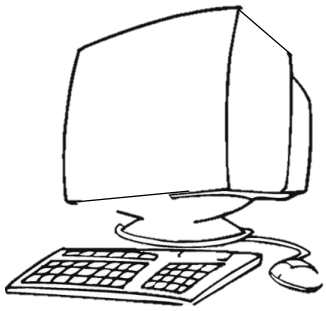
VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)

Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI FOR
M. Tech (CSE) UNDER CBCS
WITH EFFECT FROM 2018-19
(For the students admitted from 2018-19)



DEPARTMENT OFCOMPUTER SCIENCE ENGINERING
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VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)

DEPARTMENTOF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR M.Tech
I-SEMESTER w.e.f. 2018-19 under CBCS

S. No	Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
THEORY									
1	PI18AC110EH	Audit course-I: English for Research Paper Writing	2	0	0	3	60	40	0
2	PI 18PC110CS	Mathematical Foundations of Computer Science	3	0	0	3	60	40	3
3	PI 18PC120CS	Advanced Data Structures	3	0	0	3	60	40	3
4	PI 18PC130CS	Advanced Operating Systems	3	0	0	3	60	40	3
5	PI 18PE1XXCS	Professional Elective - I	3	0	0	3	60	40	3
6	PI 18PE1XXCS	Professional Elective - II	3	0	0	3	60	40	3
7	PI 18PE1XXCS	Professional Elective - III	3	0	0	3	60	40	3
PRACTICALS									
8	PI 18PC111CS	Advanced Data Structures Lab	0	0	3	0	0	50	1.5
9	PI 18PE1X1CS	Elective Based Lab	0	0	3	0	0	50	1.5
10	PI 18PC118CS	Seminar – I	0	0	2	0	0	50	1
		TOTAL	**20**	**0**	**8**	**0**	**420**	**430**	**22**
		GRAND TOTAL	**28**				**850**		
Foundation Classes: 6 Periods CCA:2 Periods									

With effect from the A.Y 2018-19

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ENGLISH FOR RESEARCH PAPER WRITING

Instruction: 2 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18AC110EH
Credits: -	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students Should be able to	At the end of the course, students will be able to
• Understand that how to improve your writing skills and level of readability • Learn about what to write in each section • Understand the skills needed when writing a Title	• write research papers • write citations as per the MLA style sheet and APA format • write concisely and clearly following the rules of simple grammar, diction and coherence.

Unit-I: Planning and Preparation, Word Order, Breaking up long sentences. Structuring Paragraphs and Sentences, Being concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit-II: Clarifying Who Did What, Highlighting your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

Unit-III: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit-IV: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

Unit-V: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

LEARNING RESOURCES :

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC110CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students Should be able to	At the end of the course, students will be able to
• Understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, software Engineering, computer architecture, Operating Systems, distributed systems, Bioinformatics, Machine Learning. • Develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency. • Study various sampling and regression analysis.	• Understand the basic notions of discrete and continuous probability. • Solve simple real world problems of discrete and continuous distributions • Understand the methods of statistical inference, and the role that sampling distributions play in those methods. • Perform correct and meaningful statistical analyses of simple to moderate complexity.

UNIT – I

Random Variables: Discrete and Continuous Random Variable, Probability Mass, Density and Cumulative Distribution Function, Expected Value, Variance, Moments, Moment Generating Function, Joint Probability Density Function, Marginal, Conditional Probability Distribution, Conditional Expectation and Independent Random Variables.

UNIT – II

Applications of Univariate and Multivariate Random Variables: Central Limit Theorem, Special Discrete Distributions – Binomial and Poisson, Continuous Distributions – Uniform, Gamma, Normal Distributions (univariate and bivariate random variables), Markov Chains.

UNIT – III

Sampling Distributions: Random samples, Sampling Distributions of Estimators, Method of Moments and Maximum likelihood function.

UNIT – IV

Statistical Inference: Parameters and Statistics, Tests of Hypothesis and Tests of Significance, Critical Region and Level of Significance, Inferences concerning a mean - inferences concerning variances

UNIT – V

Regression Analysis: Curvilinear Regression, Multiple Regression, Correlation, Multiple linear Regression (Matrix Notation)

Suggested books:

1. Miller & Freund's, Probability and Statistics For Engineers, by Richard A. Johnson, Eight Edition, PHI.
2. T. Veerarajan, Probability, Statistics and Random Processes, Second Edition, Tata McGraw-Hill.

Reference Books:

1. John Vince, Foundation Mathematics for computer Science, Springer
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Wiley.
3. M. Mitzenmacher and E. Upfal.Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatorics, Wiley

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ADVANCED DATA STRUCTURES

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC120CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Use ADT/libraries to design algorithms for a specific problem. • Understand the necessary mathematical abstraction to solve problems. • Understand advanced paradigms and data structure to solve algorithmic problems. • Analyze the algorithm efficiency and proofs of correctness.	• Design symbol table using hashing techniques. • Explain and design the operation on skip list • Develop and analyze algorithms for red-black trees, B-trees and Splay trees. • Develop algorithms for text processing applications. • Identify suitable data structures and develop algorithms for computational geometry problems.

UNIT-I
Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT-I I
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

UNIT-III
Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

UNIT-IV
Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

UNIT-V
Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

Suggested books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. Thomas H. Cormen, Leiserson .C.E, Rivest.R.L , Stein.C, Introduction to Algorithm ,2nd edition(2001), MIT press, USA.
4. Horowitz E. Sahani S, Fundamentals of computer Algorithms", Galgotia publications.

Reference Books

1. Aho, Hopcroft, Ulman, The Design and Analysis of Computer algorithms, Pearson Education, (2000).
2. Steven S.Skiena ,The algorithm design manual, Springer (1997).
3. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press,(2009).

Online resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm.
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/106101060/
4. https://www.khanacademy.org/computing/computer-science/algorithms

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ADVANCED OPERATING SYSTEMS

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code: PI18PC130CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Describe different components of distributed operating system and design suitable algorithms for the better functionality of distributed operating system.	• Explain architectures and issues in distributed operating systems • Illustrate different distributed mutual exclusion algorithms and distributed deadlock algorithms • Design distributed scheduling algorithm and describe distributed shared memory • Explain failure recovery, fault tolerance and apply various cryptographic algorithms for the protection of given data • Differentiate architectures of multiprocessor system and concurrency control algorithms

UNIT-I

Architectures of Distributed Systems: System Architecture Types, Distributed OS, Issues in Distributed Operating Systems.

Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical clocks, Vector Clocks, Global State, Termination Detection.

UNIT-II

Distributed Mutual Exclusion: The classification of Mutual Exclusion Algorithms, Preliminaries, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms ,Suzuki-kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm.

Distributed Deadlock Detection: Resource Vs Communication Deadlocks, A graph– theoretic Model, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Control Organizations for Distributed Deadlock Detection, Centralized Deadlock-Detection Algorithms, The completely Centralized Algorithm,

The Ho-Ramamoorthy Algorithms. Distributed Deadlock Detection Algorithms- A Path-Pushing, Edge-Chasing, Hierarchical Deadlock Detection Algorithms, The Menasce-Muntz and Ho-Ramamoorthy Algorithm.

Agreement protocols: The System Model, The Byzantine Agreement Problem, The Consensus Problem.

