School of Computer & Information Sciences

M.Tech (Information Technology)

SCHOOL OF COMPUTER & INFORMATION SCIENCES

Vision Statement:

- To invent, create and bring computing technology solutions to the common man, to the privileged and underprivileged sections of India, to bridge the digital divide and eradication of computer ignorance and digital illiteracy and to build a prosperous and technologically advanced nation.

Mission Statements:

MS-1: To pursue academic and research excellence, nationally and internationally

MS-2: To provide training, advisory, and consultancy to all the stakeholders.

MS-3: To lead the efforts in creative and newer modes of instruction delivery & supervision

School of Computer and Information Sciences

Name of the Academic Program: M.Tech (Information Technology)

Program Educational Objectives (PEOs)

PEO-1: Produce Post graduates who can contribute to the Research & Development effectively

PEO-2: To provide students a deep insight into cutting edge technologies and tools.

PEO-3: To create globally competent technocrat's with exposure to Scientific & Engineering aspects of development

PEO-4: To work collaboratively on multi-disciplinary projects and exhibit high levels of professional & ethical values

PEO-5: Create awareness of societal problems and its impact

Mapping Program Educational Objectives (PEOs) with Mission Statements (MS)

	MS-1	MS-2	MS-3
PEO-1	3	2	1
PEO-2	2	3	1
PEO-3	3	2	1
PEO-4	2	1	3
PEO-5	1	2	3

Write '3' in the box for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

School of Computer & Information Sciences

Name of the Academic Program: <u>M.Tech(Information Technology)</u>

Program Outcomes (POs)

PO-1: To independently carry out research/investigation and development work to solve practical problems

PO-2: To be able to write and present a substantial technical report/document

PO-3: To demonstrate knowledge and understanding of engineering principles and apply the same in solving the problems faced by society.

PO-4: To create, select, learn and apply appropriate techniques, resources, and advanced tools, including modeling and prediction with an understanding of limitations

PO-5: To recognize the opportunities and contribute to collaborative-multidisciplinary scientific research to achieve common goals.

PO-6: To acquire professional and intellectual integrity, professional ethics code of conduct and understand the responsibility to contribute to the society for sustainable development

Program Specific Outcomes (PSOs)

PSO-1: To Analyze various technology & business challenges the current banking industry is facing and how those challenges can be solved

PSO-2: To assess the suitability of various technologies in solving the problems of multiple sectors, including the banking sector.

PSO-3: To design and develop innovative technological solutions to solve the issues faced by the Banking Sector.

Mapping of Program Outcomes (POs) and Program Specific Outcomes (PSOs) with Program Educational Objectives (PEOs)

	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5
PO-1	3		1	2	
PO-2	2	1		3	
PO-3	1	3		2	
PO-4	2		1	3	
PO-5			1	3	2
PO-6		1	2		3
PSO-1	3			2	1
PSO-2	1	3			2
PSO-3	1		3		2

Mapping of Program Specific Outcomes (PSOs) where applicable.

Write '3' in the box for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

School of Computer & Information Sciences
M.Tech (Information Technology)
Scheme

I-Semester					
Core			**Optional Core/Elective**		
Code	**Course Title**	**Credits**	**Code**	**Course Title**	**Credits**
CS401	Advanced Operating Systems	4	IT423	Data Engineering	4
CS402	Algorithms	4	IT421	Business Data Analytics	3
	Optional core-I	¾	IT422	Banking Technology & Payment Systems	4
	Optional core-II	¾			
	Elective -I	¾			
CS403	*IT Lab –I*	2			
CS404	*DS & Programming Lab*	2			
		21/24			
III-Semester					
Code	**Course Title**	**Credits**			
	Project	6			

School of Computer and Information Sciences

Name of the Academic Program: M.Tech(Information Technology) (M.Tech-1)

Course Code: CS401   Title of the Course: Advanced Operating Systems
L-T-P   : 4-0-0   Credits   : 4

Prerequisite Course / Knowledge (If any): -- Basic OS course

Course Outcomes (COs)

After completion of this course successfully, the students will be able to:

- CO1: Discuss the ways system calls work. (Understand)
- CO2: Develop basic process management tasks such as scheduling, deadlock avoidance algorithms. (Create)
- CO3: Develop a paging algorithm. (Create)
- CO4: Construct simple device drivers. (Create)
- CO5: Describe different file systems in existence and learn the pros and cons of the various systems. (Understand)
- CO6: Examine real-world OS scheduling algorithms such as those used in Linux and Windows. (Analyze)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1				3					
CO2			3	2					
CO3	1			3	2				
CO4			2	3					
CO5		2		3					
CO6	2					3			

Detailed Syllabus:

UNIT - I: Introduction and Operating System Structures

Operating Systems Functionality, Computer Organization, and Architecture, OS Operations, Kernel Data Structures, OS Services, User interfaces to OS, Programmer interfaces to OS, OS Structure, System Boot.

