Link: https://developer.android.com/develop/index.html**
2. **Professional iOS Programming: Covers iOS 7 ,WROX**
3. **Link: https://developer.apple.com**

Subject: **Robotics**

L-T-P : 3-0-0

Subject code: MCSPE2052

Credit: 3

Total Number of Hours: 44

Robotics

UNIT I [10 Hours]

Introduction to Robotics:
History of Robots – Classifications – Various fields of Robotics – Actuators – Sensors – Manipulators – End effectors – Application areas – Robot programming languages.

UNIT II [16 Hours]

Robot Kinematics:
Matrix representation – Homogeneous transformation – DH representation of standard robots – Inverse kinematics. Robot Dynamics: Velocity kinematics – Jacobian and inverse Jacobian – Lagrangian formulation – Eulers Lagrangian formulation – Robot equation of motion.

UNIT III [18 Hours]

Trajectory Planning: Introduction – Path Vs trajectory – Joint-space Vs Cartesian-space descriptions – Basics of trajectory planning – Joint-space trajectory planning – Cartesian-space trajectories.
Control and Application of Robotics: Linear control of robot manipulation – Second-order systems – trajectory following control – Modeling and control of single joint – Architecture of industrial robotic controllers – Robot applications.

Text Books:

1. **"Introduction to Robotics: Analysis, Systems, Applications", Niku S. B., New Jersey: Prentice Hall, 2001.**
2. **"Introduction to Robotics: Mechanics and Control ", Craig J. J., Upper Saddle River: Pearson Prentice Hall, 2005.**

Subject: **Medical Image Processing**

L-T-P : 3-0-0

Subject code: MCSPE2053

Credit: 3

Total Number of Hours: 40

Medical Image Processing

UNIT I [15 Hours]

Image Fundamentals & Pre-Processing

Image perception, Modulation transfer function of visual system, Image fidelity criteria, Sampling theory, Image quantization, Optimum mean square quantizer and a variety of interpolation methods including nearest-neighbor, linear, cubic & higher-order, and Fourier (using the FFT),spatial image transformations (rigid and non-rigid),Image enhancement-point operation, Histogram modeling.

Sources of Medical Images

Briefly discuss the physics of Radiology, The electromagnetic spectrum, Computed Tomography, Magnetic Resonance Tomography, Ultrasound, nuclear medicine and molecular imaging, properties of the resulting images, and discuss the advantages and disadvantages of each imaging modality, Radiation protection and dosimetry.

Medical Image Representation

Pixel, Voxel, Algebraic image operations, depth color and look up table, PACS (picture archiving and communications system), Image file formats: DICOM and other formats, SNR characteristics.

UNIT II [16 Hours]

Medical Image Analysis and Classification

Image segmentation, pixel based, edge based, region based segmentation. Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and image classification, Statistical, Rule based, Neural Network approaches.

Image Registration (alignment) and Reconstruction

Intensity-based methods including a variety of cost functions (correlation, least squares, mutual information, robust estimators), and optimization techniques (fixed-point iteration, gradient descent, Nelder-Mead simplex method, etc.). Implement registration for rigid and non-rigid transformations. MRI motion compensation, Reconstruction techniques for CT (filtered back projection) and MRI (using the FFT).

UNIT II [9 Hours]

Nuclear Imaging

PET and SPECT ultrasound imaging methods, Mathematical principles, Resolution, Noise effect ,3D imaging, Positron emission tomography, Single photon emission tomography, Ultrasound imaging,applications,Medical image research and Retrieval current technology in medical search, Content based image retrieval ,Ontology, Application, Computer Aided Diagnosis

Text Books:

1. **Wolfgang Birkfellner, Applied Medical Image Processing-A Basic course, CRC Press, 2011.**
2. **Paul Sutens,"Fundamentals of Medical Imaging", 2nd edition, Cambridge University Press, 2009.**
3. **J.Michael Fitzpatrick and Milan Sonka,"Handbook of Medical Iamging, vol-2.Medical Image processing and Analysis ", SPIE Publications, 2009.**