UNIT-III

Distributed File Systems: Mechanisms for Building Distributed File Systems, Design Issues.
Case Studies: Sun NFS, Sprite File System, Apollo DOMAIN, Coda File systems.
Distributed Shared Memory: Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues.
Case Studies: IVY, Mirage, Clouds
Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributing Algorithm, Stability, Load Distributing Algorithms, Performance Comparison.

UNIT-IV

Failure Recovery: Backward and Forward Error Recovery in Concurrent Systems, Consistent Set of Checkpoints, Synchronous And Asynchronous check Pointing and Recovery.
Fault Tolerance: Commit Protocols, Non-blocking Commit Protocols, Voting Protocols.
Resource Protection and Security: The Access Matrix Model
Data Security: Cryptography: Private Key and Public Key Cryptography
Case Study: The Kerberos System.

UNIT-V

Multiprocessor System Architectures: Motivation, Basic Multiprocessor System Architectures, Interconnection Networks for Multiprocessor Systems, Caching, Hypercube Architectures.
Multiprocessor Operating Systems: Threads, Process Synchronization, Processor Scheduling, Memory management: The Mach Operating System.
Database Operating Systems: Concurrence Control Model, Problem of Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms.

Suggested Book:

1. Mukesh Singhal, Niranjan G. Shivaratri, "Advanced concepts in Operating systems", Tata McGraw Hill Edition (2001),Tata McGraw Hill Education, New Delhi.

Reference Books:

1. Pradeep K, Sinha, Distributed Operating Systems Concepts and Design, First Edition(2002), Prentice-Hall of India, Delhi.
2. Andrew S.Tanenbaum, Distributed Operating Systems, ,First Edition(2011), Pearson Education
3. India, New Delhi.

Online resources:

1. http://nptel.ac.in/courses/106106107/1
2. https://www.youtube.com/watch?v=2L7jnaXuOc8
3. https://people.eecs.berkeley.edu/~kubitron/cs194-24/index_lectures.html

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ARTIFICIAL INTELLIGENCE

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code: PI18PE110CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Understand issues and techniques involved in the creation of intelligent systems • Create logical agents to do inference using predicate logic, fuzz logic or probability theory.	• Choose appropriate state space searching techniques to maximize the performance • Understand first-order propositional and predicate logic to represent knowledge • Solve problems involving uncertain information using probabilistic techniques. Apply planning algorithms to find optimal solutions • Apply techniques like decision tree , neural network and rule learning to a given AI application for learning Understand the steps involved in Natural language processing. Apply fuzzy logic in designing AI systems

UNIT-I
Introduction: Definition, history and applications of AI. **Search in State Spaces**: Agents that plan, Uninformed search, Algorithm A*, Heuristic Functions and Search Efficiency, Alternative Search Formulations and Applications, Adversarial Search.

UNIT – II
Knowledge Representation and Reasoning: The Propositional Calculus, Resolution in Propositional Calculus, The Predicate Calculus, Resolution in Predicate Calculus, Rule-Based Expert Systems, Representing Common Sense Knowledge.

UNIT-III
Reasoning with Uncertain Information: Review of probability theory, Probabilistic Inference, Bayes Networks.
Planning Methods Based on Logic: The Situation Calculus, Planning.

UNIT-IV
Learning from Observations: Learning decision-trees using Information theory, Learning General Logical Descriptions, **Neural Networks**: Perceptron, Multilayer feed-forward neural network. Rule Learning.

UNIT-V
Natural Language Processing: Communication among agents
Fuzzy Logic Systems: Crisp Sets, Fuzzy Sets, Some fuzzy terminology, Fuzzy Logic Control, Sugeno Style of Fuzzy inference processing, Fuzzy hedges, Cut Threshold, Neuro Fuzzy systems.

Suggested Books:

1. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, (1998),Elsevier

Reference Books:

1. Stuart Russell, Peter Norvig, Artificial Intelligence – A Modern Approach, Third Edition (2015), Pearson
2. Elaine Rich, Kevin Knight, Shivashankar B Nair, Artificial Intelligence, Third Edition(2009), Tata McGraw Hill
3. George F Luger , Artificial Intelligence, Structures and strategies for Complex Problem Solving, Sixth Edition,(2009), Pearson

Online Resources :

1. http://www.nptel.ac.in/courses/106105077
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-spring-2005
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ADVANCED DATABASES

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code:PI18PE120CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to	At the end of the course, students will be able to
• Apply knowledge of advanced database management techniques to provide solution for a database intensive problem.	• Create and query tables in object relational and object oriented databases • Create, query and process data in xml files • Describe query processing mechanisms and query optimization • Explain inter query, intra query parallelism and distributed database processing techniques • Apply performance tuning methods and describe data representation in spatial, geographical and temporal databases

UNIT-I :

Object Based Databases: Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-II :

XML: Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application program Interfaces to XML , Storage of XML Data, XML applications.

UNIT-III :

Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.

UNIT-IV :

Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems.

Distributed Databases : Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.

UNIT-V :

Advanced Application Development: Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

Suggested books :

1. Abraham Silberschatz, Henry F Korth, Sudharshan S, Database System Concepts, 6th Edition(2011), McGraw-Hill International Edition.

Reference Books:

1. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition(2006), Pearson Education.
2. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition(2006) Pearson Education.
3. Raghu Ramakrishna, and Johannes Gehrke, Database Management Systems, 3rd Edition(2003), McGraw Hill.

Online resources:

1. http://nptel.ac.in/courses/106106093/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
INFORMATION SECURITY

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code:PI18PE134CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to	Students will be able to
• apply different algorithms to achieve security services	understand various components of Information Security and explain different security attacks and threats • differentiate secrete Key cryptography and public key cryptography and state DES, AES and RSA algorithms for information security • differentiate methods for message integrity and authentication and analyze strategies to protect information assets from common attacks • explain PKI Interface and differentiate methods for smart card security • implement Information security and web security protocols

UNIT-I
Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-II
Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques
Secret Key Cryptography: DES, Triple DES, AES, Key distribution, Attacks
Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks.

UNIT-III
Integrity, Authentication and Non-Repudiation: Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication, Kerberos.
Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

UNIT-IV
PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's, Intrusion Detection and Prevention Systems.
Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

UNIT-V

Applications: Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments.

Implementing Information Security: information security project management, technical topics of implementation , Non- technical aspects of implementation, Security certification and accreditation

Suggested Books

1. William Stallings, "Cryptography and Network Security ", 4th Edition. pearson. 2009
2. Michael E Whitman and Herbert J Mattord, Principles of Information Security, (2011),Cengage Learning.

