DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

PERAMBALUR – 621 212

REGULATIONS–2023

CHOICE BASED CREDIT SYSTEM

M.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(Applicable to students admitted from the Academic year 2023 – 2024 and subsequently under Choice Based Credit System)

VISION & MISSION OF THE INSTITUTION

Vision:

An active and committed centre of advanced learning focused on research and training in the fields of Engineering, Technology and Management to serve the nation better.

Mission:

- To develop eminent scholar with a lifelong follow up of global standards by offering UG,PG and Doctoral Programmes.
- To pursue Professional and Career growth by collaborating mutually beneficial partnership with industries and higher institutes of research.
- To promote sustained research and training with emphasis on human values and leadership qualities.
- To contribute solutions for the need based issues of our society by proper ways and means as dutiful citizen.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision:

To produce globally competent, socially responsible professionals in the field of Computer Science and Engineering.

Mission:

M1: Impart high quality experiential learning to get expertise in modern software tools

M2: Inculcate industry exposure and build inter disciplinary research skills.

M3: Mould the students to become Software Professionals, Researchers and Entrepreneurs by providing advanced laboratories.

M4: Acquire Innovative skills and promote lifelong learning with a sense of societal and ethical responsibilities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Graduates of the programme will develop proficiency in identifying, formulating, and resolving complex computing problems.
PEO 2	Graduates of the programme will achieve successful careers in the field of computer science and engineering, pursue advanced degrees, or demonstrate entrepreneurial success.
PEO 3	Graduates of the programme will cultivate effective communication skills, teamwork abilities, ethical values, and leadership qualities for professional engagement in industry and research organizations.

PROGRAM OUTCOMES (POs)

PO	Graduate Attribute
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles ofmathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequentresponsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, andneed for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technologicalchange.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1	Analyze, develop and provide solutions to industrial problems in computer domain using programming, data processing and analytical skills.
PSO 2	Apply software application oriented skills to innovate solution to meet the ever changing demands of IT industry.

DHANALAKSHIMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
M.E COMPUTER SCIENCE AND ENGINEERING
REGULATIONS – 2023
CHOICE BASED CREDIT SYSTEM
COURSE MATRIX
I-IV CURRICULA AND SYLLABI

SEMESTER –I									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	P23MA101	Applied Probability and Statistics	4	3-1-0	40		60		50
2	P23CST11	Research Methodology and IPR	2	2-0-0	40		60		50
3	P23CST12	Advanced Data Structures and Algorithms	4	3-0-2	40		60		50
4	P23CST13	Advanced Database Design	3	3-0-0	40		60		50
5	P23CST14	Network Programming and Security	4	3-1-0	40		60		50
6	P23CST15	Machine Learning Technique	3	3-0-0	40		60		50
7	P23CSP11	Machine Learning Laboratory	2	0-0-4	60		40		50
TOTAL			**22**						

FC	**RMC**	**PCC**	**PEC**	**EEC**	**OEC**	**TOTAL CREDITS**
4	2	16	-	-	-	22

SEMESTER - II									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	P23CST21	Embedded Systems with IoT	3	3-0-0	40		60		50
2	P23CST22	Advanced Operating Systems	3	3-0-0	40		60		50
3	P23CST23	Deep Learning	3	3-0-0	40		60		50
4	P23CST24	Advanced Software Engineering	3	3-0-0	40		60		50
5		Professional Elective I	3	3-0-0	40		60		50
6	P23CSP21	Software Engineering Laboratory	2	0-0-4	60		40		50
7	P23CSP22	Deep Learning Laboratory	2	0-0-4	60		40		50
TOTAL			**19**						

S.NO	**COURSE CODE**	**PROFESSIONAL ELECTIVE – I**
1	P23CSE01	Cloud Computing Technologies
2	P23CSE02	Digital Image Processing
3	P23CSE03	Mobile and Wireless Communications
4	P23CSE04	Agile Methodologies
5	P23CSE05	Big Data Analytics and Algorithm

FC	**RMC**	**PCC**	**PEC**	**EEC**	**OEC**	**TOTAL CREDITS**
-	-	16	3	-	-	19

SEMESTER - III									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1		Professional Elective II	3	3-0-0	40		60		50
2		Professional Elective III	3	3-0-0	40		60		50
3		Professional Elective IV	3	3-0-0	40		60		50
4	P23CSP31	Project Work – Phase I	6	0-0-12	40		60		50
TOTAL			**15**						

S. NO	**COURSE CODE**	**PROFESSIONAL ELECTIVE – II**	**COURSE CODE**	**PROFESSIONAL ELECTIVE – III**	**COURSE CODE**	**PROFESSIONAL ELECTIVE – IV**
1	P23CSE06	High Performance Computing for Big Data	P23CSE11	Mobile and Pervasive Computing	P23CSE16	Mobile Application Development
2	P23CSE07	Software Testing and Software Quality Assurance	P23CSE12	Web Services and API Design	P23CSE17	Full Stack Web Application Development
3	P23CSE08	Cognitive Computing	P23CSE13	Computer Vision and Pattern Recognition	P23CSE18	Cyber Security and Cyber Threats
4	P23CSE09	Information Extraction and Information Retrieval	P23CSE14	Natural Language Processing	P23CSE19	Cryptocurrency and Blockchain Technologies
5	P23CSE10	Web Analytics	P23CSE15	Data Visualization Technique	P23CSE20	Embedded Software Development

FC	**RMC**	**PCC**	**PEC**	**EEC**	**OEC**	**TOTAL CREDITS**
-	-	-	9	6	-	15

SEMESTER - IV									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	P23CSP41	Project Work – Phase II	12	0-0-24	40		60		50
TOTAL			**12**						

FC	**RMC**	**PCC**	**PEC**	**EEC**	**OEC**	**TOTAL CREDITS**
-	-	-	-	12	-	12

TOTAL COURSES & CREDITS – SEMESTER WISE

SEMESTER	I	II	III	IV	TOTAL
No of COURSES	7	7	4	1	19
CREDITS	22	19	15	12	68

SUMMARY

M.E., COMPUTER SCIENCE AND ENGINEERING							
S. No	Subject Area	Credits Per Semester				Credits Total	Percentage %
		I	II	III	IV		
1	FOUNDATION COURSES	4	0	0	0	4	**5.88**
2	RESEARCH METHODOLOGY AND IPR COURSES	2	0	0	0	2	**2.94**
3	PROFESSIONAL CORE COURSES	16	16	0	0	32	**47.05**
4	PROFESSIONAL ELECTIVE COURSES	0	6	6	0	12	**17.64**
5	EMPLOYABILITY ENHANCEMENT COURSES	0	0	6	12	18	**26.47**
6	OPEN ELECTIVE COURSES	0	0	0	0	0	**0**
Total		**22**	**22**	**12**	**12**	**68**	**100**

SEMESTER I

P23MA101	APPLIED PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I LINEAR ALGEBRA 12

Vector spaces – norms – Inner Products – Eigen values using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

UNIT II PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson , Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Functions of two-dimensional random variables – Regression curve – Correlation.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean , variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Apply the concepts of Linear Algebra to solve practical problems.

CO2: Solve engineering problems using the ideas of probability and random variables.

CO3: Understand two dimensional random variables and be equipped for a possible extension to multivariate analysis.

CO4: Apply statistical tests in testing hypotheses on data.

CO5: Develop critical thinking based on empirical evidence and the scientific approach to knowledge development.

CO6: Apply the concept of population principal components in multivariate analysis.

REFERENCES:

1. Dallas E Johnson, "Applied multivariate methods for data Analysis", Thomson and Duxbury press,3rd Edition, 2014.
2. Richard A. Johnson and Dean W. Wichern, "Applied multivariate statistical Analysis", Pearson Education, 6th Edition, 2013.
3. Bronson, R.,"Matrix Operation", Schaum's outline series, Tata McGraw Hill,2nd Edition, 2011.
4. Oliver C. Ibe, "Fundamentals of Applied probability and Random Processes", Academic Press, 2nd Edition, 2014.
5. Johnson R. A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson India Education, Asia, 9th Edition, 2017.

P23CST11	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To provide better familiarity with the research topic by properly explaining each concept associated with it.
- To define the tools and techniques to be used for collecting, analyzing and interpreting the data to find out the solutions.
- To determines the reliability and validity of the whole research work.
- To derive crucial findings for solving business problems.
- To develop the logical thinking ability of individuals.

UNIT I RESEARCH DESIGN **6**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES **6**

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING **6**

Overview of Multivariate analysis, Hypotheses testing and Measures of Association.
Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS **6**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Biodiversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS **6**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Develop knowledge, Understanding and an insight of the various underlying concepts of research.

CO2: Differentiate and establish a relationship between various research methods and sampling techniques.

CO3: Understand Research designs, tools and techniques of gathering data.

CO4: Analyze qualitative and quantitative data, and explain how evidence gathered supports or refutes an initial hypothesis.

CO5: Apply the theoretical knowledge into practical dissertation work.

CO6: Understand the objectives and benefits of patent.

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11th Edition, 2012.
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 10th Edition, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 1st Edition, 2007.