UNIT - II: Process and Thread Management

Process Concept, Process operations, Process Scheduling, Extended Process State Diagram, Process Context Switch in detail; Interprocess Communication: Pipes, Named Pipes, Shared Memory; Process Synchronization: Signals, Mutexes, Semaphores, Monitors; Thread Management: thread creation, thread scheduling, thread synchronization; Deadlocks: Resource Allocation Graphs, deadlock detection, prevention and avoidance, recovery from deadlock.

UNIT - III: Memory Management

Memory allocation techniques: paging and segmentation, Swapping, the structure of the page table; Virtual memory: demand paging, copy-on-write, Page replacement, allocation of frames, kernel memory allocation, thrashing, memory-mapped files, Translation-Lookaside Buffer (TLB).

UNIT - IV: File System Management

Disk management: formatting, boot block, swap-space management, RAID structure; Disk scheduling algorithms: elevator, C-scan; File concept, Access methods, directory structure, file sharing, protection, file system structure; file system implementation: file system metadata storage structures such as inode, allocation methods, free space management, efficiency and performance including disk cache and recovery from failures.

UNIT - V: I/O Management

I/O devices: polling, interrupt-driven, DMA; Application I/O interface: character and block devices, network devices; clocks and timers, nonblocking and asynchronous I/O, vectored I/O; Kernel I/O interface: I/O scheduling, Buffering, Caching.

Reference Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne. Operating System Concepts, 9th edition, Wiley.
2. Charles Crowley. Operating Systems: A Design-Oriented Approach, Prentice-Hall India.
3. W. Richard Stevens, . Advanced Programming in Unix Environment, Pearson Education.
4. W. Richard Stevens. Unix Network Programming, vol. 2, Pearson Education.
5. William Stallings. Operating Systems: Internals and Design Principles, Pearson Education.
6. Maurice J. Bach. The Design of the Unix Operating System, Prentice-Hall India.
7. Robert Love. Linux Kernel Development, Pearson Education.
8. Thomas Anderson and Michael Dahlin. Operating Systems: Principles and Practice, 2nd edition, Recursive Books.

School of Computer and Information Sciences

Name of the Academic Program: M.Tech((Information Technology) (M.Tech-I)

Course Code: CS402   Title of the Course: Algorithms
L-T-P: 4-0-0   Credits   : 4

Prerequisite Course / Knowledge (If any): Data Structures in under graduate level, discrete mathematical structures, knowledge of sorting algorithms and basic search strategies

Course Outcomes (COs)

After completion of this course successfully, the students will be able to:

- CO-1: Assess the inherent structure/hardness of a problem (Evaluate)

- CO-2: Select an appropriate strategy to solve a problem (Understand)

- CO-3 Design an algorithm that suits the time complexity requirements of the problem. (Create)

- CO-4: Estimate the time and space complexities of an algorithm along with the necessary mathematical proofs when necessary. (Evaluate)

- CO-5: Devise algorithms by choosing appropriate data structures (Create)

**Mapping of Course Outcomes (COs) with Program Outcomes (POs)
and Program Specific Outcomes (PSOs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2			3					1
CO2				3		1		2	
CO3			3					1	2
CO4		3		2					1
CO5				1			2		3

Detailed Syllabus

UNIT-I: Analysis of Algorithms: Asymptotic Notation; Best, worst and average case analysis of algorithms; Solving recurrence relations using the substitution method, generating functions, Master's theorem, etc. Warm-up to complexity analysis: Heap data structure, priority queue application, Best, Worst, and average-case analysis of a few sorting algorithms like heap sort, insertion, bubble, selection, counting, and radix sort algorithms. Strategies for problem-solving

UNIT-II: Divide and Conquer strategy: Time complexity analysis for Merge Sort and Quick Sort Algorithms

UNIT-III: Greedy strategy: Theoretical foundation of greedy strategy: Matroids Algorithms for solving problems like Knapsack Problem (Fractional), Minimum Spanning Tree problem; Shortest Paths, Job Scheduling, Huffman's code etc. along with proofs of corrections and complexity analysis

UNIT-IV: Dynamic Programming strategy: Identify situations in which greedy and divide and conquer Strategies may not work. Understanding of optimality principle. Technique of memorization. Applications to problems like Coin change, 0/1 and 0/n- Knapsack, Shortest Paths, Optimal Binary Search Tree (OBST), Chained Matrix Multiplication, Traveling Salesperson Problem (TSP) etc.

UNIT-V: Backtracking and Branch & Bound strategies: State-space tree construction, traversal techniques and solving problems like 0/1 and 0/n knapsack, TSP, Applications of Depth First Search: Topological sorting, Finding strongly connected components and game problems.

UNIT-VI: Theory of NP-Completeness: Complexity classes of P, NP, NP-Hard, NP-Complete, Polynomial reductions, Cook's theorem. Discussion of problems: Satisfiability(SAT), CNF-SAT, Min-Vertex Cover, Max-Clique, Graph Coloring, NP-Completeness proofs.