Reference Books

1. Michael E. Whitman and Hebert J Mattord, "Principles of Information Security", 4th edition Ed. Cengage Learning 2011
2. Behrouz A Forouzan, "Cryptography and Network Security", TMH, 2009
3. Joseph Migga Kizza," A guide to Computer network security", Springer, 2010
4. Dario cataiano," Contemporary Cryptalogy", Springer, 2010

Online resources

1. http://nptel.ac.in/courses/106106129/

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
MACHINE LEARNING

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PE130CS
Credits: 3	CIE Marks: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes. • To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances. • Explore supervised and unsupervised learning paradigms of machine learning. • To explore Deep learning technique and various feature extraction strategies	• Extract features that can be used for a particular machine learning approach in various IOT applications. • To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach. • To mathematically analyse various machine learning approaches and paradigms

UNIT-I

Supervised Learning (Regression/Classification)

Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes

Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

UNIT-II

Unsupervised Learning

Clustering: K-means/Kernel K-means , Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion Generative Models (mixture models and latent factor models)

UNIT-III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT-IV

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

UNIT-V

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

UNIT-VI

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

References:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
INFORMATION STORAGE MANAGEMENT

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code: PI18PE114CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Apply the knowledge of different Storage techniques to practice scalable data universe generated by heterogeneous devices and devising a support system for a highly available self sustainable business solutions that are robust, secure & cloud enabled	• Evaluate Storage architectures and key data center elements in classic, virtualized & cloud Environments, explain physical & logical components of storage infrastructure, RAID & Intelligent Storage Systems • Describe storage networking technologies: FC-SAN, IP-SAN, FCoE, NAS, Object-based and unified storage • Elaborate business continuity solutions, backup and recovery technologies, and local and remote replication solutions • Detail the various enabling technologies, service models & Adoption considerations in the area of cloud • Apply information security and storage security domains and identify parameters for managing and monitoring storage infrastructure

UNIT-I

Storage System : Introduction to information storage, virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk drive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning).

UNIT-II

Storage Networking : Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option – FCoE, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT-III

Backup, Replication, Archive : Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

UNIT-IV

Cloud Infrastructure : Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits, Cloud Service Models, Deployment Models, Cloud Computing Infrastructure, Cloud Challenges, Cloud Adoption Considerations, Concepts in practice.

UNIT-V

Storage Security & Management: Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments,

Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering.

Suggested Books:

1. Somasundaram G. and Alok Shrivastava, Information Storage and Management, 2nd Edition (2012), Wiley, New Delhi

Reference Books:

1. Robert Spalding, Storage Networks: The Complete Reference, (2003), Tata McGraw Hill, New Delhi.
2. Marc Farley, Building Storage Networks, (2001), Tata McGraw Hill, New Delhi.
3. Meeta Gupta, Storage Area Network Fundamentals, (2002), CISCO Press, USA.

Online Resources:

1. http://nptel.ac.in/courses/106108058/

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
MOBILE COMPUTING

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PE115CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Describe the functionalities and standards of mobile systems, design and develop mobile apps.	• Describe the principles of cellular wireless networks. • Explain GSM, GPRS, 3G technologies and broadcasting techniques • Identify and choose wireless LAN protocols for different environments • Compare file systems for mobility support and discuss ways to publish data on air • Design and develop mobile app and compare models of mobile transactions

UNIT-I

Introduction: Wireless Transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread Spectrum, MAC- SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

UNIT-II

Telecommunication Systems: GSM, GPRS, Satellite Systems - Basics, Routing, Localization, Handover, FAMA and DAMA, Broadcast Systems- DAB, DVB, CDMA and 3G.

UNIT-III

Wireless LAN: IEEE 802.11, Architecture, Services, MAC-Physical Layer, IEEE 802.11a-802.11b Standards, Bluetooth.

UNIT-IV

Mobile IP - Dynamic Host Configuration Protocol, Traditional TCP- Classical TCP Improvements-WAP, WAP 2.0

Publishing & Accessing Data in Air: Pull and Push Based Data Delivery Models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air

File System Support for Mobility: Distributed File Sharing for Mobility Support, CODA and other Storage Manager for Mobility Support.

UNIT-V

Mobile Platforms - Android, iOS, Windows Phone 8, Mobile App or Website, Android Development Tools, Application Development, Android development Practices.

Mobile Transaction and Commerce: Models for Mobile Transaction, Kangaroo and Joey Transactions, Team Transaction.

Recovery Model for Mobile Transactions, Electronic Payment and Protocols for Mobile Commerce.

Suggested Books:

1. Jochen, M Schiller, Mobile Communications, 2nd Edition(2009), Pearson Education.

Reference Books:

1. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", Wiley Publishers,(2012).
2. KumkumGarg, Mobile Computing, Pearson Education, (2010).
3. Asoke K Talukder, Roopa R Yavagal, "Mobile Computing", TMH, (2008).
4. Raj Kamal, Mobile Computing, Oxford, (2009).
5. A Survey of Mobile Transactions appeared in Distributed and Parallel Databases, pgs. 193-230, Kluwer Academic Publishers, (2004).
6. S.Acharya, M.Franklin and S.Zdonik, Balancing Push and Pull for Data Broadcast, Proceedings of ACM SIGMOD, Tuscon, AZ, May1997.
7. S.Acharya, R. Alonso, M.Franklin and S.Zdonik, "Broadcast Disks: Data Management for Asymmetric Communication Environments", Proceedings of ACM SIGMOD Conference, San Jose, CA, May 1995.

Online Resources:

1. http://nptel.ac.in/courses/117102062/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ADVANCED DATA STRUCTURES LAB

Instructions: 3 Hours / Week	Semester End Exam Marks : 0	Course Code: PI18PC111CS
Credits: 1.5	CIE Marks : 40	Duration of SEE: -----

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Identify and apply various algorithm design strategies to solve engineering problems with efficient time and space utilization	• Implement and use basic data structures like stack, queue, linked list to solve problems • Implement hashing techniques • Develop algorithm to do operations on special trees • Develop string pattern matching algorithms. • Implement range searching algorithms

1. Stack, queues and Linked list
2. Linear open addressing collision resolution Techniques
3. Chaining collision resolution Techniques
4. Double hashing
5. Skip list
6. Binary Search Tree (BST)
7. AVL Tree
8. B-trees
9. Brute-Force pattern matching algorithm
10. Boyer–Moore Pattern Matching Algorithm.
11. KMP Pattern Matching Algorithm with failure function.
12. Huffman Coding algorithm
13. One dimensional range searching algorithm
14. Two dimensional range searching algorithm
15. Priority search tree

Suggested books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. Thomas H. Cormen, Leiserson .C.E, Rivest.R.L , Stein.C, Introduction to Algorithm ,2nd edition(2001), MIT press, USA.
3. M.T.Goodrich, R.Tomassia, Algorithm design – Foundations, Analysis, and Internet Algorithms, John Wiley, (2002).
4. Horowitz E. Sahani S, Fundamentals of computer Algorithms", Galgotia publications.

Reference Books

1. Aho, Hopcroft, Ulman, The Design and Analysis of Computer algorithms, Pearson Education, (2000).
2. Steven S.Skiena ,The algorithm design manual, Springer (1997).
3. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press,(2009).

Online resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm.
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/106101060/
4. https://www.khanacademy.org/computing/computer-science/algorithms

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
ADVANCED DATABASES LAB

Instructions: 3 Hours / Week	Semester End Exam Marks : 0	Course Code: PI18PE121CS
Credits: 1.5	CIE Marks : 50	Duration of SEE: ---

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Apply database management techniques to provide solution for a data intensive problem	• Create and query the tables in object relational and object oriented databases • Create, query and process data in xml files • Implement sort and join operations on tables • Access remote data in distributed database system • Apply tuning methods to optimize the performance of a database

List of Experiments:

1. Creating tables and Inserting values for Retail Banking Database
2. Grouping Data, Sub Queries
3. Joins, Set operations
4. Aggregation operations.
5. Creating indexes on a table
6. Views, Clusters
7. Sequences, Object Types
8. Object views, Nested tables
9. Variable Arrays, Referencing Objects
10. Creating XML File for university database
11. Implementing External Sort-Merge algorithm
12. Implementing Nested-loop join algorithm
13. Implementing Block Nested-loop join algorithm
14. Accessing remote data

Suggested books :

1. Ivan Bayross, SQL, PL/SQL, The Programming Language of Oracle, 4th Edition, PBP Publications.

Reference Books:

1. AbrSilberschatz, Henry F Korth, Sudharshan S, Database System Concepts, 6th Edition(2011), McGraw-Hill International Edition.