P23CST12	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

1. To understand and analyze fundamental data structures, such as binary search trees, disjoint sets, and self-adjusting lists.
2. Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primarily testing, max flow, discrete Fourier transform.
3. Will be exposed to algorithmic issues in a variety of areas, including linear programming and game-theory.

UNIT I INTRODUCTION TO ALGORITHMS 9

Role of Algorithms in computing- Analyzing algorithm- Designing algorithm- Asymptotic Notations- Summations -Formulas and properties- Recurrences. SORTING TECHNIQUES: Heap sort – Quick sort-Radix sort- Bucket sort- Analysis of sorting algorithms

UNIT II TREE STRUCTURES 9

Binary Search Trees- AVL Trees- Red-Black Trees- BTrees-Splay Trees - HEAP STRUCTURES: Min/Max heaps- Leftist Heaps- Binomial Heaps- Fibonacci Heaps

UNIT III MULTIMEDIA STRUCTURES 9

Segment Trees- k-d-Trees-Point Quad Trees-MX-Quad Trees-R-Trees-TV-Trees.

UNIT IV PROBLEM SOLVING TECHNIQUES 9

Branch and Bound-NP hard and NP complete problems-Huffman Coding-Activity Networks-Flow Shop Scheduling-Randomized Algorithms. ALGORITHMS: Greedy Algorithms-Backtracking-Dynamic programming

UNIT V GRAPH ALGOR ITHMS **9**

GraphRepresentation–BFS–DFS–TopologicalSort–ConnectedComponents–MinimumSpanningtrees-–Kruskal's Algorithm - Prim's Algorithm – Dijkstra's Algorithm – Floyd's Algorithm – Bellman Ford Algorithm.

List of Experiments: **30**

1. Polynomial Differentiation.
2. Printing the node details level wise.
3. Searching the given element from N*N matrix using Binary search.
4. Knapsack Problem using Greedy Method.
5. Traveling salesman Problem.
6. Binary Tree Traversal.
7. Implementing RED BLACK Trees.
8. Minimum Spanning Tree using KRUSKAL'S Algorithm.
9. Minimum Spanning Tree using FLOYD – WARSHALL Algorithm.
10. Implementing Splay trees.
11. Implementing quad trees

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Design data structures and algorithms to solve computing problems.

CO2: Choose and implement efficient data structures and apply them to solve problems.

CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems

CO4: Design one's own algorithm for an unknown problem.

CO5: Apply suitable design strategy for problem solving.

CO6: Apply the graph algorithms to solve problems.

REFERENCES:

1. Thomas H Coreman, Charles E. Leiserson, Ronald L.Rivest, "Introduction to Algorithms", MIT Press, 3rd Edition, 2009.
2. Sara Baase, AllenranGelda, "Computer Algorithms and Introduction to Design and Analysis", Pearson,3rd Edition, 2000.
3. Sahni,"Data Structures algorithm and application in Java", Tata McGraw Hill Education, 2nd Edition, 2000.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Addison Wesley, 4thEdition, 2022.

P23CST13	ADVANCED DATABASE DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture.
2. Demonstrate principles of design, development and administration relevant to Oracle database technology.
3. Formulate a working definition of database development and administration.
4. To understand the emerging databases like Mobile, Multimedia, Cloud and Big Data and Hadoop infrastructures.

UNIT I INTRODUCTION **9**

Data base system Architecture – Query Optimization Techniques - Transaction Management: Transaction Processing Concepts - Concurrency Control - Recovery Techniques -Database Security.

UNIT II PARALLEL DBMS **9**

Architecture-Query evaluation-Query optimization-parallelizing Individual operations. Distributed DBMS: Architecture-storing data-Cataloguing-Query processing-Transactions Concurrency and Recovery.

UNIT III MOBILE DATABASES **9**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols

UNIT IV OBJECT AND MULTIMEDIA DATABASE SYSTEMS **9**

Object Databases–Advantages and disadvantages compared to Relational Databases- Abstract data types, Objects identity and reference types- Inheritance Database design for ORDBMS ODMG data model and ODL OQL.MULTIMEDIA DATABASES: Nature of Multimedia data and applications Data management issues– Components of Multimedia database management system.

UNIT V BIGDATA AND HADOOP **9**

Big Data–Introduction-Technologies–Reference Architecture- Hadoop– Introduction to Hadoop Distributed File System– Design of HDFS–HDFS Concepts–Interfaces for Hadoop File System–Map Reduce–weather Dataset–Analyzing the data with Hadoop–Anatomy of Map Reduce Job Run.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to

CO1: Convert the ER-model to relational tables, populate relational databases and formulate SQL queries on data.

CO2: Understand and write well-formed XML documents

CO3: Be able to apply methods and techniques for distributed query processing.

CO4: Design and Implement secure database systems.

CO5: Use the data control, definition, and manipulation languages of the NoSQL databases

CO6: Understand the concept of Hadoop Distributed File System.

REFERENCES:

1. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”,McGraw Hill Publications,3rdEdition, 2003.
2. Korth.H.F. and A.Silberschatz, “Data base system concepts”, McGraw Hill Publications, 6thEdition, 2006.
3. RamezElmasri and B.Navathe:, “Fundamentals of Database Systems”, Addison Wesley, 6th Edition, 2013.
4. StenfnoCeri and Gieusppepelagatti, “Distributed database-principles and systems”, 3rdEdition, 2013.
5. O’Reilly MediaHarrison, Guy, “Next Generation Databases, NoSQL and Big Data” ,Apress publishers, First Edition,2015.

P23CST14	NETWORK PROGRAMMING AND SECURITY	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1. To understand the advanced Concepts of Networks.
2. To explore various technologies in the TCP/IP
3. To study about the applications using TCP and UDP sockets
4. To learn about security services and algorithms
5. To understand the paradigm of authentication and authorization mechanism.

UNIT I INTRODUCTION AND TCP/IP 12

Introduction-A Simple Daytime Client-Protocol Independence-Error Handling: Wrapper Functions- A Simple daytime server-Road map to client/server Examples in the text- OSI model – BSD Networking history – Test Networks and Hosts – Unix Standards – 64 bit architectures.

UNIT II THE TRANSPORT LAYER 12

TCP,UDP, and SCTP – Introduction – the big picture-User Datagram Protocol(UDP) – Transmission Control Protocol(TCP) – Stream Control Transmission Protocol(SCTP) – TCP Connection Establishment and Termination – TIME/WAIT State – SCTP Association Establishment and Termination – Port Numbers – TCP Port Numbers – Concurrent Servers –Buffer Sizes and Limitations– Standard Internet Services- Protocol Usage by Common Internet Applications.

UNIT III ELEMENTRY SOCKETS 12

Sockets Introduction – Socket Address Structure – Value-Result – Arguments – Byte Ordering Functions – Byte Manipulation Functions – inet_aton,inet_addr and inet_ntoa Functions-inet_pton and inet_ntop Functions-Sock_ntop and Related Functions – readn,written and Readline Functions.

UNIT IV COMPUTER SECURITY 12

Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanism – A Model for Network Security – Standards. Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles – Symmetric Block Encryption Algorithm – Random and Pseudorandom Numbers – Stream Ciphers and RC4 – Cipher Block Modes of Operation.

UNIT V PUBLIC KEY CRYPTOGRAPHY AND MESSAGE AUTHENTICATION 12

Approaches to message authentication – Secure Hash Functions – Message Authentication Codes – Public key Cryptography Principles – Public key cryptography Algorithms – Digital Signatures – Key Distribution and User Authentication – Symmetric Key distribution using Symmetric Encryption – Kerberos – Key distribution using Asymmetric Encryption – X509 Certificates – Public key Infrastructure – Federated Identity Management.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Describe the advanced concepts of networks.

CO2: Describe concepts of TCP / IP and Transport Layer.

CO3: Create applications using elementary TCP and UDP sockets

CO4: Appreciate the importance of security services and algorithms

CO5: Choose appropriate key distribution, authentication and authorization mechanisms for the network system

CO6: Apply public key cryptography algorithms in message authentication.

REFERENCES

1. Stevens, W.Richard, Fenner.B, Rudoff.A.M, "UNIX Network Programming", Addison – Wesley, 3rdEditon, 2004.
2. Stalings.W, Network Security Essentials: Applications and Standards, Prentice Hal, 6th Edition, 2017.
3. Richard Stevens.W, UNIX Network Programming Volume 2: Inter Process Communications Addison – Wesley, 2nd Edition, 2005.
4. Stallings.W, Cryptography and Network Security : Principles and Practices, Pearson Education, 7th Edition, 2014.

P23CST15	MACHINE LEARNING TECHNIQUE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand the concepts of machine learning.
2. To appreciate supervised and unsupervised learning and their applications.
3. To understand the theoretical and practical aspects of Probabilistic Graphical Models.
4. To appreciate the concepts and algorithms of reinforcement learning.
5. To learn aspects of computational learning theory.

UNIT I INTRODUCTION **9**

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations– Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms– Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING **9**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING **9**

K- Nearest Neighbor Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning

UNIT V ADVANCED LEARNING **9**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of course, students will be able to

CO1: Understand and outline problems for each type of machine learning

CO2: Design a Decision tree and Random Forest for an application

CO3: Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.