Reference Books:
1. Introduction to Algorithms-T.Cormen, C.E.Leiserson, R.L.Rivest, PHI, 3rdEdition 2009.
2. Algorithms- R.Johnsonbaugh and M.Schaefer, Pearson, 2004.
3. Fundamentals of Algorithmics - G.Brassard and P.Bratley, PH, 1996
4. The Algorithm Design Manual- Steven S. Skiena, Springer, 2009

School of Computer and Information Sciences

Name of the Academic Program: **M.Tech (Information Technology) (IMTECH-VII)**

Course Code: CS404   Title of the Course: Data Structures & Programming Lab

L-T-P: 0-0-3   Credits   : 2

Prerequisite Course / Knowledge (If any): Programming and Data Structures at under graduate level

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO-1: Solve a problem by choosing appropriate data structures in the C programming language (Apply)
- CO-2: Select suitable data structure for an idea and propose a solution using C Programming Language (Analyze)
- CO-3: Analyze the time taken to solve the problem by using the C programming language (Analyze)
- CO-4: Assess the solution in terms of efficiency, modularity and well-documented programs in C under the Linux environment (Evaluate)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3		1						2
CO2			1	3				2	
CO3		2					3		
CO4			2		1			3	

Detailed Syllabus:

UNIT-I: Implementing Stacks and types of Queues as dynamic data structures using linked lists and their applications

UNIT-II: Binary Tree, Binary search trees & Traversals of BST, balanced trees - AVL Trees and their applications

UNIT-III: Sorting Techniques, Basic Searching Techniques, Hashing-Collision Resolution and closed hashing.

UNIT-IV: Graphs: Representations (Matrix and Adjacency List), basic traversal techniques: Depth First Search , Breadth First Search, Implementation of Kruskal Algorithm, Dijkstra Algorithm, Spanning and Minimal Spanning Trees.

UNIT-V: Multi link Structures, B Trees and B+ Trees and their applications.

Reference Books:

1.   Horowitz, E., and Sahni.S: Fundamentals of Data structures. Computer Science Press,   1978.

2.   Tanenbaum, A.M., and Augenstein, M.J.: Data Structures with Pascal, Prentice - Hall International, 1985.

3.   Stubbas, D.: Data Structures with Abstract Data Types and Modula2, Brooks & Cole   Pub. Co. 1987.

4.   Trembley & Sorenson: An Introduction to Data Structures with Applications; Tata McGraw Hill

5.   Kruse, R.L., Leung, B.P., and tondo, C.L.: Data Structures and Program Design in C; Prentice-Hall of India 1999.

School of Computer and Information Sciences

Name of the Academic Program: M.Tech (I-Sem)

Course Code: IT423   Title of the Course: Data Engineering

L-T-P: 4-0-0   Credits   : 4

Prerequisite Course / Knowledge (If any): None

Course Outcomes (COs)

After completion of this course successfully, the students will be able to
- CO-1: Describe the process of data management using various data models. (Understand)
- CO-2: Apply the Hadoop framework to solve specific problems involving big data. (Apply)
- CO-3: Create a data-based system by analyzing the requirement of a system. (Create)
- CO-4: Analyze the security requirement of a data-based system and design a secure system accordingly. (Analyze)
- CO-5: Evaluate data quality of data being produced from a data source. (Evaluate)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1		2	3						
CO2	2			1					3
CO3		1		3					2
CO4	3						1	2	
CO5	1			3	2				

Detailed Syllabus:

UNIT- I: Relational data model, Relational Database Design, Indexing, Storage and File structure, Indexing & Hashing, Query processing, Query optimizations, Transactions, Concurrency, Recovery systems.

UNIT- II: Foundations of NO SQL, Data models, Distribution models, Consistency, Map-reduce, Key-value databases, Document databases, Column-Family stores, Graph databases, Schema migrations, Beyond No-SQL.

UNIT- III: Database Security with general Security Landscape and a Defense-in-Dept strategy, Databases as a Networked server, Authentication and Password Security, Application Security, Using Granular Access Control, Security database-to-database communications, Encryption, Regulations, and Compliance, Auditing Categories, Auditing Architectures.

UNIT- IV: Fundamentals of Big data and big data analytics, concepts of Hadoop, Related Technologies, Applications.

UNIT- V: Introduction to Data Quality, Data Quality dimensions, Models for Data Quality, Activities and Techniques for Data Quality, Data Quality issues in Data Integration Systems, Methodologies for Data Quality Measurement and Improvement, Tools for Data Quality, Open Problems, Case Studies

Reference Books:

1. Michael Stonebraker and Joe Hellerstein, *Readings in Database Systems*, Morgan Kaufmann. The MIT Press.
2. Avi Silberschatz, Hank Korth, and S.Sudarshan, *Database Systems Concepts*, McGraw Hill.
3. Pramod J Sadalage, Martin Fowler. *NoSQL Distilled: A Brief Guide to Emerging World of Polyglot Persistence.* Addison Wesley.
4. Jules J. Burman, *Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information*. Morgan Kaufmann.
5. Carlo Batini, Monica Scannapieco, *Data Quality: Concepts, Methodologies & Techniques*. Springer