Online resources:

1. http://nptel.ac.in/courses/106106093/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER
SEMINAR-I

Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Course Code: PI18PC118CS
Credits: 1	CIE Marks: 50	Duration of SEE: --

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	• Improve presentation and communication skills • Acquire knowledge about recent advancements in industry and new research trends • Collect information through literature survey, analyze and present them • Acquire knowledge about new hardware and software needs of market • Acquire technical document writing skills

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members.

Students are to be exposed to following aspects of seminar presentation:

Literature survey

Organization of material

Preparation of OHP slides / PC presentation

Technical writing.

Each student is required to:

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The CIE marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.

VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)

DEPARTMENTOF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR M.Tech (CSE)
II-SEMESTER w.e.f. 2018-19 under CBCS

S. No	Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
THEORY									
1	PI 18AC210EH	Audit course-II: Pedagogy Studies	2	-	-	3	60	40	0
2	PI18PC240ME	Research Methodology and IPR	2	-	-	3	60	40	2
3	PI 18HS200EH	Skill Development Course	2	-	-	3	60	40	2
4	PI 18PC210CS	Advanced Algorithms	3	0	0	3	60	40	3
5	PI 18PC220CS	Data Mining	3	0	0	3	60	40	3
6	PI 18PC230CS	Object Oriented Software Engineering	3	0	0	3	60	40	3
7	PI 18PE2XXCS	Program Elective -IV	3	0	0	3	60	40	3
8	PI 18PE2XXCS	Program Elective - V	3	0	0	3	60	40	3
PRACTICALS									
9	PI 18PC211CS	Advance Algorithms Lab	0	0	3	0	0	50	1.5
10	PI 18PE2X1CS	Elective Based Lab	0	0	3	0	0	50	1.5
11	PI 18PC218CS	Seminar- II	0	0	2	0	0	50	1
12	PI 18PC219CS	Mini Project	0	0	2	0	0	50	1
		TOTAL	**21**	**0**	**10**	**-**	**480**	**520**	**24**
		GRAND TOTAL	**31**				**1000**		

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DEAPRTMENT OF HUMANITIES AND SOCIAL SCIENCES
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
PEDAGOGY STUDIES
VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)

Instruction: 2 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC210EH
Credits: 0	CIE marks: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students will be able to: 1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. 2. Identify critical evidence gaps to guide the development.	**Students will be able to understand:** 1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries? 2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? 3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit-I **Introduction and Methodology :**

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.

Unit-II

- **Thematic overview:**
  - Pedagogical practices that are being used by teachers
  - in formal and informal classrooms in developing countries.
  - Curriculum, Teacher education.

Unit-III

- **Evidence on the effectiveness of pedagogical practices**
  - Methodology for the in depth stage: quality assessment of included studies.
  - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
  - Theory of change.
  - Strength and nature of the body of evidence for effective pedagogical practices.
  - Pedagogic theory and pedagogical approaches.
  - Teachers' attitudes and beliefs and Pedagogic strategies.

Unit-IV

- **Professional development: alignment with classroom practices and follow-up support**
  - Peer support
  - Support from the head teacher and the community.
  - Curriculum and assessment
  - Barriers to learning: limited resources and large class sizes

Unit-V

- **Research gaps and future directions**
  - Research design
  - Contexts
  - Pedagogy
  - Teacher education
  - Curriculum and assessment
  - Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR M.Tech (CSE) II-SEMESTER
RESEARCH METHODOLOGY AND IPR

Instruction: 2 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC240ME
Credits: 2	Sessional Marks: 40	Duration of SEE : 3 hrs.

Course Outcomes
At the end of the course, Students will be able to
• Understand research problem formulation. • Analyze research related information and follow research ethics • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II
Effective literature studies approaches, analysis Plagiarism, Research ethics,

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-III
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.

With effect from the A.Y 2018-19

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
SKILL DEVELOPMENT COURSE

Instruction: 2 Hours/ week	Semester End Exam Marks: 60	Course Code: **PI18HS200EH**
Credits: 2	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students Should be able to	At the end of the course, students will be able to
The four major skills of language learning, listening, speaking, reading and writing provide the right key to success. The main objective of the Skill Development Course curriculum is to involve content for all the above mentioned four skills in teaching English and to get students proficient in both receptive and productive skills.	• Better Comprehension and Presentation Skills • Exposure to Versant, AMCAT and better strike rate during placement • Better Interview Performance

Unit I: **Remedial English: Delightful Descriptions**:
Describing Past, Present and Future Events.

Unit II: **Developing Conversational Skills –** Exchange of pleasantries, Exchange facts and opinions, Using relevant vocabulary.

UNIT III: **Contextual Conversations:** Ask for Information, Give Information, Convey bad news, show appreciation

UNIT IV: **Business English**: **Professional Communication**:
Concise Cogent Communication, Active Listening, Interact, Interpret and Respond. **Expositions and Discussions:** Organization, Key Points, Differing Opinions, Logical conclusions. **Effective Writing Skills:** Structure, Rough Draft, Improvisations and Final Draft for Emails, paragraphs and Essays. **High Impact Presentations:** Structure, Content, Review, Delivery

Unit V: **Industry Orientation and Interview Preparation**
Interview Preparation– Fundamental Principles of Interviewing, Resume Preparation, Types of Interviews, General Preparations for an Interview. **Corporate Survival skills**: Personal accountability, Goal Setting, Business Etiquette, Team Work

Suggested Readings:

1. Business Communication, by Hory Shankar Mukerjee, Oxford/2013
2. Managing Soft Skills for Personality Development by B.N.Gosh, Tata McGraw-Hill/ 2012
3. Personality Development & Soft Skills by Barun K Mitra, Oxford/2011
4. Murphy, Herta A., Hildebrandt, Herbert W., & Thomas, Jane P., (2008) "Effective Business Communication", Seventh Edition, Tata McGraw Hill, New Delhi
5. Locker, Kitty O., Kaczmarek, Stephen Kyo, (2007), "Business Communication – Building Critical Skills", Tata McGraw Hill, New Delhi
6. Lesikar, Raymond V., &Flatley, Marie E., (2005)"Basic Business Communication – Skills for Empowering the Internet Generation", Tenth Edition, Tata McGraw Hill, New Delhi
7. Raman M., & Singh, P., (2006) "Business Communication", Oxford University Press, New Delhi.