CO4: Use a tool to implement typical Clustering algorithms for different types of applications.

CO5: Design and implement an HMM for a Sequence Model type of application and identify applications suitable for different types of Machine Learning with suitable justification.

CO6: Apply advanced learning algorithms for unknown problems.

REFERENCES:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 1st edition, 2017.
2. EthemAlpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press, 3rd Edition, 2004.
3. Hastie. T, Tibshirani. R, Friedman. J. H, "The Elements of Statistical Learning", Springer, 2nd Edition, 2017.

P23CSP11	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1. To introduce 'R' programming environment and Python
2. To implement machine learning algorithms
3. To Understand different categories of existing algorithms
4. To choose appropriate algorithm for a given application.

LIST OF EXPERIMENTS:

1. Apply Principal Component Analysis on a high dimensional data set to reduce dimension.
2. Implement and study a non-parametric technique namely, K-Nearest Neighbor classifier on a given dataset.
3. Illustrate linear discriminate analysis for two class and multi class classification problems
4. Apply Linear Regression Technique on two different prediction data sets.
5. Demonstrate the use of Logistic Regression on data sets used in Experiment no 3 and compare with the results of linear Regression
6. Implement Probabilistic Classifier namely, Bayesian Classifier on a multi class classification data set.
7. Apply and analyze Support Vector Machine Algorithm with different kernel functions and parameter values for a linearly separable and non linearly separable classification Task.
8. Demonstrate the use of Relevance Vector Machine and compare results with other techniques such as SVM for multi class classification mechanism.
9. Implement multi layer feed forward neural network and analyze results for different

configurations and activation functions.

10. Use the same dataset in a previous experiment apply regularization techniques and compare the results.
11. Apply Convolutional Neural Network algorithm for an image classification task. Study the performance for various network configurations.
12. Demonstrate the use of hidden markov model based technique for a given sequential modeling task.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Obtain a low dimensional representation for any given input data.

CO2: Implement few commonly used machine learning algorithms in R programming environment and Python.

CO3: Apply and analyze performance of generative vs discriminative learning algorithms.

CO4: Develop an Intelligent system for a problem that involves machine learning based automated decision making.

CO5: Evaluate results for different experimental settings and test cases.

CO6: Develop image classification system for various network configurations.

SEMESTER II

P23CST21	EMBEDDED SYSTEMS WITH IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To get familiarized with the embedded hardware architecture
2. To understand the basics of RTOS and the attributes of various communication protocols.
3. To build knowledge on Embedded C programming and realize the concept of peripheral interfacing.
4. To get introduced with the concept of IoT and architecture of IoT systems
5. To acquire knowledge over IoT implementation tools and thecore elements of IIoT

UNIT I EMBEDDED SYSTEMS ARCHITECTURE 9

CISC Architecture:- Introduction to MCS51 Family - 8051 Microcontroller - Architecture - Timers - Interrupts - Serial Data Communication - RISC Architecture:- overview of PIC 16F87x family - PIC16F877A - Architecture - Timers - Interrupts - Serial ports - Introduction to ARM - LPC4088 Architecture

UNIT II INTRODUCTION TO IOT 9

Introduction to IoT - Current technological trends and future prospects - Evolution of IoT- Business Scope - Relation with embedded system - Basic Architecture of an IoT - From M2M to IoT - M2M towards IoT - IoT Value Chains - An emerging industrial structure for IoT.

UNIT III ELEMENTS OF IOT 9

Application Sensors and Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN and LPWA - Overview of IoT supported Hardware platforms such as: Raspberry pi - ARM Cortex Processors - Arduino and Intel Galileo boards - Wearable Development Boards.

UNIT IV COMMUNICATION AND CONNECTIVE TECHNOLOGIES 9

IoT Communication Model - Cloud computing in IoT - IoT in cloud architecture - Logging on to cloud - Selecting and Creating cloud service - cloud based IoT platforms - IBM Watson - Google cloud.

UNIT V DATA ANALYTICS AND IOT PLATFORM 9

Big Data Analytics - Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis - Apache Storm - Data Visualization - Visualization tools for IoT.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand the concept of embedded system and its architectural features

CO2: Develop embedded software using Embedded C and Python.

CO3: Implement the various IoT Protocols

CO4: Acquire real world signals and perform remote process monitoring utilizing the concept of IoT.

CO5: Design and implement IoT enabled embedded control strategy for a given application.

CO6: Apply IoT concepts in big data analytics.

REFERENCES:

1. Rajkamal, 'Embedded system-Architecture, Programming, Design', TataMcgraw Hill, 3rd Edition, 2016.
2. Peckol, "Embedded System Design", John Wiley, 2nd Edition, 2010.
3. Ismail Butun, "Industrial IoT Challenges, Design Principles, Applications, and Security", Springer, 1st Edition, 2020.
4. Pethuru Raj and Anupama C. Raman , "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 1st Edition, 2017

P23CST22	ADVANCED OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To get a comprehensive knowledge of the architecture of distributed systems.
2. To understand the deadlock and shared memory issues and their solutions in distributed environments.
3. To know the security issues and protection mechanisms for distributed environments.
4. To get a knowledge of multiprocessor operating systems and database operating systems.

UNIT I INTRODUCTION **9**

Architectures of Distributed Systems - System Architecture types - issues in distributed operating systems - communication networks – communication primitives. Theoretical Foundations - inherent limitations of a distributed system – lamport's logical clocks – vector clocks – causal ordering of messages – global state – cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis.

UNIT II DISTRIBUTED DEADLOCK DETECTION AND RESOURCE MANAGEMENT **9**

Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems – issues in deadlock detection and resolution – control organizations for distributed deadlock detection – centralized and distributed deadlock detection algorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture – mechanism for building distributed file systems – design issues – log structured file systems.

UNIT III DISTRIBUTED SHARED MEMORY AND SCHEDULING **9**

Distributed shared memory-Architecture– algorithms for implementing DSM – memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – components of a load distributing algorithm – stability – load distributing algorithms – performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing -task migration and associated issues. Failure Recovery and Fault tolerance: introduction– basic concepts – classification of failures – backward and forward error recovery, backward error recovery- recovery in concurrent systems – consistent set of checkpoints – synchronous and asynchronous checkpointing and recovery – checkpointing for distributed database systemsrecovery in replicated distributed databases.

UNIT IV DATA SECURITY **9**

Protection and security -preliminaries, the access matrix model and its implementations.-safety in matrix model- advanced models of protection. Data security – cryptography: Model of cryptography, conventional cryptography- modern cryptography, private key cryptography, data encryption standard-public key cryptography – multiple encryption – authentication in distributed systems.

UNIT V MULTIPROCESSOR AND DATABASE OPERATING SYSTEM **9**

Multiprocessor operating systems - basic multiprocessor system architectures – interconnection networks for multiprocessor systems – caching – hypercube architecture. Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threadsprocess synchronization and scheduling. Database Operating systems :Introduction- requirements of a database operating system Concurrency control : theoretical aspects – introduction, database systems – a concurrency control model of database systems- the problem of concurrency control – serializability theory- distributed database systems, concurrency control algorithms – introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms – concurrency control algorithms: data replication.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: Understand and explore the working of Theoretical Foundations of OS.
CO2: Analyze the working principles of Distributed Deadlock Detection and resource management
CO3: Understand the concepts of distributed shared memory and scheduling mechanisms
CO4: Understand and analyze the working of Data security
CO5: Apply the learning into multiprocessor system architectures.
CO6: Understand concurrency control system in multiprocessor and database operating system.

REFERENCES:

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", McGraw Hill Education, 7th Edition, 2017.
2. Andrew S.Tanenbaum, "Modern operating system", PHI, 4th Edition, 2007
3. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 1st Edition, 2003.
4. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 3rd Edition, 2003.

P23CST23	DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. Develop and Train Deep Neural Networks.
2. Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition
3. Build and train RNNs, work with NLP and Word Embeddings
4. The internal structure of LSTM and GRU and the differences between them
5. The Auto Encoders for Image Processing

UNIT I DEEP LEARNING CONCEPTS **9**

Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modeling. Early Neural Networks. How Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data. Video Data.

UNIT II NEURAL NETWORKS **9**

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Over fitting and Under fitting. Hyper parameters.

UNIT III CONVOLUTIONAL NEURAL NETWORK **9**

About CNN. Linear Time Invariant. Image Processing Filtering. Building a convolutional neural network. Input Layers, Convolution Layers. Pooling Layers. Dense Layers. Backpropagation Through the Convolutional Layer. Filters and Feature Maps. Backpropagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions. Various Optimizers. LeNet, AlexNet, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, Microsoft ResNet Model. R-CNN, Fast R-CNN, Faster R-CNN, Mask-RCNN, YOLO

UNIT IV NATURAL LANGUAGE PROCESSING USING RNN **9**

About NLP & its Toolkits. Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Backpropagation Through Time. Bidirectional RNNs (BRNN) . Long Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to-Sequence Models (Seq2Seq). Gated recurrent unit GRU.