Name of the Academic Program: **M.Tech (I-Sem)**

Course Code: IT421   Title of the Course: Business Data Analytics

L-T-P: 3-0-1   Credits   : 3

Prerequisite Course / Knowledge (If any): Knowledge of basic linear algebra, statistics and database

management systems are desirable

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO-1: Discuss the ideas, the techniques, recent developments in Analytics in all its forms viz., descriptive, predictive and prescriptive analytics (Understand)
- CO-2: Analyse various techniques to assess suitable application scenarios of each method (Analyse)
- CO-3: Relate data-driven problems as data mining or predictive analytics problem (Apply)
- CO-4: Apply analytic techniques on solving problems of various domains such as banking, insurance, finance, manufacturing, and bioinformatics (Apply)
- CO-5: Evaluate the performance of various techniques in the context of specific use cases from multiple domains such as banking, insurance, finance, manufacturing, and bioinformatics (Evaluate)

**Mapping of Course Outcomes (COs) with Program Outcomes (POs)
and Program Specific Outcomes (PSOs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1			2	3			1		
CO2			2				3	1	
CO3	3	1			2				
CO4				3		1		2	
CO5				2		3			1

Detailed Syllabus:

UNIT- 1**:** Introduction to Analytics

Introduction to Analytics; its various forms viz., descriptive, predictive, and prescriptive. Introduction to Data Warehousing and its concepts, Data Mining (DM), DM concepts, DM Process, CRISP-DM Methodology, Data Preparation/Pre-processing techniques – Feature Selection methodologies, dimension reduction techniques such as PCA and Transformations. Data Visualization Techniques, Data Balancing Techniques, etc.

UNIT- 2: Descriptive and Predictive Analytical techniques

Association Rule Mining and it's Algorithms & Applications; Clustering, Hierarchical and Partition clustering – Techniques and applications; Forecasting- Simple Linear Regression, Multiple Linear Regression; Classification – Logistic Regression, Decision Trees, k-NN, Neural Networks, Case-Based Reasoning, etc.

UNIT- 3: Practical Considerations in Analytics Projects

Determination of best analytical/data mining technique, MSE, NRMSE, MAPE, Confusion Matrix, ROC, AUC, Lift, Comprehensibility, etc.

UNIT- 4: Applications and Case Studies

Analytical CRM applications such as bankruptcy prediction, churn prediction, default prediction, customer segmentation, market basket analysis, credit scoring, Financial Fraud detection; Manufacturing in Hardware industry; Bioinformatics applications for cancer prediction, etc.

UNIT- 5: Advanced Analytics and Case Studies

Unstructured data mining, Text Analytics, Web Mining, etc., Cyber Fraud Detection including Phishing/Spam/Malware detection; Overview of prescriptive analytics and application in time series data mining with a case study from banking operations. Introduction to Big Data and applications

Suggested Assignments: Two mini-projects dealing with data mining applications to finance shall be assigned to students

Reference Books:

1. IH Witten, E Frank (2005), *Data Mining: Practical machine learning tools and techniques*, Morgan Kaufmann.

2. Kimball, Ralph; Reeves, Laura et al. (1998) *Data warehouse lifecycle toolkit: expert methods for designing, developing, and deploying data warehouses*, John Wiley & Sons.

3. Galit Shmueli and Nitin R. Patel, Peter Bruce (2010), *Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner*, John Wiley.

4. Gary Miner, John Elder, Andrew Fast, Thomas Hill, Robert Nisbet, Dursun Delen, Andrew Fast (2012), *Practical Text Mining and Statistical Analysis for Non-structured Text Data Applications*, Academic Press.

5. A. K. Pujari (2001), *Data Mining Techniques*, University Press.

6. Han, Jiawei; Kamber, Micheline, J. Pei (2011), *Data mining: concepts and techniques*. Morgan Kaufmann Publishers.

7. M. N. Murty and V. S. Devi, (2013), Pattern Recognition: An Algorithmic Approach, Springer.

8. L. Bellatreche, K. Karlapalem and M. Mohania (2001), *Some Issues in Design of Data Warehousing Systems, Chapter VI,* In book Developing Quality Complex Database Systems: Practices, Techniques and Technologies (Shirley A. Becker eds), IDEA GROUP PUBLISHING.

9. C. Bishop, (2011), *Pattern Recognition and Machine Learning*, Springer.

10. Trevor Hastie, Robert Tibshirani, Jerome Friedman (2003), *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, Springer.

School of Computer and Information Sciences

Name of the Academic Program: M.Tech (I-Sem)

Course Code: IT421   Title of the Course: Banking Technology & Payment Systems

L-T-P: 4-0-0   Credits   : 4

Prerequisite Course / Knowledge (If any): None

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO-1: Understand the role played by technology in enhancing the effectiveness of the banking sector (Understand)

- CO-2: Remember various technologies used for delivering Banking & Financial services. (Remember)

- CO-3: Evaluate evolution of Banking Technology, starting with current technologies going on to banking technologies of the future. (Evaluate)

- CO-4: Analyze the current and future requirements, architectures of banks (Analyze)

- CO-5: Create roadmap and strategies of banking technology. (Create)

- CO-6: Apply how to go about integrating the technology and business goals of banks (Apply)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1			2	3			1		
CO2			2				3	1	
CO3	3	1			2				
CO4				3		1		2	
CO5				2		3			1

Detailed Syllabus:

UNIT-I: Banking Operations-Overview: Introduction to Banking, Evolution of Banking Technology, Impact of Technology on Banking operations. Centralized Banking- concepts and opportunities, Centralized Banking – Architectures, Challenges and Implementation & management Issues.