Journals / Magazines:

1. Journal of Business Communication, Sage publications
2. Management Education, Mumbai

Websites:

www.mindtools.com
www.bcr.com

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
ADVANCED ALGORITHMS

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC210CS
Credits: 3	Sessional Marks: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• introduce students to the advanced methods of designing and analyzing algorithms. • choose appropriate algorithms and use it for a specific problem. • understand different classes of problems concerning their computation difficulties.	• Analyze the complexity/performance of sorting and graph algorithms • Apply greedy paradigm to solve problem on non linear data structure • Design and analyze network flow and matrix computation algorithms. • Design and analyze algorithms using dynamic programming approach and number theoretic algorithm to solve shortest path problem • Differentiate between NP-complete and NP-hard problems

UNIT-I

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT-II

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-III

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT-IV

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

UNIT- V

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness. Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Suggested books

1. Thomas H. CORMEN, LEISERSON .C.E, RIVEST.R.L , STEIN.C, "Introduction to Algorithm,2nd edition(2001), MIT press, USA.
2. Aho, Hopcroft, Ulman, The Design and Analysis of Computer algorithms,(2000) Pearson Education
3. "Algorithm Design" by Kleinberg and Tardos.

Reference Books

1. M.T.Goodrich, R.Tomassia, Algorithm design – Foundations, Analysis, and Internet Algorithms, John Wiley, (2002).
2. Horowitz E. Sahani S, Fundamentals of computer Algorithms, Galgotia publications.
3. Steven S.Skiena ,The algorithm design manual, Springer (1997).
4. Hari Mohan Pandy, Design analysis and Algorithms, University Science Press, (2009).

Online resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm.
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/106101060/
4. https://www.khanacademy.org/computing/computer-science/algorithms

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
DATA MINING

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PC220CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Analyze various data mining tasks to find relevant patterns from large databases	• Explain the steps in KDD , Identify various pre-processing techniques and Compute similarity among objects and differentiate relational & multidimensional data models • Build a classification model to classify unknown data objects based on different classification techniques • Illustrate the use of advanced classification models for prediction • Find associations and correlations among items by mining frequent patterns from transactional databases • Evaluate clusters formed based on various clustering techniques

UNIT-I

Introduction: Challenges, The Origins of Data Mining, Data Mining Tasks

Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity, OLAP and Multidimensional Data Analysis.

UNIT-II

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Model Overfitting, Evaluating the Performance of a Classifier, Methods for Comparing Classifiers, Rule-Based Classifier.

UNIT-III

Classification: Nearest-Neighbor classifiers, Bayesian Classifiers, Artificial Neural Networks (ANN), Support Vector Machine (SVM), Ensemble Methods, Class Imbalance Problem, Multiclass Problem.

UNIT-IV

Association Analysis: Problem Definition, Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative Methods for Generating Frequent Itemsets, FP-Growth Algorithm, Evaluation of Association Patterns, Effect of Skewed Support Distribution, Handling Categorical Attributes, Handling Continuous Attributes, Handling a Concept Hierarchy.

UNIT-V

Cluster Analysis: Overview, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Characteristics of Data, Clusters and Clustering Algorithms.

Suggested books

1. Pang-Ning Tan, Vipin Kumar, Michael Steinbach, "Introduction to Data Mining", (2017),Pearson Education

Reference books

1. Jiawei Han & Micheline Kamber and Jain Pei ,Data Mining Concepts and Techniques , Third Edition(2011), India.
2. Margaret H Dunham, Data Mining Introductory and advanced topics , Pearson education
3. Arun K Pujari ,Data Mining Techniques, (2017) ,University Press
4. Sam Anahory , Dennis Murray ,Data Warehousing in the Real World, Pearson Education
5. Paulraj Ponnaiah, Data Warehousing Fundamentals, Wiley Student ed.

Online resources

1. http://web.stanford.edu/class/cs345a/

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
OBJECT ORIENTED SOFTWARE ENGINEERING

Instructions: 3 Hours / Week	Semester End Exam Marks : 70	Course Code: PI18PC230CS
Credits: 3	CIE Marks : 30	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• construct an efficient information system using Object Oriented programming concepts	• Define the software systems ,discuss different problems in software system development and solve these problems using object oriented concepts • Differentiate different fact finding techniques to capture the requirements and apply different methods for requirement analysis • Analyze the different object oriented programming concepts and apply them in software system development • Apply different design patterns in software system development to solve real world problems • Explain different methods for database design and different reusable components for software system development

UNIT-I

Information System: Problems in Information System development, Project Life Cycles, Managing Information Systems Development, User Involvement and Methodological approaches, Basic Concepts and Origins of Object Orientation Modeling concepts.

UNIT-II

Requirement Capture, Requirement Analysis, Refining the Requirement Models, Object Interaction.

UNIT-III

Operations, Control, Design, System Design**.**

UNIT-IV

Object Design, Design patterns, Human Computer Interaction, Designing Boundary Classes.
Testing concepts: Fault and Erroneous states and failures, Test Cases.
Testing activities: Component Inspection, Usability Testing, Unit Testing, Integration Testing, system testing, Regression Testing, Model Based Testing.

UNIT-V

Data Management Design, Implementation, Reusable Components, Managing Object Oriented Projects, System Development Methodologies.

Suggested Books :

1. Simon Benett, Steve Mc Robb & ray Farmer, Object Oriented System Analysis and Design using UML,2nd Edition (2002), McGraw Hill

Reference Books

1. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Using UML Patterns and Java, 2nd Edition(2006), Pearson Education Asia
2. Grady Booch, James Rumbaugh, Ivor Jacobson, The Unified Modeling Language-User Guide, 4th Edition(1999) ,Addison Wesley
3. Ivor Jacobson, Grady Booch, James Rumbaugh, The Unified Software Development Process, 4th Edition(1999), Addison Wesley, 1999

Online Resources

1. http://philip.greenspun.com/teaching/teaching-software-engineering

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
DISTRIBUTED COMPUTING

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code: PI18PE244CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• describe the design issues of distributed systems and demonstrate component technologies	• Explain the goals and design issues of distributed systems • Demonstrate remote procedural call and describe message and stream oriented communication • Describe design issues of server and naming entities in a distributed system • Distinguish between CORBA, EJB and GLOBE • Describe quality of service parameters in distributed multimedia systems

UNIT-I

Introduction: Definition of Distributed Systems, Goals: Makin Resources Accessible, Distribution Transparency, Openness, Scalability, Types of Distributed Systems: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems, Architectural Styles, System Architectures: Centralized Architectures, Distributed Architectures, Hybrid Architectures, Architectures Versus Middleware: Interceptors, General Approaches to Adaptive Software.

UNIT-II

Communication: Layered Protocols, Types of Communication, Remote Procedure Call: Basic RPC Operation, Parameter Passing, Asynchronous RPC, Message-Oriented Communication: Message-Oriented Transient Communication, Message-Oriented Persistent Communication, Stream Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization.

UNIT-III

Processes, Threads: Introduction to Threads, Threads in Distributed Systems, Clients: Networked User Interfaces, Client-Side Software for Distribution Transparency, Servers: General Design Issues, Server Clusters, Managing Server Clusters.

Naming: Names, Identifiers and Addresses, Flat Naming: Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches, Structured Naming: Name Spaces, Name Resolution, The Implementation of a Name Space, Example: DNS, Attribute-Based Naming: Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations.

UNIT-IV

Distributed Object Based Systems: Architecture: Distributed Objects, Example: Enterprise Java Beans (EJB), Example: Globe Distributed Shared Objects, Processes: Object Servers, Example: Ice Runtime System, Communication: Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging, Naming: CORBA Object References, Globe Object References, Synchronization, Caching and Replication: Entry Consistency, Replicated Invocations, Fault Tolerance: Example: Fault-Tolerant CORBA, Java, Security: Example: Globe, Security for Remote Objects.