UNIT V DEEP REINFORCEMENT & UNSUPERVISED LEARNING **9**

About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy Gradient Methods. Actor-Critic Algorithm. About Autoencoding. Convolutional Auto Encoding. Variational Auto Encoding. Generative Adversarial Networks. Autoencoders for Feature Extraction. Auto Encoders for Classification. Denoising Autoencoders. Sparse Autoencoders

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Feature Extraction from Image and Video Data

CO2: Implement Image Segmentation and Instance Segmentation in Images.

CO3: Implement image recognition and image classification using a pretrained network

CO4: Traffic Information analysis using Twitter Data

CO5: Design Autoencoder for Classification & Feature Extraction

CO6: Apply reinforcement learning algorithm in healthcare system.

REFERENCES:

1. Josh Patterson and Adam Gibson, "Deep Learning A Practitioner's Approach", O'Reilly Media, Inc, 1st Edition, 2017.
2. JojoMoolayil, "Learn Keras for Deep Neural Networks", Apress, 1st Edition, 2018
3. Vinita Silaparasetty, "Deep Learning Projects Using TensorFlow 2", Apress, 1st Edition, 2020
4. François Chollet, "Deep Learning with Python",Manning Shelter Island,1st Edition, 2017
5. SantanuPattanayak, "Pro Deep Learning with TensorFlow", Apress, 1st Edition, 2018.

P23CST24	ADVANCED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To give an overview of fundamentals of software process models and principles.
2. To describe the essentials of software Engineering concepts related to requirements, modeling, deriving distributed architecture, software validation and reuse
3. To establish foundation on concepts of aspect-oriented development and recent trends and tools.

UNIT I SOFTWARE PROCESS MODELS AND PRINCIPLES 9

Software Process Models: Waterfall, V-model, Spiral iterative and incremental-Componentbased development, Fourth Gen Techniques, Introduction to Agile Software Development, AgilePrinciples and Practices, Extreme Programming

UNIT II MODELLING REQUIREMENTS AND DESIGN 9

Software Requirements Engineering, Software Architecture: Architectural Tactics and Patterns-Architecture in the Life Cycle: Architecture and Requirements. Designing Architecture. Object Oriented Design, Design principles DFD, UML tools, OOD metrics, Overview of Design Patterns

UNIT III SOFTWARE VALIDATION 9

Introduction to Software Verification Validation, levels of testing, types of testing, Black box design techniques, White box design techniques, statement coverage, decision coverage, condition coverage, Static Review process. Functional non-functional testing. Software Maintenance - Software Maintenance, Software Configuration Management.

UNIT IV SOFTWARE REUSE 9

Reuse based Software Engineering Approaches supporting software reuse Application Frame works Commercial-Of-The-Shelf (COTS) systems: COTS Solution Systems, COTS Integrated Systems. Component-Based Software Engineering (CBSE) Components, Component Models CBSE Processes: CBSE for Reuse, CBSE with Reuse Component based Development Component Qualification, Adaptation, and Composition Economics of CBSE.

UNIT V ASPECT ORIENTED SOFTWARE DEVELOPMENT 9

Introduction to Aspect-Oriented Software Development (AOSD): Aspect-Orientation in the Software Life cycle Developing Software components with Aspects. Insight into Mashup in Software Engineering Categorization of Mashup Enterprise Mashups - Principles of lean, Insight into Lean software development principles. Social Software Engineering

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Identify appropriate process models based on the Project requirements

CO2: Understand the importance of having a good Software Architecture.

CO3: Understand the five important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.

CO4: Understand the basic notions of a web service, web service standards, and service-oriented architecture;

CO5: Be familiar with various levels of Software testing

CO6: Apply aspect oriented software development in social software engineering.

REFERENCES:

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", McGrawHill,7th Edition, 2010.
2. Ian Sommerville, "Software Engineering", Addision-Wesley,9th Edition, 2017.
3. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Addison- Wesley Professional, 3rdEdition, 2012.

P23CSP21	SOFTWARE ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1. To impart state-of-the-art knowledge on Software Engineering and UML in an interactive manner through the Web.
2. Present case studies to demonstrate practical applications of different concepts.
3. Provide a scope to students where they can solve small, real-life problems.

LIST OF EXPERIMENTS

1. Write a Problem Statement to define a title of the project with bounded scope of project
2. Select relevant process model to define activities and related task set for assigned project
3. Prepare broad SRS (Software Requirement Specification) for the above selected projects
4. Prepare USE Cases and Draw Use Case Diagram using modeling Tool
5. Develop the activity diagram to represent flow from one activity to another for software development
6. Develop data Designs using DFD Decision Table & ER Diagram.
7. Draw class diagram, sequence diagram, Collaboration Diagram, State Transition Diagram for the assigned project
8. Write Test Cases to Validate requirements of assigned project from SRS Document
9. Evaluate Size of the project using function point metric for the assigned project
10. Estimate cost of the project using COCOMO and COCOCMOII for the assigned project
11. Use CPM/PERT for scheduling the assigned project
12. Use timeline Charts or Gantt Charts to track progress of the assigned project

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Produce the requirements and use cases the client wants for the software being Produced.

CO2: Participate in drawing up the project plan. The plan will include at least extent and work assessments of the project, the schedule, available resources, and risk management can model and specify the requirements of mid-range software and their architecture.

CO3: Create and specify such a software design based on the requirement specification that the software can be implemented based on the design.

CO4: Assess the extent and costs of a project with the help of several different assessment methods.

CO5: Develop a quality software product using agile process.

CO6: Apply scheduling algorithms for assigned projects using CPM / PERT

P23CSP22	DEEP LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1. Implement the various deep learning algorithms in Python
2. Learn to work with different deep learning frameworks like Keras, Tensor flow, PyTorch, Caffe etc.

LIST OF EXPERIMENTS

1. Basic image processing operations : Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
2. Implement SVM/Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network
3. Study the effect of batch normalization and dropout in neural network classifier
4. Familiarization of image labelling tools for object detection, segmentation
5. Image segmentation using Mask RCNN, UNet, SegNet
6. Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
7. Image Captioning with Vanilla RNNs
8. Image Captioning with LSTMs
9. Network Visualization: Saliency maps, Class Visualization
10. Generative Adversarial Networks
11. Chatbot using bi-directional LSTMs
12. Familiarization of cloud based computing like Google colab

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Effectively use the various machine learning tools

CO2: Can develop knowledge in solving real world problems using state-of-art deep learning techniques

CO3: Apply various pre-processing techniques on different datasets

CO4: Develop Deep learning programs for Supervised & Unsupervised learning models

CO5: Analyze the graphical outcomes of learning algorithms with specific datasets

CO6: Design a chatbot using learning algorithms.

PROFESSIONAL ELECTIVES (PE)

SEMESTER II

ELECTIVE I

		L	T	P	C
P23CSE01	**CLOUD COMPUTING TECHNOLOGIES**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1. To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution.
2. To understand the architecture, infrastructure and delivery models of cloud computing.
3. To explore the roster of AWS services and illustrate the way to make applications in AWS.
4. To gain knowledge in the working of Windows Azure and Storage services offered by Windows Azure
5. To develop the cloud application using various programming model of Hadoop and Aneka

UNIT I VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE 9

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization- Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation

UNIT II CLOUD PLATFORM ARCHITECTURE 9

Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges

UNIT III AWS CLOUD PLATFORM - IAAS 9

Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools: Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager

UNIT IV PAAS CLOUD PLATFORM 9

Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services- REST API- Blops

UNIT V PROGRAMMING MODEL 9

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Employ the concepts of virtualization in the cloud computing

CO2: Identify the architecture, infrastructure and delivery models of cloud computing

CO3: Develop the Cloud Application in AWS platform

CO4: Apply the concepts of Windows Azure to design Cloud Application

CO5: Develop services using various Cloud computing programming models.

CO6: Understand the concept of Aneka: Cloud Application Platform

REFERENCES:

1. Bernard Golden, "Amazon Web Service for Dummies", John Wiley & Sons, 1st Edition, 2013.
2. Raoul Alongi, "AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level", Amazon Asia- Pacific Holdings Private Limited,1st Edition, 2019.
3. Sriram Krishnan, "Programming: Windows Azure", O'Reilly,1st Edition,2010.
4. Rajkumar Buyya, Christian Vacchiola, S.ThamaraiSelvi, "Mastering Cloud Computing" , MCGrawHill Education (India) Pvt. Ltd.,1st Edition,2013.
5. Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner"s Guide‖", McGraw-Hill Osborne Media, 1st Edition,2009.

P23CSE02	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To study fundamental concepts of digital image processing.
2. To understand and learn image processing operations and restoration.
3. To use the concepts of Feature Extraction
4. To study the concepts of Image Compression.
5. To expose students to current trends in the field of image segmentation

UNI I INTRODUCTION **9**

Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels. Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing, and sharpening spatial filters, combining the spatial enhancement methods.

UNIT II IMAGE RESTORATION **9**

A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function. Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation

UNIT III FEATURE EXTRACTION **9**

Detection of discontinuities – Edge linking and Boundary detection- Thresholding- -Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.