UNIT-II: Delivery Channels: Products, Services & Delivery Technologies. ATM- technology and operations, Electronic Cards- debit and credits, Smart cards in banking/e-money Internet Banking Architecture and Implementation, Internet Banking/Mobile Banking management, Phone banking and call centres, Electronic Delivery Channels Integration.

UNIT-III: Back office Operations: Credit appraisal system, Forex management/SWIFT, Treasury management, Asset Liability management, Risk management- Operational risk, MIS/DSS/EIS for Banks, Data Centre and Business continuity management, Internal workflow operations, Corporate Intranet and Knowledge management, Technology & Human Resource management, IT Governance.

UNIT-IV: Electronic & Mobile Commerce: Introduction to Electronic Commerce, Business Models, Market Research and E-Commerce, Advertising in E-Commerce, Legal & Public policy issues relating to E-Commerce, Introduction to Mobile Commerce, Mobile Payments, Mobile banking, Mobile micro payments and mobile macro payments, Auctions, Agents in E-Commerce, E-Trading, B2B,B2C.

UNIT-V: Payment Systems: Introduction to Payment Systems, Payments through the Internet- privacy issues- Card based, net based payment systems, SET Protocol MICR, ECS, EFT, Global Payment Scenario – Interbank/Intrabank, RTGS, History of Money/Electronic Money/ Electronic cheques, Micro payments.
 (Number of Units may be decided by the School / Department / Centre)

Suggested Readings:

1. Bank 3.0, Brett king, John wiley, 2013.
2. The Art of Better Retail Banking, Hugh Croxford, Frank Abramson, Alex Jablonowski, John Wiley 2005
3. Business knowledge for IT in Retail Banking-Bizle Professional series, UK Edition, Essvale Corporation Ltd 2007.
4. Financial Services Information System, Jessica Keyes, Auerbach, 2000.
5. Technology management in financial services, Ross, McGill, Palgrave Macmillan, 2008
6. Financial Technology management, Vol.1, Gulati, V.P., Srivasvatava, Shilpa; ICFAI University Press, 2008
7. Financial Technology management, Vol.2, Gulati, V.P., Srivasvatava, Shilpa; ICFAI University Press, 2008
8. Information Systems for Banks, Bhaskaran R, Taxmann, IIBF, 2005
9. Electronic Commerce: A Managerial Perspective, Efrain Turban, Jae Lee, David King H, Michael Chang, Pearson Education, New Delhi 2001
10. Electronic Commerce, Bhaskar, Bharat, Tata McGraw Hill, New Delhi-2008.
11. M-Commerce: technologies, services and business models, Sadeh, Norman, John Wiley & Sons, 2002
12. Electronic Payment Systems for E-Commerce, Mahony D, Pierece M, Tiwari H, Artech House Computer Security Series, 2001 ….

School of Computer & Information Sciences
M.Tech (Information Technology)
Scheme

II-Semester					
Core			**Optional Core/Elective**		
Code	**Course Title**	**Credits**	**Code**	**Course Title**	**Credits**
CS451	Software Engineering	4	IT471	Biometrics	4
	Optional core-III	4	IT472	Soft Computing	3
	Elective –II	¾			
	Elective –III	¾			
	Elective –IV	¾			
CS452	*IT Lab –II*	2			
CS453	*SE Lab*	2			
CS454	*Communication Skills*	3			
IV-Semester					
Code	**Course Title**	**Credits**			
	Project	12			

School of Computer and Information Sciences

Name of the Academic Program: **M.Tech (Information Technology) (M.Tech-II)**

Course Code: CS 451   Title of the Course   : **Software Engineering**

L-T-P   : 3-0-0   Credits   : 3

Prerequisite Course / Knowledge (If any): It is expected that the students must have done at least one programming course at undergraduate/postgraduate level

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO1: Explain the models of software development process (Understand).
- CO2: Evaluate the appropriateness of different models of software development for their application in various domains (Evaluate).
- CO3: Apply the requirements engineering to software systems. (Apply)
- CO4: Describe Software Architectures (understand).
- CO5: Assess the applicability of software architectures for various combinations of non-functional requirements (Evaluate level).
- CO6: Apply object oriented and structured and structured paradigms to design software systems (Apply).
- CO7: Apply testing strategy to test software applications (Apply).

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1			2	3	1				
CO2			3	2	1				
CO3			1	3	2				
CO4			3	2	1				
CO5	3		2		1				
CO6		1		3	2				
CO7	2	1		3					

Detailed Syllabus:

UNIT-I: Introduction to Software Engineering

Need of software engineering, systems engineering, challenges in software engineering, Software process models, quality characteristics of software systems, Ethics in Software Engineering.