Subject: **Medical Image Processing**

L-T-P : 3-0-0

Subject code: MCSPE2053

Credit: 3

Total Number of Hours: 40

4. **John L.Semmlow," Biosignal and Medical Image processing", 2nd edition, CRC Press 2008.**
5. **Kavyan Najarian and Robert Splerstor,"Biomedical signals and Image processing", CRC-Taylor and Francis, New York, 2006.**
6. **R.C.Gonzalez and R.E.Woods,"Digital Image Processing", 2nd edition, Person Education, 2002.**
7. **Anil K. Jain," Fundamentals of Digital Image Processing", Pearson education, Indian Reprint 2003.**
8. **Alfred Horowitz,"MRI Physics for Radiologists-A Visual Approach ", 2nd edition Springer Verlag Netwok. 1991.**

Subject: **Embedded Software Development**

L-T-P : 3-0-0

Subject code: MCSPE2054

Credit: 3

Total Number of Hours: 45

Embedded Software Development

UNIT I [11 Hours]

Processors and Instruction sets

Introduction to embedded computing, overview of embedded system design process, Instruction sets of processors: ARM, PIC, TI C64x, programming I/O, modes and exceptions, coprocessors, memory system,cpu performance ,cpu power consumption.

Embedded S/W development environments

RTOS, kernel architecture: Hardware, Task/process control subsystem, Device drivers ,File subsystem, system calls, Embedded Operating systems, Task scheduling in embedded systems: task scheduler, first in first out, shortest job first, round robin ,priority based scheduling, Context switch: Task synchronization: mutex, semaphore, Timers, Types of embedded operating systems, debugging, consumer electronics architecture, platform-level performance.

UNIT II [16 Hours]

Program Design and analysis

Components for embedded programs, models of programs, Assembly, linking and loading, compiler optimizations, program level performance analysis, performance optimization, program level energy optimization, optimizing program size ,program validation and testing,
Design example: Digital still camera.

Processes and Operating Systems

Multiples tasks and multiple processes, multirate systems, pre-emptive RTOS ,priority-based scheduling,inter-process communication, evaluating OS performance, processes and power optimization, Case study: Real time and embedded, Linux-design example: Telephone answering machine.

UNIT II [18 Hours]

Program Design and analysis

Components for embedded programs, models of programs, Assembly, linking and loading, compiler optimizations, program level performance analysis, performance optimization, program level energy optimization, optimizing program size ,program validation and testing,
Design example: Digital still camera.

Processes and Operating Systems

Multiples tasks and multiple processes, multirate systems, pre-emptive RTOS ,priority-based scheduling,inter-process communication, evaluating OS performance, processes and power optimization, Case study: Real time and embedded, Linux-design example: Telephone answering machine.

UNIT II [10 Hours]

System Design, Networks and multiprocessors

System design methodologies, requirements analysis, specifications, architecture design, quality assurance, distributed embedded systems, shared-memory multiprocessors, and design example: Video accelerator.

Subject: **Embedded Software Development**

L-T-P : 3-0-0

Subject code: MCSPE2054

Credit: 3

Total Number of Hours: 45

Text Books:

1. **Marilyn Wolf, "Computers as Components: Principles of Embedded Computing Systems Design",3rd edition ,Morgan Kaufmann,2012.**
2. **Christopher Hallinan,"Embedded Linux Primer: A Practical Real-World Approach",2nd edition, Prentice Hall,2010.**
3. **Karim Yaghmour et.al.,"Building Embedded Linux Systems",O'Reily,2008.**
4. **David E.Simon,"An embedded software Primer", Addison-Wesley, 1999.**
5. **Frankvahid/Tony Givargis,"Embedded System Design-A unified Hardware/Software Introduction.**
6. **J.W.Valvano,"Embedded Microcomputer System: Real Time Interfacing".**

Specialized Laboratory

Subject: **Specialized Laboratory**

L-T-P : 0-0-1

Subject code: MCSES2160

Credit: 4

Total Number of Hours: 20

This laboratory includes the Experiments from "Data Analytics using R".

Subject: **Seminar I**

L-T-P : 0-0-1

Subject code: MCSES2170

Credit: 2

Total Number of Hours: 20

Seminar I