UNIT IV IMAGE COMPRESSION **9**

Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphological algorithms

UNIT V IMAGE SEGMENTATION **9**

Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation. Object Recognition: Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Apply knowledge of Mathematics for image processing operations

CO2: Apply techniques for image restoration.

CO3: Identify and extract salient features of images

CO4: Apply the appropriate tools (Contemporary) for image compression and analysis.

CO5: Apply segmentation techniques and do object recognition.

CO6: Apply the image segmentation in object recognition.

REFERENCES:

1. Rafeal C.Gonzalez, Richard E.Woods, “Digital Image Processing”, Pearson Education/PHI,4th Edition, 2018.
2. Sridhar S, “Digital Image Processing”, Oxford University Press, 2nd Edition, 2016
3. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Thomson Course Technology, .Brooks/Cole, 1st Edition, 2004
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, Thompson Learning,Second Edition, 2007.
5. Rafeal C.Gonzalez, Richard E.Woods, Steven L. Eddins, “Digital Image Processing using Matlab”, Pearson Education, 2nd Edition, 2017

P23CSE03	MOBILE AND WIRELESS COMMUNICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand the basic concepts in cellular communication.
2. To learn the characteristics of wireless channels.
3. To understand the impact of digital modulation techniques in fading.
4. To get exposed to diversity techniques in wireless communication.
5. To acquire knowledge in multicarrier systems.

UNIT I CELLULAR CONCEPTS **9**

Frequency Reuse – Channel Assignment Strategies – Handoff Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service – Improving coverage & capacity in cellular systems-Cell Splitting- Sectoring- Repeaters for Range Extension-Microcell Zone Concept.

UNIT II THE WIRELESS CHANNEL **9**

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver –Capacity comparisons – Capacity of Frequency Selective Fading channels.

UNIT III PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS **9**

Performance of flat fading and frequency selective fading – Impact on digital modulation techniques –- Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter symbol Interference.

UNIT IV DIVERSITY TECHNIQUES **9**

Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combing – Maximal-Ratio Combining – Equal - Gain Combining – Capacity with Receiver diversity – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme– Transmit & Receive Diversity-MIMO Systems.

UNIT V MULTICARRIER MODULATION **9**

Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Sub channels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio- Frequency and Timing offset.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Design solutions for cellular communication

CO2: Determine the capacity of wireless channels

CO3: Analyze the performance of the digital modulation techniques in fading channels

CO4: Apply various diversity techniques in wireless communication

CO5: Design multicarrier systems in wireless communication

REFERENCES:

1. Theodore.S. Rappaport, "Wireless Communications: Principles and Practice", Pearson Education, India, 2nd Edition,2010.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 1st Edition, 2005.
3. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Wiley Series in Telecommunications, Cambridge University Press, 1st Edition, 2005.
4. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies", CRC press, 2019.
5. Keith Q. T. Zhang, "Wireless Communications: Principles, Theory and Methodology", John Wiley & Sons, 1st edition, 2016.

P23CSE04	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To learn the fundamental principles and practices associated with each of the agile development methods
2. To apply the principles and practices of agile software development on a project of interest and relevance to the student.
3. To provide a good understanding of software design and a set of software technologies and APIs.
4. To do a detailed examination and demonstration of Agile development and testing techniques.
5. To understand Agile development and testing.

UNIT I AGILE SOFTWARE DEVELOPMENT 9

Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges. Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality

UNIT II AGILE AND SCRUM PRINCIPLES 9

Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values

UNIT III AGILE PRODUCT MANAGEMENT 9

Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue

UNIT IV AGILE REQUIREMENTS AND AGILE TESTING 9

User Stories, Backlog Management. Agile Architecture: Feature Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools. Agile Testing Techniques, Test-Driven Development, User Acceptance Test

UNIT V AGILE REVIEW AND SCALING AGILE FOR LARGE PROJECTS 9

Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, The rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools. Scrum of Scrums, Team collaborations, Scrum, Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Analyze existing problems with the team, development process and wider organization

CO2: Apply a thorough understanding of Agile principles and specific practices

CO3: Select the most appropriate way to improve results for a specific circumstance or need

CO4: Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems

CO5: Evaluate likely successes and formulate plans to manage likely risks or problems

CO6: Apply agile techniques to estimate the project variables.

REFERENCES

1. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices" Alan Apt Series4th Edition, 2011
2. Mike Cohn, "Succeeding with Agile : Software Development Using Scrum", Pearson, 3rd Edition, 2010.
3. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 1st Edition, 2003.
4. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
5. Craig Larman, "Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.

P23CSE05	BIG DATA ANALYTICS AND ALGORITHM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To introduce the concepts and phases of big data analytics.
2. To study the tools required to manage and analyze big data.
3. To explore the concept of knowledge representation
4. To learn the ability of planning strategies
5. To study the learning techniques and logistic regression

UNIT I INTRODUCTION TO BIG DATA 9

Introduction - Challenges of Conventional Systems,What is Business Analytics, Business Analytics lifecycle, Why Big Data Analytics, Defining Big data, Characteristics of Big Data(V's), Business Analytics phases: Data Acquisition- Data Cleaning - Data Manipulation - Data Analysis (Statistical and Analytical methods) to make sense of data - Data Visualization.

UNIT II HADOOP MAPREDUCE **9**

Introduction to HADOOP - Hadoop ecosystem components and uses, Hadoop Storage: HDFS, Concept of Hadoop Distributed file system, Design of HDFS, Configuration of HDFS. Hadoop Data Types, large-scale deep belief nets with mapreduce - Functional-Concept of Mappers, Functional-Concept of Reducers, MapReduce Execution Framework, Partitioners and Combiners, Hadoop Clusters component :NameNode, Secondary NameNode, and DataNode, Data flow (Anatomy of File Write and Read) - detecting malicious domain using deep Learning at scale.

UNIT III KNOWLEDGE REPRESENTATION **9**

Issues, predicate logic, resolution, representing knowledge using rules, forward versus backward reasoning, matching, control knowledge, weak slot and filler structure-semantic nets, frames, strong slot - learning curve analysis by logistic regression

UNIT IV GAME PLAYING **9**

Mini-max search, alpha-beta cutoffs, planning system, goal stack planning, hierarchical planning, understanding as constraint satisfaction, waltz algorithm, natural language processing, syntactic processing - scalable multi-dimensional prediction mode

UNIT V LEARNING **9**

Rote learning, learning by taking advice, learning in problem solving, learning from examples, winston's learning program, decision trees, perception, vision, speech recognition, navigation, manipulation, robot architecture - data analytics using scalable logistic regression - sentimental classification of big data using logistic regression

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: Understand the key issues in big data management

CO2: Acquire various analyzing techniques, software tools in big data analytics

CO3: Analyze various AI approaches to solve problems.

CO4: Learn various classification techniques in big data analytics.

CO5: Design models for real world scenarios.

CO6: Understand the concept of learning in robot architecture.

REFERENCES:

1. Stefano Ceri , Giuseppe Pelagatti , "Distributed Databases: Principles and Systems Paperback", McGraw Hill Education,2017.
2. Tom White, " Hadoop: The Definitive Guide", O"reilly Media, 4th Edition, 2015
3. Prajapati, V, "Big data analytics with R and Hadoop", Packt Publishing Ltd, 2016
4. E.RichK.Knight, and B. Nair, "Artificial Intelligence", TMH, 3rdEdition,2017
5. RusselNorvig, Artificial Intelligence A modern Approach, 3 rd Edition, Pearson Education,2010

SEMESTER III
PROFESSIONAL ELECTIVE II

		L	T	P	C
P23CSE06	**HIGH PERFORMANCE COMPUTING FOR BIG DATA**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1. To learn the fundamental concepts of High Performance Computing.
2. To learn the network & software infrastructure for high performance computing.
3. To understand real time analytics using high performance computing.
4. To learn the different ways of security perspectives and technologies used in HPC.
5. To understand the emerging big data applications.

UNIT I INTRODUCTION **9**

The Emerging IT Trends- IOT/IOE-Apache Hadoop for big data analytics-Big data into big insights and actions – Emergence of BDA discipline – strategic implications of big data – BDA Challenges – HPC paradigms – Cluster computing – Grid Computing – Cloud computing – Heterogeneous computing – Mainframes for HPC - Supercomputing for BDA – Appliances for BDA.

UNIT II NETWORK & SOFTWARE INFRASTRUCTURE FOR HIGH PERFORMANCE BDA **9**

Technologies that support Real time analytics – MOA: Massive online analysis – GPFS: General parallel file system – Client case studies – Key distinctions – Machine data analytics – operational analytics – HPC Architecture models – In Database analytics – In memory analytics

UNIT III REAL TIME ANALYTICS USING HIGH PERFORMANCE COMPUTING **9**

Procedures and work instructions – Supporting quality devices - Staff training and certification - Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control.

UNIT IV SECURITY AND TECHNOLOGIES **9**

Security, Privacy and Trust for user – generated content: The challenges and solutions – Role of real time big data processing in the IoT – End to End Security Framework for big sensing data streams – Clustering in big data.