UNIT-V

Distributed Multimedia Systems: Introduction, Characteristics of Multimedia Data, Quality of Service Management: Quality of Service Negotiation, Admission Control, Resource Management: Resource Scheduling, Stream Adaptation.

Suggested books:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems: Principles and Paradigms, PHI, 2nd Edition, (2011).
2. Colouris G. Dollimore Jean, Kindberg Tim, "Distributed Systems Concepts and Design", 4th Edition, ,(2012),Pearson Education.

Reference Books:

1. Arun Kulkarni, Nupur Prasad Giri, Nikhilesh Joshi, Bhushan Jadhav, "Parallel and Distributed Systems", Weily Paperback – 2016

Online resources:

1. http://courses.cs.washington.edu/courses/cse552/07sp/
2. http://nptel.ac.in/courses/106106107/
3. https://henryr.github.io/distributed-systems-readings/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
IMAGE PROCESSING

Instructions: 3 Hours / Week	Semester End Exam Marks : 60	Course Code: PI18PE255CS
Credits: 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
• Understand the different operations required in the image processing for better representation and recognition of objects in an image.	• Distinguish sampling and quantization processes in obtaining digital images from continuously sensed data and describe the steps in image processing. • Apply Fourier transformation and other transformation techniques to enhance digital image. • Apply different techniques in spatial domain and frequency domain to enhance and segment digital images. • Describe different methods to encode raw image data into standard compressed image format. • Demonstrate most commonly applied image restoration and color models and their use in basic image processing.

UNIT-I

Introduction to Digital Image Processing, Origins and Applications of Digital Image Processing. Fundamental Steps in Digital Image Processing, Components of Digital Image Processing System. Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization.

UNIT-II

Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT) of One Variable, Extension to Function of Two Variables, , Image Smoothing and Sharpening using Frequency Domain Filters.

UNIT-III

Intensity Transformations and Spatial Filtering: Histogram Processing, Fundamental of Spatial Filtering, Smoothing and Sharpening Spatial Filters. Image Segmentation: Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

UNIT-IV

Image Compression: Fidelity Criteria, Image Compression Models, Image Formats, Containers and Compression Standards, Compression Methods: Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-Length Coding.

UNIT-V

Restoration: Noise Models, Inverse filtering, Least squares Filtering.
Color Image Processing : Color fundamentals, color models, Pseudocolor Image Processing, Basics of full color image processing.

Suggested books:

1. Gonzalez R.C., Woods R.E, Digital Image Processing, Third Edition 2007, Prentice Hall, USA.
2. Jayaraman S, Esakkirajan S, Veerakumar T, Digital image processing, 13th reprint 2014,McGraw Hill Education, New Delhi.

Reference Books:

1. William K. Pratt, Digital Image Processing, 3rd Edition 2001 , John Wiley & Sons Inc, UK.
2. Mc Andrew, Introduction to Digital Image Processing, Cengage Learning 2004.
3. Sonka, Hlavac, Boyle, Digital Image Processing and Computer Vision, Cengage Learning 2008.
4. Rosenfeld A. Kak AC, Digital Picture Processing Vol .I & II Acad, Press, 2nd.

Online resources:

1. https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/introduction/.
2. http://freevideolectures.com/Course/2316/Digital-Image-Processing-IIT-Kharagpur.

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
ADVANCED ALGORITHMS LAB

Instructions: 3 Hours / Week	Semester End Exam Marks : 0	Course Code: PI18PC211CS
Credits: 1.5	CIE Marks :50	Duration of SEE:-----

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Identify and apply various algorithm design strategies to solve engineering problems with efficient time and space utilization	• Implement Sorting Algorithms • Apply divide-and-conquer, greedy design strategy, and dynamic programming approaches to solve problems • Implement network flow algorithms • Develop Fourier transform algorithm. • Implement encryption algorithms

1. Quick , Merge sort and topological Sort Algorithms.
2. Graph Traversal-DFS , BFS algorithms.
3. Single Source Shortest Path algorithms- Dijkstra's and Bellman-Ford.
4. Minimum Cost Spanning tree Algorithms- Prim's and Kruskal's.
5. Edmond's Blossom algorithm
6. Network Flow- Ford-Fulkerson Algorithm.
7. LUP Decomposition Algorithm
8. All-Pairs shortest paths Algorithm.
9. Matrix Chain Multiplication Algorithm.
10. Optimal Binary Search Tree (OBST) Algorithm.
11. Longest Common Subsequence (LCS) algorithm.
12. Discrete Fourier Transform algorithm
13. Fast Fourier Transform algorithm
14. Encryption algorithms-RSA and DES
15. Randomized Quick sort algorithm

Suggested books

1. Thomas H. Cormen, Leiserson .C.E, Rivest.R.L , Stein.C, Introduction to Algorithm ,2nd edition(2001), MIT press, USA.
2. M.T.Goodrich, R.Tomassia, Algorithm design – Foundations, Analysis, and Internet Algorithms, John Wiley, (2002).
3. Horowitz E. Sahani S, Fundamentals of computer Algorithms", Galgotia publications.

Reference Books

1. Aho, Hopcroft, Ulman, The Design and Analysis of Computer algorithms, Pearson Education, (2000).
2. Steven S.Skiena ,The algorithm design manual, Springer (1997).
3. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press,(2009).

Online resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm.
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/106101060/
4. https://www.khanacademy.org/computing/computer-science/algorithms

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
DISTRIBUTED COMPUTING LAB

Instruction:3 Hours/ week	Semester End Exam Marks: 0	Course Code: PI18PE241CS
Credits: 1.5	CIE Marks :50	Duration of SEE:-----

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Implement distributed applications	• Develop, test and debug RPC and RMI based client-server programs in Linux • Create client and server using socket programming • Develop an application using EJB and Web services • Implement programs using message passing interface • Develop an application on Hadoop framework

List of Experiments :

1. Design a distributed application which consists of a state-full server using socket primitives
2. Design a distributed application which consists of a stateless server using socket primitives
3. Design a distributed application which consists of a server and client using Threads
4. Design a distributed application using Remote Procedural Call (RPC) for remote computation
5. Design a distributed application using Remote Method Invocation (RMI) for remote computation in which client submits two strings to the server and server returns the concatenation of the given strings
6. Design a distributed application using RMI in which client submits a string to the server and server returns the reverse of it
7. Design a distributed application using Stateless Session Bean in Enterprise Java Bean (EJB)
8. Design a distributed application using State-full Session Bean in EJB
9. Implement Message Passing Interface (MPI) program using Point-to-Point Communication Library Calls
10. Design a distributed application using MPI for remote computation
11. Design a Web service using Simple Object Access Protocol (SOAP)
12. Installation and configuration of Hadoop
13. Implement a distributed application on Hadoop framework to count word frequency with Map Reduce
14. Implement a distributed application on Hadoop framework to process a log file of a system

Note: The students have to submit a report at the end of the semester.

Suggested books:

1. W. Richard Stevens ,Unix Network Programming, Volume 1: The Sockets Networking API, PHI, (2013).
2. Nirva Morisseau-Leroy, Martin K. Solomon, Julie Basu, Oracle8i Java Component Programming With EJB, CORBA AND JSP, Tata McGraw Hill, (2000).