UNIT-II: Requirements Engineering

Requirements engineering process, requirements specification, structured and object oriented analysis

UNIT-III: Software Design

Architectural design, detailed design, Structured and object oriented design, user interface design

UNIT-IV: Software Testing

Verification, Validation, testing techniques, Testing Process

UNIT-V: Tools and Evolution

CASE Tools, Reverse engineering, Reengineering and Configuration management.

Reference Books:

6. Ian Sommerville (2016), "*Software Engineering*",10th Edition, Pearson Education Limited, Global Edition
7. Roger S Pressman, Bruce R Maxim(2015), "*Software Engineering, A Practitioner's Approach*", 8th Edition, TataMcGraw Hill, Indian Edition
8. Grady Booch, James Rumbaugh, Ivor Jacobson(2005), "*The Unified Modeling Language User Guide*", 2nd Edition, Addison Wesley Professional.US

School of Computer and Information Sciences

Name of the Academic Program: M.Tech (Computer Science) (M.Tech-II)

Course Code: CS452   Title of the Course: IT Lab-II (Web Technologies Lab)
L-T-P: 0-0-3   Credits   : 2
Prerequisite Course / Knowledge (If any): --None

Course Outcomes (COs)

After completion of this course successfully, the students will be able to:

- CO-1: Design web pages using scripting languages, cascading styles sheets and identify its elements and attributes. (Create)
- CO-2: Develop web pages using client side technologies and perform event handling and validation procedures. (Create)
- CO- 3: Create schemas and documents using markup languages, design and develop lightweight data-interchange formats for exchange of data between client and server applications. (Create)
- CO-4: Apply JavaScript libraries to create dynamic web page, access and use web services for interactive web contents. (Apply)
- CO-5: Develop applications using server side technologies, implement session management, database connectivity, and create dynamic HTML content with servlets and Java server pages. (Create)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1			3	2	1				
CO2			3	2	1				
CO3			2	3	1				
CO4			2	3	1				
CO5		1		2	3				

Detailed Syllabus:

UNIT- I: HTML, Forms & CSS

Introduction To HTML5, WWW, W3C, web publishing, Introduction To Style sheet, types of style sheets-Inline, External, Embedded CSS, text formatting properties, CSS Box Model, CSS Border, margin properties, Positioning Use of classes in CSS, color properties, use of <div>&<span>, Layout Design using CSS.

UNIT- II: JavaScript

Intro to script, types, intro of JavaScript, JavaScript identifiers, operators, control & Looping structure, Intro of Array, Array with methods, Math, String, Date Objects with methods User defined & Predefined functions, DOM objects, Window Navigator, History, Location, Event handling, Validations On Forms.

UNIT- III: Representing Web Data: XML, JSON

XML, XML Schema and DTD document definitions, XSLT transformations and programming, XPath, XQuery, Introduction to JSON.

UNIT- IV: jQuery& AJAX

Introduction to jQuery, Syntax Overview, Anatomy of a jQuery Script, Creating first jQuery script, Traversing the DOM, Selecting Elements with jQuery, Refining & Filtering Selections, Selecting Form Elements, Working with Selections, Chaining, Getters & Setters, CSS, Styling, & Dimensions, Manipulating Elements, Getting and Setting Information about Elements, Moving, Copying, and Removing Elements, Creating New Elements, Manipulating Attributes, Utility Methods, Events, Connecting Event to Elements, Namespacing Events, Event handling, Triggering Event handlers, Event Delegation, Animating effects, animate(), click(), hover(), toggle(), Plugins , Create a basic plugin, Finding &Evaluating Plugins, Writing Plugins, Tabs, Panels and Panes examples, jQuery UI and Forms, AJAX Overview, jQuery's AJAX related methods, Ajax and Forms, Ajax Events

UNIT- V: Java based Server Side Programming

Introduction to Java Programming Language, Features of JAVA; Java Language Basics, Packages and Interfaces, Exception handling; Database Management through JDBC, Connecting to a database for creation or manipulation; Multithreading Programming, Introduction to Servelet, HTTP Servelet Class, Request Interface, Response Interface, Session Tracking, Database Connectivity from Servelet, Interservelet Communication, Servelet Collaboration, Overview of JSP, Relation of Applets and Servelets with JSP, Scripting Elements, JSP Expressions, JSP Scriplets, JSP Declarations, Predefined Variables, Creating Custom JSP Tag Libraries Using Nested Tags, Structuring Generated Servelet in JSP Pages, Including Files and Applets in JSP Documents, Integrating Servelet and JSP.

Reference Books:

1. Internet and World Wide Web How to Program, P.J. Deitel, H.M. Deitel
2. Jeffrey C. Jackson, "Web Technologies—A Computer Science Perspective", Pearson Education, 2006.
3. Complete reference HTML.
4. JavaScript Bible
5. HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross
6. XML: How to program Deitel&Deitel.

Suggested Exercises

1. Develop an Ajax application so that it uses any of the file (JSON or XML) as input and displays the read data without changing the front end of the application. (Assume appropriate members and data for the design and development of the required application).

2. Design and develop a graphical user interactive application with various components (elements). Also perform client-side validation using JavaScript.

3. Write JS code that reads XML file or JSON file and print the details as tabular data. (Assume appropriate members and data for the design and development of the required application).