UNIT V EMERGING BIG DATA APPLICATIONS **9**

Deep learning Accelerators – Accelerators for clustering applications in machine learning - Accelerators for classification algorithms in machine learning – Accelerators for Big data Genome Sequencing

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand the basics concepts of High Performance computing systems.

CO2: Apply the concepts of network and software infrastructure for high performance computing

CO3: Use real time analytics using high performance computing.

CO4: Apply the security models and big data applications in high performance computing

CO5: Understand the emerging big data applications.

CO6: Apply classification algorithms for accelerators.

REFERENCES:

1. Pethuru Raj, Anupama Raman, Dhivya Nagaraj and Siddhartha Duggirala, "HighPerformance Big-Data Analytics: Computing Systems and Approaches", Springer, 1st Edition, 2015.
2. Kuan-Ching Li , Hai Jiang, Albert Y. Zomaya, "Big Data Management and Processing", CRC Press,1st Edition,2017.
3. Chao wang, "High Performance Computing for Big Data: Methodologies and Applications", CRC Press,1st Edition,2018
4. Khosrow Hassibi, "High-Performance Data Mining And Big Data Analytics", Create Space Independent Publishing Platform,1st Edition,2014

P23CSE07	SOFTWARE TESTING AND SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To learn the criteria for test cases.
2. Understand the integration of SQA components into the project life cycle.
3. Be familiar with the software quality infrastructure.
4. Be exposed to the management components of software quality.
5. Be familiar with the Quality standards, certifications and assessments

UNIT I INTRODUCTION **9**

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester‘s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT II LEVELS OF TESTING **9**

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

UNIT III INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE 9

Need for Software quality – Software quality assurance (SQA) – Software quality factors- McCall's quality model – SQA system components – Pre project quality components – Development and quality plans. Procedures and work instructions – Supporting quality devices - Staff training and certification - Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control.

UNIT IV SQA COMPONENTS AND PROJECT LIFE CYCLE 9

Integrating quality activities in the project life cycle – Reviews – Software Testing – Quality of software maintenance components – Quality assurance for external participants contribution – CASE tools for software quality Management.

UNIT V STANDARDS, CERTIFICATIONS & ASSESSMENTS 9

Quality management standards – ISO 9001 and ISO 9000-3 –Capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – Organization of Quality Assurance – Role of management in SQA – SQA units and other actors in SQA systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Design test cases suitable for a software development for different domains.

CO2: Document test plans and test cases designed.

CO3: Utilize the concepts of SQA in software development life cycle

CO4: Apply the concepts in preparing the quality plan & documents.

CO5: Ensure whether the product meets company's quality standards and client's expectations and demands

CO6: Understand the concept of SPICE project

REFERENCES:

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 3rd Edition, 2009.
2. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 2nd Edition, 2011.
3. KshirasagarNaim and Priyadarshi Tripathy," Software Testing and Quality Assurance Theory and Practice", John Wiley & Sons Inc., 1st Edition, 2008
4. Mordechai Ben-Menachem, "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 2014

P23CSE08	COGNITIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To familiarize Use the Innovation Canvas to justify potentially successful products.
2. To learn various ways in which to develop a product idea.
3. To understand about how Big Data can play vital role in Cognitive Computing
4. To know about the business applications of Cognitive Computing
5. To get into all applications of Cognitive Computing

UNIT I FOUNDATION OF COGNITIVE COMPUTING 9

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation, and visualization services.

UNIT II NATURAL LANGUAGE PROCESSING IN COGNITIVE SYSTEMS 9

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations

UNIT III BIG DATA AND COGNITIVE COMPUTING 9

Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, using advanced analytics to create value, Impact of open source tools on advanced analytics.

UNIT IV BUSINESS IMPLICATIONS OF COGNITIVE COMPUTING 9

Preparing for change ,advantages of new disruptive models , knowledge meaning to business, difference with a cognitive systems approach , meshing data together differently, using business knowledge to plan for the future , answering business questions in new ways , building business specific solutions , making cognitive computing a reality , cognitive application changing the market The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing.

UNIT V APPLICATION OF COGNITIVE COMPUTING 9

Building a cognitive health care application: Foundations of cognitive computing for healthcare, constituents in healthcare ecosystem, learning from patterns in healthcare Data, Building on a foundation of big data analytics, cognitive applications across the health care eco system, starting with a cognitive application for healthcare, using cognitive applications to improve health and wellness, using a cognitive application to enhance the electronic medical record Using cognitive application to improve clinical teaching.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Explain applications in Cognitive Computing.

CO2: Describe Natural language processor role in Cognitive computing.

CO3: Explain future directions of Cognitive Computing

CO4: Evaluate the process of taking a product to market

CO5: Comprehend the applications involved in this domain.

CO6: Apply cognitive computing for health care eco system**.**

REFERENCES:

1.Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data Analytics", Wiley, 2015.

2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 2013.

3. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016

P23CSE09	INFORMATION EXTRACTION AND INFORMATION RETRIEVAL	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand the basics of Information Retrieval.
2. To understand machine learning techniques for text classification and clustering
3. To understand various search engine system operations.
4. To learn different techniques of recommender system.

UNIT I INTRODUCTION **9**

Information Retrieval – Early Developments – The IR Problem – The User_s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II MODELING AND RETRIEVAL EVALUATION **9**

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING **9**

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING **9**

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM **9**

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Use an open source search engine framework and explore its capabilities

CO2: Apply appropriate method of classification or clustering.

CO3: Design and implement innovative features in a search engine.

CO4: Design and implement a recommender system.

CO5: Simulate and analyze the characteristics of Software Testing models.

CO6: Apply various techniques for recommender system.

REFERENCES:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", ACM Press Books, 2nd Edition, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", The MIT Press, 1st Edition, 2011.

P23CSE10	WEB ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand the Web analytics platform, and their evolution.
2. To learn about the various Data Streams Data.
3. To learn about the benefits of surveys and capturing of data
4. To understand Common metrics of web as well as KPI related concepts.
5. To learn about the various Web analytics versions.

UNIT I INTRODUCTION **9**

Definition, Process, Key terms: Site references, Keywords and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion metrics; Categories: Offsite web, on site web; Web analytics platform, Web analytics evolution, Need for web analytics, Advantages, Limitations.

UNIT II DATA COLLECTION **9**

Click stream Data: Web logs, Web Beacons, JavaScript tags, Packet Sniffing; Outcomes Data: Ecommerce, Lead generation, Brand/Advocacy and Support; Research data: Mindset, Organizational structure, Timing; Competitive Data: Panel-Based measurement, ISP-based measurement, Search Engine data.

UNIT III QUALITATIVE ANALYSIS **9**

Heuristic evaluations: Conducting a heuristic evaluation, Benefits of heuristic evaluations; Site Visits: Conducting a site visit, Benefits of site visits; Surveys: Website surveys, Post-visit surveys, creating and running a survey, Benefits of surveys. Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding click stream data quality, Identifying unique page definition, Using cookies, Link coding issues.

UNIT IV WEB METRICS **9**

Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non e-commerce sites): Improving bounce rates, Optimizing adwords campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI. Relevant Technologies: Internet & TCP/IP, Client / Server Computing, HTTP (Hypertext Transfer Protocol), Server Log Files & Cookies, Web Bugs.

UNIT V WEB ANALYTICS 2.0 **9**

Web analytics 1.0, Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis : CI data sources, Toolbar data, Panel data ,ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities. Google Analytics: Brief introduction and working, Adwords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand the Web analytics platform, and their evolution.

CO2: Use the various Data Streams Data.

CO3: Know how the survey of capturing of data will benefit.

CO4: Understand Common metrics of web as well as KPI related concepts.

CO5: Apply various Web analytics versions in existence.

CO6: Apply web analytics 2.0 for google website optimizer

REFERENCES:

1. Clifton B, “Advanced Web Metrics with Google Analytics”, Wiley Publications, Inc.,2nd Edition, 2012.
2. Kaushik A., “Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity”, Wiley Publishing, Inc. 1st Edition, 2010.
3. Sterne J., “Web Metrics: Proven methods for measuring web site success”, John Wiley and Sons, 1st Edition, 2002

PROFESSIONAL ELECTIVE III

P23CSE11	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand the basics of Mobile Computing and Personal Computing
2. To learn the role of cellular networks in Mobile and Pervasive Computing
3. To expose to the concept of sensor and mesh networks
4. To expose to the context aware and wearable computing
5. To learn to develop applications in mobile and pervasive computing environment
6.

UNIT I INTRODUCTION **9**

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices

UNIT II 3G AND 4G CELLULAR NETWORKS **9**

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III SENSOR AND MESH NETWORKS **9**

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks

UNIT IV CONTEXT AWARE COMPUTING & WEARABLE COMPUTING **9**

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications

UNIT V APPLICATION DEVELOPMENT **9**

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Design a basic architecture for a pervasive computing environment

CO2: Design and allocate the resources on the 3G-4G wireless networks

CO3: Analyze the role of sensors in Wireless networks

CO4: Work out the routing in mesh network

CO5: Deploy the location and context information for application development

CO6: Develop mobile computing applications based on the paradigm of context aware computing and wearable computing

REFERENCES:

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 14th Edition, 2019.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert, "Management", Pearson Education, 6th Edition, 2014.