Reference Books:

1. Arun Kulkarni, Nupur Prasad Giri, Nikhilesh Joshi, Bhushan Jadhav, Parallel and Distributed Systems, Weily Paperback – 2016.

Online resources:

1. http://www.hpjava.org/mpiJava.html
2. http://hadoop.apache.org/
3. http://courses.cs.washington.edu/courses/cse552/07sp/
4. https://henryr.github.io/distributed-systems-readings/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
SEMINAR-II

Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Course Code: PI18PC218CS
Credits: 1	CIE Marks :50	Duration of SEE:-----

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to	At the end of the course, Students will be able to
• Acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	• Improve presentation and communication skills. • Aware of recent advancements in industry and new research trends • Collect information through literature survey, analyze and present them • Acquire knowledge about new hardware and software needs of market • acquire technical document writing skills

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.
Seminar topics can be chosen by the students with the advice from the faculty members.
Students are to be exposed to following aspects of seminar presentation.
Literature survey
Organization of material
Preparation of OHP slides / PC presentation
Technical writing.

Each student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged. The sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER
MINI PROJECT

Instructions: 2 Hours / Week	Semester End Exam Marks : --	Subject Reference Code: PI18PC219CS
Credits: 1	CIE Marks :50	Duration of SEE:-----

Course objectives	Course outcomes
Students should be able to	At the end of the course students will be able to
• Develop an application in the relevant area of Computer Science • Learn contemporary technologies	• Understand the literature survey and identify the problem • Design a model to address the proposed problem • Develop and test the solution • Demonstrate the work done in the project through presentation and documentation • Adapt to contemporary technologies

The students are required to carry out mini projects in any areas such as Advanced operating systems, Advanced Databases, Artificial Intelligence , Advanced algorithms, Data Mining , Distributed Computing , Object Oriented software Engineering

Students are required to submit a report on the mini project at the end of the semester.

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DEPARTMENTOF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR M.Tech
III-SEMESTER w.e.f. 2019-20 under CBCS

S. No	Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
THEORY									
1	PI 18OE3XXCS	Open Elective	3	-	-	3	60	40	3
2	PI 18PE3XXCS	Professional Elective - VI	3	-	-	3	60	40	3
PRACTICALS									
3	PI 18PW319CS	Dissertation - Phase-I / Internship	-	-	8	-	-	100	4
		TOTAL	6	-	8	-	120	180	10
		GRAND TOTAL	**14**				**300**		

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – III SEMESTER
CLOUD COMPUTING

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PE 364CS
Credits: 3	CIE: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• evaluate the deployment and service models, understand the security issues and apply the concepts in practice to design a cloud solution.	• Relate the evolution of hardware & software which substantiated the need and rise for cloud computing and its service offerings • Apply deployment approaches and prototype a cloud computing system • Analyze the need for virtualization in a cloud environment and apply it across compute and storage levels • Analyze the security issues across SPI infrastructure and evaluate the role of IAM and Privacy in cloud • Explain the standards in cloud computing & showcase the cloud service providers strategy in providing cloud computing

UNIT-I

The Evolution of Cloud Computing: Hardware Evolution, Internet Software Evolution, Establishing a common Protocol for the Internet, Evolution of Ipv6, Cloud Formation- From One Computer to a Grid of Many, Server Virtualization, Parallel Processing, Vector Processing, Symmetric Multiprocessing Systems, Massively Parallel Processing Systems.

Web Services and the Cloud: Communication-as-a Service (CaaS), Infrastructure-as-a-Service (laaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-as-a-Service(SaaS)

UNIT-II

Cloud Deployment Models: Public, Private, Hybrid Community.

Building Cloud Networks: The Evolution from the MSP Model to Cloud, Computing and Software- as-a-Service, The Cloud Data Centre, Collaboration, Service-Oriented Architectures as a Step Towards Cloud Computing, Basic Approach to a Data Centre-Based SOA The Role of Open Source Software in Data Centers, Where Open Source Software is Used?

UNIT-III

Virtualization: Introduction, types and technologies, accomplishing virtualization, Levels of virtualization, importance of virtualization in Cloud computing. Virtualization at the infrastructure level, CPU Virtualization, Virtualization in a Multicore processor, Hypervisor and its types, Storage Virtualization

Case studies: Xen Virtual machine monitor – Xen API, VMware – VMware products

Federation in the Cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information System.

UNIT-IV

Security Issues in Cloud Computing: Infrastructure Security, Data Security and Storage, Identity and Access Management, Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

Privacy Issues : Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications

UNIT-V

Audit and Compliance

Internal Policy Compliance, Governance, Risk, and Compliance (GRC)

Common Standards in Cloud Computing: The Open Cloud Consortium, The Distributed Management Task Force, Standards for Application Developers, Standards for Messaging, Internet Messaging Access Protocol (IMAP), Standard for Security

Case study of CSP's: AWS, Google Cloud, Microsoft Azure, Salesforce

Suggested Books:

1. John W.Rittinghouse, James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press Special Indian edition, 2009,CRC Press, New Delhi.
2. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, Distributed and Cloud Computing From Parallel Processing to the Internet of Things, 2012, Morgan Kaufmann, Elsevier
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, 1st Edition, 2009, O'Reilly.

Reference Books:

1. Ivanka Menken, Cloud computing Specialist Certification Kit virtualization ,2nd Edition, 2010, Emereo Pty Limited, New Delhi.
2. William Von Hagen, Professional Xen Virtualization, Wrox, 2008,Wiley Publications, New Delhi.
3. David Marshall, Wade A. Reynolds, Dave McCrory Advanced Server Virtualization: VMware and Microsoft Platforms in the virtual Data Center, Auerbach Publications, 2006, New Delhi.

Online Resources:

1. https://aws.amazon.com/ec2/
2. https://cloud.google.com/appengine/
3. http://nptel.ac.in/courses/126104006
4. http://nptel.ac.in/courses/106106129/

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – III SEMESTER
WEB MINING

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PE360CS
Credits: 3	CIE: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Describe the techniques to perform data mining functionalities on Web Data and understand the relationship of web search with information retrieval .	• Explain various types of web data mining techniques to perform association rule mining and classification on web data • Describe various clustering techniques used in Web Mining and working of a search engine • Apply different techniques to find the rank of a web page • Describe the functionality of a web Crawler and the methods for structured data extraction and Information integration • Explain the applications of web usage mining such as Sentiment analysis and Opinion mining

UNIT-I

Introduction: The World Wide Web, History of the Web and the Internet, Web Data Mining

Association Rules and Sequential Patterns: Basic Concepts, Apriori Algorithm, Data Formats for Association Rule Mining, Mining with Multiple Minimum Supports, Mining Class Association Rules

Supervised Learning: Basic Concepts, Decision Tree Induction, Classifier Evaluation, Naïve Bayesian Classification, Naïve Bayesian Text Classification, K-Nearest Neighbor Learning, Ensemble of Classifiers

UNIT-II

Unsupervised Learning: Basic Concepts. K-means Clustering, Representation of Clusters, Hierarchical Clustering, Distance Functions, Data Standardization, Handling of Mixed Attributes, Which Clustering Algorithm to Use? Cluster Evaluation

Information Retrieval and Web Search: Basic Concepts, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Inverted Index and Its Compression

UNIT-III

Information Retrieval and Web Search: Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming

Link Analysis: Social Network Analysis, Co-Citation and Bibliographic Coupling, PageRank , HITS, Community Discovery

UNIT-IV

Web Crawling: A Basic Crawler Algorithm, Implementation Issues, Evaluation, Crawler Ethics and Conflicts

Structured Data Extraction: Wrapper Generation**,** Preliminaries, Wrapper Induction, Instance-Based Wrapper Learning, Automatic Wrapper Generation, String Matching and Tree Matching, Building DOM Trees.