4. Using JSP technologies develop an application to perform the following operations:: Login/Register, make a topic, leave replies, edit content, delete content. Create different permissions for different users – simple users should only be allowed to edit (not delete) the topics and replies that were created by them. Admins should be able to delete and edit anything.

5. Develop an application using HTML, CSS and Java Script such that access to JSON data from URL parameters will display the data based on the search keywords mentioned in the textbox. (Assume appropriate members and data for the design and development of the required application).

6. Using JSP technologies develop an interactive application to support selection, addition, deletion and searching operations.

7. Create a basic plugin for the operations using jQuery UI and Forms.

8. Create a document that reads and stores cookies containing a user name and number of times, he or she has visited your website. Whenever the user visits the site, the system displays the cookies in alert dialogue box, increments the counter cookie by 1 and then resets the counter's expiration date to one year from the current date.

9. Using Web Technologies to develop Visual Aids.

10. Practice exercise of developing web base application with the help of JSP and databases.

11. Design and develop GUI to perform the event handling operations and triggering the events.

12. Develop an application for exemplifying the use of Unobtrusive jQuery at Client Side.

Name of the Academic Program: **M.Tech (Information Technology) (M.Tech-II)**

Course Code CS 453   Title of the Course   : **Software Engineering Lab**

L-T-P   : 0-0-3   Credits   : 2

Prerequisite Course / Knowledge (If any): It is expected that the students must have done at least one programming course at undergraduate/postgraduate level

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO1: Create user stories (Create).
- CO2: Develop test plans for test first development (Create).
- CO3: Design & develop the stories (Create).
- CO4: Create the documentation (Create).
- CO5: Develop Software requirements specification document (Create).
- CO6: Apply object oriented and structured paradigm (Apply).
- CO7: Generate test reports (Create)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2			3	1				
CO2		2	3	1					
CO3			2	3	1				
CO4	2	3			1				
CO5		1	3	2					
CO6		1		2	3				
CO7		2	3	1					

Detailed Syllabus:

For a given case study/problem statement, the following deliverables are to be realized

- Define stories
- Identify tasks and develop test plan for stories/task (with the help of specifications)
- Design and develop increments
- Test the increments and release the increment
- Apply object oriented and structured modelling
- Implement the case study for plan driven approach by writing use case specification, designing the system and implementing the same.

Reference Books:

1. Ian Sommerville (2016), "*Software Engineering*",10th Edition, Pearson Education Limited, Global Edition

2. Roger S Pressman, Bruce R Maxim(2015), "*Software Engineering, A Practitioner's Approach*", 8th Edition, TataMcGraw Hill, Indian Edition

School of Computer and Information Sciences

Name of the Academic Program: **M.Tech (Information Technology) (M.Tech-II)**

Course Code: IT 471   Title of the Course   : **Biometrics**

L-T-P   : 4-0-0   Credits   : 4

Prerequisite Course / Knowledge (If any): Nil

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO-1: Review various Biometric approaches (Understand)
- CO-2: Evaluate the applicability of biometrics in various domains (Evaluate)
- CO-3: Apply different Biometrics techniques on varied applications (Apply)
- CO-4: Analyze the performance of Biometrics (Analyze)
- CO-5: Synthesize the algorithms for various Biometrics (Create)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1		2		3			1		
CO2			1		2			3	
CO3									
CO4	2			3			1		
CO5						1	3		2

Detailed Syllabus:

UNIT-I: Biometrics - Physiological or Behavioral, Verification, Identification and Applications, Biometric Technologies, Working of Biometrics, Benefits, Application Design, Performance measures; Fingerprinting: Fingerprint Recognition, Fingerprint Scanning, Practical Applications of Fingerprint Scanning, Accuracy and Integrity, Fingerprint Matching, Fingerprint Classification, Fingerprint Image Enhancement, Fingerprint Feature Extraction, Fingerprint Form Factors, Types of Scanners: Optical - Silicon – Ultrasound, Multispectral Fingerprint Matching.

UNIT-II: Hand Biometrics: Palm print, Vein pattern, Knuckle, Finger Geometry & Handwriting Recognition: Introduction, Applications, Combining Biometric Methods, Strengths and Weaknesses.

UNIT-III: Iris & Face Recognition: Introduction, Benefits of Using Iris Technology, Iris-Scan: How it Works, Iris-Scan Applications, Iris-Scan Issues, Introduction to Facial Recognition, How Is Facial Recognition Technology Currently Being Used?, How Well Does Facial Recognition Work, Why Face Recognition, Facial Recognition: How it Works, Image Quality, Facial Scan Process Flow, Verification vs. Identification, Primary Facial Recognition Technologies, Facial Recognition Applications.

UNIT-IV: Voice Recognition & Keystroke Dynamics: Introduction, Working, Strengths and Weaknesses, Voice Recognition Applications, Voice Verification in Telephone Banking, Understanding Voice Recognition.