P23CSE12	WEB SERVICES AND API DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To learn the basics of Web service.
2. To become familiar with the Web Services building blocks
3. To learn to work with RESTful web services.
4. To implement the RESTful web services.
5. To understand resource-oriented Architecture.

UNIT I INTRODUCTION TO WEB SERVICE **9**

Overview – Web service-Architecture – Service-Oriented Architecture (SOA), Architecting Web Services: Web Services Technology Stack, Logical Architectural View, Deployment Architectural View, and Process Architectural View.

UNIT II WEB SERVICE BUILDING BLOCKS **9**

Introduction to SOAP: SOAP Syntax- Sending SOAP Messages - SOAP Implementations - Introduction to WSDL: WSDL Syntax - SOAP Binding - WSDL Implementations - Introduction to UDDI: The UDDI API - Implementations - The Future of UDDI

UNIT III RESTFUL WEB SERVICES **9**

Programmable Web - HTTP: Documents in Envelopes - Method Information - Scoping Information - The Competing Architectures - Technologies on the Programmable Web -Leftover Terminology - Writing Web Service Clients: The Sample Application - Making the Request: HTTP Libraries - Processing the Response: XML Parsers - JSON Parsers: Handling Serialized Data - Clients Made Easy with WADL.

UNIT IV IMPLEMENTATION OF RESTFUL WEB SERVICES **9**

Introducing the Simple Storage Service - Object-Oriented Design of S3 - Resources - HTTP Response Codes Resource- URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface – Spring Web Services – Spring MVC Components - Spring Web Flow - A Service Implementation using Spring Data REST.

UNIT V RESOURCE ORIENTED ARCHITECTURE 9

Resource- URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface- Designing Read-Only Resource-Oriented Services : Resource Design - Turning Requirements Into Read-Only Resources - Figure Out the Data Set- Split the Data Set into Resources- Name the Resources - Design Representation- Link the Resources to Each Other- The HTTP Response

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Explain how to write XML documents.

CO2: Apply the web service building blocks such as SOAP, WSDL and UDDI

CO3: Describe the RESTful web services.

CO4: Implement the RESTful web service with Spring Boot MVC

CO5: Discuss Resource-oriented Architecture.

CO6: Understand various resources in resource oriented architecture.

REFERENCES:

1. Leonard Richardson and Sam Ruby, "RESTful Web Services", O'Reilly Media, 1st Edition, 2007
2. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2nd Edition, 2005.
3. Lindsay Bassett, "Introduction to JavaScript Object Notation", O'Reilly Media, 1st Edition, 2015
4. Craig Walls, "Spring in Action,", Manning Publications,Fifth Edition, 2018
5. Raja CSP Raman, LudovicDewailly, "Building A RESTful Web Service with Spring 5", Packt Publishing, 5th Edition, 2018.

P23CSE13 COMPUTER VISION AND PATTERN RECOGNITION L T P C

3 0 0 3

COURSE OBJECTIVES:

To formulate and solve computer vision and pattern recognition problems using scientific, statistical and engineering approaches.

UNIT I COMPUTER VISION OVERVIEW 9

Introduction to Computer Vision – History – Image Information – Geometric Primitives and Transformations – Photometric Image Information – The Digital Camera – Image Processing – Point Operators – Linear Filtering – Neighborhood Operators.

UNIT II IMAGE TRANSFORMATION AND FEATURE DETECTION 9

Fourier Transforms – Pyramids and Wavelets – Global Optimization – Feature Detection and Matching – Points and Patches – Edges – Lines - Patterns to Features – Features Scaling – Evaluation and Selection of Features.

UNIT III SEGMENTATION AND PATTERN RECOGNITION 9

Active contours – Split and Merge – Mean Shift and Mode Finding – Normalized Cuts – Graph Cuts – Object Detection – Face Recognition – Instance Recognition – Category Recognition – Context and Scene Understanding.

UNIT IV PATTERN CLASSIFIERS AND CLUSTERING 9

Nearest Neighbors – Support Vector Machines – Decision Tree -Ensemble Classifiers – Rejecting Architectures – Native Patterns-based Rejection – Cast Study – Fuzzy C-Means – K-Means – Hierarchical Clustering.

UNIT V DATA IMPUTATIONS 9

Data Imputations Concepts and Key Problems – Imputation Methods – Use of Information Granules – Granular Imputation – Data Imputation – Imbalanced Data .

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Implement fundamental image processing techniques required for computer vision

CO2: Perform image transformation

CO3: Implement segmentation and pattern recognition

CO4: Apply clustering algorithms for pattern classification

CO5: Apply data imputation techniques for key problems.

CO6: Apply data imputations for imbalanced data.

REFERENCES:

1. Szeliski, Richard. “Computer Vision : Algorithms and Applications.” Springer Science & Business Media, 1st Edition :2010.
2. Homenda, Wladyslaw and Witold Pedrycz. “Pattern Recognition : A Quality of Data Perspective”, John Wiley & Sons, 1st Edition :2018.

P23CSE14	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand basics of linguistics, probability and statistics
2. To study statistical approaches to NLP and understand sequence labeling
3. To outline different parsing techniques associated with NLP
4. To explore semantics of words and semantic role labeling of sentences
5. To understand discourse analysis, question answering and chatbots

UNIT I INTRODUCTION 9

Natural Language Processing – Components - Basics of Linguistics and Probability and Statistics – Words-Tokenization-Morphology-Finite State Automata

UNIT II STATISTICAL NLP AND SEQUENCE LABELING 9

N-grams and Language models –Smoothing -Text classification- Naïve Bayes classifier – Evaluation - Vector Semantics – TF-IDF - Word2Vec- Evaluating Vector Models -Sequence Labeling – Part of Speech – Part of Speech Tagging -Named Entities –Named Entity Tagging

UNIT III CONTEXTUAL EMBEDDING 9

Constituency –Context Free Grammar –Lexicalized Grammars- CKY Parsing – Earley'salgorithm- Evaluating Parsers -Partial Parsing – Dependency Relations- Dependency Parsing - Transition Based - Graph Based

UNIT IV COMPUTATIONAL SEMANTICS **9**

Word Senses and WordNet – Word Sense Disambiguation – Semantic Role Labeling – Proposition Bank- FrameNet- Selectional Restrictions - Information Extraction - Template Filling

UNIT V DISCOURSE ANALYSIS AND SPEECH PROCESSING **9**

Discourse Coherence – Discourse Structure Parsing – Centering and Entity Based Coherence – Question Answering –Factoid Question Answering – Classical QA Models – Chatbots and Dialogue systems – Frame-based Dialogue Systems – Dialogue–State Architecture

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand basics of linguistics, probability and statistics associated with NLP

CO2: Implement a Part-of-Speech Tagger

CO3: Design and implement a sequence labeling problem for a given domain

CO4: Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP

CO5: Implement a simple chatbot using dialogue system concepts

CO6: Apply dialogue state architecture concepts in speech processing.

REFERENCES:

1. Daniel Jurafsky and James H.Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition" ,Prentice Hall Series in Artificial Intelligence, 1st Edition, 2020
2. Jacob Eisenstein. "Natural Language Processing ", MIT Press, 2019
3. Samuel Burns "Natural Language Processing: A Quick Introduction to NLP with Python and NLTK", MIT Press2019
4. Christopher Manning, "Foundations of Statistical Natural Language Processing", MIT Press, 2009.
5. Nitin Indurkhya,Fred J. Damerau, "Handbook of Natural Language Processing", Hardcover,Second edition, 2010

P23CSE15	DATA VISUALIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To develop skills to both design and critique visualizations.
2. To introduce visual perception and core skills for visual analysis.
3. To understand technological advancements of data visualization
4. To understand various data visualization techniques
5. To understand the methodologies used to visualize large data sets

UNIT I INTRODUCTION AND DATA FOUNDATION **9**

Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT II FOUNDATIONS FOR VISUALIZATION 9

Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables – Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNIT III VISUALIZATION TECHNIQUES 9

Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data - Dynamic Data - Combining Techniques. Geospatial Data : Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data – Other Issues in Geospatial Data Visualization Multivariate Data : Point-Based Techniques - LineBased Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks-Displaying Arbitrary Graphs/Networks.

UNIT IV INTERACTION CONCEPTS AND TECHNIQUES 9

Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations – Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space –Data Space - Attribute Space- Data Structure Space - Visualization Structure – Animating Transformations - Interaction Control.

UNIT V RESEARCH DIRECTIONS IN VISUALIZATIONS 9

Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation , Hardware and Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Visualize the objects in different dimensions.

CO2: Design and process the data for Visualization.

CO3: Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical sciences.

CO4: Apply the virtualization techniques for research projects.

CO5: Identify appropriate data visualization techniques given particular requirements imposed by the data.

CO6: Solve problems in designing effective visualizations

REFERENCES:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", Morgan Kaufmann Publishers, 4th edition, 2021.
3. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.