Information Integration: Introduction to Schema Matching, Pre-Processing for Schema Matching, Schema-Level Match, Domain and Instance-Level Matching, Combining Similarities, 1: Match.

UNIT-V

Opinion Mining and Sentiment Analysis: Sentiment Classification, Feature-Based Opinion Mining and Summarization, Comparative Sentence and Relation Mining, Opinion Search, Opinion Spam.

Web Usage Mining: Data Collection and Pre-Processing, Data Modeling for Web Usage Mining.

Learning Resources:

1. Bing Liu , Web Data Mining, Springer India, 2010).
2. Soumen Chakrabarti, Mining the Web, Morgan-Kaufmann Publishers, Elseiver, (2002).
3. Manu Konchady, Text Mining Application Programming, Cengage Learning, (2006

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – III SEMESTER
MULTIMEDIA TECHNOLOGIES

Instruction: 3 Hours/ week	Semester End Exam Marks: 60	Course Code: PI18PE365CS
Credits: 3	CIE: 40	Duration of SEE: 3 hrs.

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, Students will be able to
• Explain the different techniques for storing multimedia data and synchronization of the them	• Explain the properties of Multimedia systems and characteristics of data streams • Describe the transmission of digital image &video and techniques for animation • Work with different compression standards and storage for multimedia data • Perform the synchronization of the multimedia data • Illustrate the application of multimedia systems

UNIT-I

Media and Data Streams: Properties of multimedia systems, Data streams characteristics: Digital representation of audio, numeric instruments digital interface Bark concepts, Devices, Messages, Timing Standards Speech generation, analysis and transmission.

UNIT-II

Digital Image: Analysis, recognition, transmission, **Video**: Representation, Digitalization transmission **Animations**: Basic concepts, animation languages, animations control transmission

UNIT-III

Data Compression Standards: JPEG, H-261, MPEG DVI
Optical storage devices and Standards: WORHS, CDDA, CDROM, CDWO, CDMO. Real Time Multimedia, Multimedia file System.

UNIT-IV

Multimedia Communication System: Collaborative computing session management, transport subsystem, QOS, resource management.

Multimedia Databases: Characteristics, data structures, operation, integration in a database model.

Synchronization: Issues, presentation requirements, reference to multimedia synchronization, MHEG

UNIT-V

Multimedia Application: Media preparation, Composition, integration communication, consumption, entertainment.

Learning Resources:

1. Ralf Steninmetz, Klara Hahrstedt, Multimedia: Computing, Communication and Applications, PHI PTR Innovative Technology Series.
2. John F.Koegel Bufford, Multimedia System, Addison Wesley, (1994).
3. Mark Elsom – Cook, Principles of Interactive Multimedia, Tata Mc-Graw Hill, (2001).
4. Judith Jefcoate, Multimedia in Practice: Technology and Application, PHI (1998).

With effect from the A.Y 2018-19

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – III SEMESTER
DISSERTATION - PHASE I /INTERNSHIP

Instruction: 8 Hours /week	SEE Marks: ---	Course Code: **PI 18PW319CS**
Credits: 4	CIE Marks: 100	Duration of SEE: ----

Course Objective	Course Outcomes
The objective of this course is to: • Start with a suitable Dissertation work in consultation with the supervisor in the areas of his/her specialization either in the Institute or Industry.	On completion of the course, the students will be able to: 1. apply and Solve the problems in the relevant field of specialization from the knowledge gained from theoretical and practical courses pursued during the course. 2. Develop the capability to conduct investigations on the chosen problem. 3. Develop flair for R&D work.

- A research project topic may be selected either from published lists or from the creative ideas of the students themselves in consultation with their project supervisor.
- To improve the student research and development activities.

The CIE marks will be awarded to the students by at least 2 faculty members and the supervisor on the basis of an oral presentation and submission of a progress report.

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DEPARTMENTOF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR M.Tech
IV-SEMESTER w.e.f. 2019-20 under CBCS

S. No	Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
PRACTICALS									
1	PI18PW419CS	Dissertation – Phase II / Internship	0	0	24	-	Viva-Voce Grade		12
		GRAND TOTAL	**0**	**0**	**24**				**12**

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – IV SEMESTER
Dissertation – Phase II / Internship

Instruction: 24 Hours /week	SEE Marks:Grade	Course Code: **PI18PW419CS**
Credits: 12	CIE Marks: --	Duration of SEE: ---

Course Objectives	Course Outcomes
The objectives of this course are to: • Complete the Dissertation work in line with the chosen field in the areas of his/her specialization.	On completion of the course, the students will be able to: 1. Prepare a thesis with all the findings in the chosen area. 2. Present a seminar with all the results during the Viva-voce examination.

The final assessment involves presentation of the dissertation work by the student and the award of the grade by an expert of relevant specialization.

List of Professional Electives (Stream wise)		
AI and Data Engineering		
PE-I	PI18PE110CS	Artificial Intelligence
PE-II	PI18PE120CS	Advanced Data bases
PE-III	PI18PE130CS	Machine Learning
PE-IV	PI18PE240CS	Natural Language Processing
PE-V	PI18PE250CS	Information Retrieval Systems
PE-VI	PI18PE360CS	Web Mining
Systems & Networks		
PE-I	PI18PE 114CS	Information Storage Management
PE-II	PI18PE 124CS	Parallel Computer Architecture
PE-III	PI18PE 134CS	Information Security
PE-IV	PI18PE 244CS	Distributed Computing
PE-V	PI18PE 254CS	Wireless Sensor Networks
PE-VI	PI18PE 364CS	Cloud Computing
Applications		
PE-I	PI18PE 115CS	Mobile Computing
PE-II	PI18PE 125CS	Parallel Algorithms
PE-III	PI18PE 135CS	Software Engineering For Real Time Systems
PE-IV	PI18PE 245CS	Software Quality & Testing
PE-V	PI18PE 255CS	Image Processing
PE-VI	PI18PE 365CS	Multimedia Technologies

Audit Course – I			
			Credits
	PI18AC110EH	English for Research Paper Writing	2
	PI18AC120XX	Value Education	2
	PI18AC130XX	Stress Management by Yoga	2
	PI18AC140XX	Sanskrit for Technical Knowledge	2
Audit Course –II			
	PI18AC210EH	Pedagogy Studies	2
	PI18AC220XX	Personality Development through Life Enlightenment Skills.	2
	PI18AC230XX	Constitution of India	2
	PI18AC240XX	Disaster Management	2
Open Electives			
	PI18OE310XX	Business Analytics	3
	PI18OE320XX	Industrial Safety	3
	PI18OE330XX	Operations Research	3
	PI18OE340XX	Cost Management of Engineering Projects	3
	PI18OE350XX	Composite Materials	3
	PI18OE360XX	Waste to Energy	3