UNIT-V: Multi-Modal Biometrics: Multi-Modal Biometric Systems, Fusion Methodology, Levels of Fusion, Feature-Extraction Level Fusion, Data Matching Level Fusion, Probabilistic-Decision level Fusion, Fusion Procedure, Modes of Operation, Integration Strategies, Design Issues, Soft Biometrics, A Biometric Vision, Securing Biometric Template: Cancellable biometrics, Authentication, Security Analysis.

Suggested Readings:

1. Raud M. Bolle, Jonathan H. Connell, Sharath Panakanti, Nalini K. Ratha, Andrew W. Senior, Guide to biometrics, Springer, 2003. 85 .
2. Anil K. Jain, Patrick Flynn, Arun A. Ross, Handbook of Biometrics, Springer, 2007.
3. Davide Maltoni, Dario Maio, Anil K. Jain, Salil Prabhakar, Handbook of fingerprint recognition, Springer, 2002.
4. David D. Zhang, Palmprint Authentication, Kluwer Academic Publishers, 2004.
5. Chuck Wilson, Vein pattern recognition- a privacy enhancing biometric, CRC press, 2010.
6. Stan Z. Li, Anil K. Jain, Handbook of face recognition, Springer, 2004.
7. Arun A. Ross, Karthik Nandakumar, Anil K. Jain, Handbook of Multibiometrics, Springer, 2006.
8. Bir Bhanu, Venu Govindaraju, Multibiometrics for human identification, Cambridge University Press, 2011.
9. Hai Zhou Li, Kar Ann Toh, Liyuan Li, Advanced topics in biometrics, World Scientific, 2011.
10. Stan Z. Li, Anil K. Jain, Encyclopaedia of Biometrics, Volume 1 & 2. Springer, 2009.

Name of the Academic Program: <u>M.Tech (Information Technology) (M.Tech-II)</u>

Course Code: IT 472   Title of the Course   : **Soft Computing**

L-T-P   : 3-0-0   Credits   : 3

Prerequisite Course / Knowledge (If any): Nil

Course Outcomes (COs)

After completion of this course successfully, the students will be able to

- CO-1: Describe various soft computing techniques (Understand)
- CO-2: Apply various soft computing techniques for problem solving (Apply)
- CO-3: Compare various algorithms to solve a problem and evaluate their performances (Evaluate)
- CO-4: Analyze the suitability of soft computing techniques for various domains (Analyze)
- CO-5: Create new techniques by hybridizing existing techniques to solve challenging problems (Create)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1			3	2			1		
CO2				3	1			2	
CO3			3				1		2
CO4	2			3			1		
CO5					2	1			3

Detailed Syllabus:

UNIT- I: **Fuzzy Sets and Fuzzy Logic**:
Introduction, fuzzy sets versus crisp sets, fuzzy relations, extension principles, fuzzy numbers, linguistic variable, hedges, fuzzy logic, fuzzy rule base design and analysis, fuzzy control system, fuzzy segmentation and clustering, fuzzy decision making.

UNIT- II: **Artificial Neural Networks**:
Basic models, single and multi layer perceptions, back propagation algorithm for MLP, support vector machine, radial basis function neural networks, general regression neural networks, Probabilistic neural networks, Kohonen's self-organizing feature map, deep learning and deep neural network.

UNIT- III: **Evolutionary Techniques:**
Basics of genetic algorithm (GA), schema theorem and convergence of GA, differential evolution, ant colony optimization, particle swarm optimization.

UNIT- IV: **Rough Sets**
Definition, upper and lower approximations, boundary region, definability, roughness, reduct and core, decision matrices and applications.

UNIT- V: **Hybrid Systems**:
Neural network based fuzzy Systems, fuzzy logic based neural networks, genetic Algorithm for neural network design and learning, fuzzy logic and genetic algorithm for optimization.

Suggested Readings:

1. T. J. Ross (2010), *Fuzzy logic with engineering applications*, 3rd Edition, John Wiley & Sons.
2. H.-J. Zimmermann (2001), *Fuzzy set theory and its applications*, 4th edition, Kluwer Academic Publishers.
3. G. Bojadziev and M. Bojadziev (1995), *Fuzzy sets, fuzzy logic, applications*, World Scientific.
4. G. J. Klir and B. Yuan (1995), *Fuzzy sets and fuzzy logic: theory and applications*, Prentice Hall.
5. Z. Pawlak (1991), *Rough sets: theoretical aspects of reasoning about data*, Kluwer Academic Publishers.
6. S. Haykin (2008), *Neural networks and learning machines*, 3rd edition, Prentice Hall.
7. D. W. Patterson (1998), *Artificial neural networks: theory and applications*, Prentice Hall.
8. M. H. Hassoun (1995), *Fundamentals of artificial neural network*, MIT Press.
9. D. E. Goldberg (1989), *Genetic algorithms in search and optimization, and machine learning*, Addison-Wesley.
10. K. Deb (2010), *Multi-objective optimization using evolutionary algorithms*, Wiley India Pvt Ltd.
    A. P. Engelbrecht (2007), Computational intelligence – an introduction, 2nd edition, Wiley.
11. C.-T. Lin and C. S. G. Lee (1996), *Neural fuzzy systems: a neuro-fuzzy synergism to intelligent systems*, Prentice Hall.