PROFESSIONAL ELECTIVE IV

P23CSE16	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To facilitate students to understand android SDK
2. To help students to gain basic understanding of Android application development
3. To understand how to work with various mobile application development frameworks
4. To inculcate working knowledge of Android Studio development tool
5. To learn the basic and important design concepts and issues of development of mobile applications

UNIT I MOBILE PLATFORM AND APPLICATIONS 9

Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues.

UNIT II INTRODUCTION TO ANDROID 9

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT III ANDROID APPLICATION DESIGN ESSENTIALS 9

Anatomy of Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT IV ANDROID USER INTERFACE DESIGN & MULTIMEDIA 9

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures.

UNIT V ANDROID APIs 9

Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Identify various concepts of mobile programming that make it unique from programming for other platforms

CO2: Create, test and debug Android application by setting up Android development

CO3: Demonstrate methods in storing, sharing and retrieving data in Android applications

CO4: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces

CO5: Create interactive applications in android using databases with multiple activities including audio, video and notifications and deploy them in marketplace.

CO6: Understand Android network APIs.

REFERENCES:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd Edition, 2011.
2. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.
3. Prasanth Kumar Pattnaik,RajibMall,"Fundamentals of Mobile Computing",PHI Learning Pvt.Ltd,New Delhi-2012
4. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2010.
5. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2009.

P23CSE17	FULL STACK WEB APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To develop TypeScript Application Develop Single Page Application (SPA)
2. Able to communicate with a server over the HTTP protocol
3. Learning all the tools need to start building applications with Node.js
4. Implement the Full Stack Development using MEAN Stack

UNIT I FUNDAMENTALS & TYPESCRIPT LANGUAGE 9

Server-Side Web Applications. Client-Side Web Applications. Single Page Application. About TypeScript. Creating TypeScript Projects. TypeScript Data Types. Variables. Expression and Operators. Functions. OOP in Typescript. Interfaces. Generics. Modules. Enums. Decorators. Enums. Iterators. Generators.

UNIT II ANGULAR 9

About Angular. Angular CLI. Creating an Angular Project. Components. Components Interaction. Dynamic Components. Angular Elements. Angular Forms. Template Driven Forms. Property, Style, Class and Event Binding. Two way Bindings. Reactive Forms. Form Group. Form Controls. About Angular Router. Router Configuration. Router State. Navigation Pages. Router Link. Query Parameters. URL matching. Matching Strategies. Services. Dependency Injection. HttpClient. Read Data from the Server. CRUD Operations. Http Header Operations. Intercepting requests and responses.

UNIT III NODE.js 9

About Node.js. Configuring Node.js environment. Node Package Manager NPM. Modules. Asynchronous Programming. Call Stack and Event Loop. Callback functions. Callback errors. Abstracting callbacks. Chaining callbacks. File System. Synchronous vs. asynchronous I/O. Path and directory operations. File Handle. File Synchronous API. File Asynchronous API. File Callback API. Timers. Scheduling Timers. Timers Promises API. Node.js Events. Event Emitter. Event Target and Event API. Buffers. Buffers and TypedArrays. Buffers and iteration. Using buffers for binary data. Flowing vs. non-flowing streams. JSON.

UNIT IV EXPRESS.Js 9

Express.js. How Express.js Works. Configuring Express.js App Settings. Defining Routes. Starting the App. Express.js Application Structure. Configuration, Settings. Middleware. body-parser. cookie-parser. express-session. response-time. Template Engine. Jade. EJS. Parameters. Routing. router.route(path). Router Class. Request Object. Response Object. Error Handling. RESTful.

UNIT V MONGODB **9**

Introduction to MongoDB. Documents. Collections. Subcollections. Database. Data Types. Dates. Arrays. Embedded Documents. CRUD Operations. Batch Insert. Insert Validation. Querying The Documents. Cursors. Indexing. Unique Indexes. Sparse Indexes. Special Index and Collection Types. Full-Text Indexes. Geospatial Indexing. Aggregation framework.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Develop basic programming skills using Javascript

CO2: Implement a front-end web application using Angular.

CO3: Create modules to organise the server

CO4: Build RESTful APIs with Node, Express and MongoDB with confidence.

CO5: Learn to Store complex, relational data in MongoDB using Mongoose

CO6: Develop web application using MongoDB

REFERENCES:

1. Adam Freeman, "Essential TypeScript", Apress, 1st Edition, 2019
2. Mark Clow, "Angular Projects", Apress, 2nd Edition, 2018
3. Alex R. Young, Marc Harter,"Node.js in Practice", Manning Publication, 2014
4. Azat Mardan, "Pro Express.js", Apress, 1st Edition, 2015
5. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, "MongoDB in Action", Manning Publication, Second edition, 2016

P23CSE18	CYBER SECURITY AND CYBER THREATS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To introduce the basic concepts of cyber security
2. To acquire knowledge on cyber threats and attacks
3. To become aware of significant security technologies and tools
4. To impart knowledge on cipher methods and cryptographic algorithms
5. To explore various protocols for establishing secured communication

UNIT I INTRODUCTION TO CYBERSECURITY **9**

Introduction – Need for Security – Security Approaches – Principles of Security – Components – Balancing Security & Access – Software Development Life Cycle – Security Systems Development Life Cycle – Security Professionals and the organization

UNIT II CYBERSECURITY – THREATS & ATTACKS **9**

Threats: Intellectual Property - Software Attacks – Deviations in QoS – Espionage – Forces of Nature – Human Error – Information Extortion – Missing, inadequate or incomplete organization policy – Missing, inadequate or incomplete controls – sabotage – Theft – Hardware Failures – Software Failures Attacks: Malicious Code – Hoaxes – Back Doors – Password Crack – Brute Force – Dictionary – DoS and DDoS – Spoofing – Man-in-the-Middle – Spam – Email Bombing – Sniffers – Social Engineering – Pharming – Timing Attack

UNIT III SECURITY TOOLS & TECHNOLOGIES 9

Firewall and VPNs – Intrusion Detection and Prevention Systems – Other Security Tools - Access Control – Firewalls – Protecting Remote Connections – Intrusion Detection and Prevention Systems – Honeypots, Honeynets and Padded Cell Systems

UNIT IV CYRPTOGRAPHY 9

Cryptology Terminology - Cipher methods – Cryptographic Algorithms – Cryptographic tools – Attacks on cryptosystems - Physical Security

UNIT V PROTOCOLS FOR SECURE COMMUNICATION 9

Basic Concepts – SHTTP, SSL & SET – S/MIME, PEM & PGP – WEP, WPA & WPA2 – IPSEC & PGP

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand the basic concepts, need, approaches, principles and components of security.

CO2: Explain the various cyber threats and attacks.

CO3: Describe the various Security Technologies and Tools.

CO4: Explain the basic principles of cryptography and algorithms.

CO5: Examine the various protocols for secure communication.

CO6: Apply security protocols in web applications.

REFERENCES:

1. Michael E. Whitman, Herbert J. Mattord," Principles of Information Security", CENGAGE Learning, 4th Edition. 2011.
2. William Stallings," Cryptography and Network Security – Principles and Practice", Pearson Education, 7th Edition. 2017.
3. Atul Kahate," Cryptography and Network Security", Mc Graw Hill, 4th Edition, 2019

P23CSE19 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. This course is intended to study the basics of Blockchain technology.
2. During this course the learner will explore various aspects of Blockchain technology like application in various domains.
3. By implementing, learners will have idea about private and public Blockchain, and smart contract.

UNIT I INTRODUCTION OF CRYPTOGRAPHY AND BLOCKCHAIN 9

Introduction to Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

UNIT II BITCOIN AND CRYPTOCURRENCY 9

Introduction to Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain and Digital Currency, Transactional Blocks, Impact of Blockchain Technology on Cryptocurrency.

UNIT III INTRODUCTION TO ETHEREUM **9**

Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, , Transactions, Receiving Ethers, Smart Contracts.

UNIT IV INTRODUCTION TO HYPERLEDGER AND SOLIDITY PROGRAMMING **9**

Introduction to Hyperledger, Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer. Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types.

UNIT V BLOCKCHAIN APPLICATIONS **9**

Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand and explore the working of Blockchain technology

CO2: Analyze the working of Smart Contracts

CO3: Apply the learning of solidity to build de-centralized apps on Ethereum

CO4: Apply hyperledger concepts in Smart Contracts**.**

CO5: Understand and analyze the working of Hyperledger

CO6: Develop applications on Blockchain.

REFERENCES:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Packt Publishing, Second Edition, 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 1st Edition, 2016
3. Antonopoulos, "Mastering Bitcoin", O'Reilly Publishing, 1st Edition, 2014.
4. Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 1st Edition, 2018.
5. D. Drescher, "Blockchain Basics'. Apress, 2nd Edition, 2017.

P23CSE20 **EMBEDDED SOFTWARE DEVELOPMENT** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

1. To understand the architecture of embedded processor, microcontroller, and peripheral devices.
2. To interface memory and peripherals with embedded systems.
3. To study the embedded network environment.
4. To understand challenges in Real time operating systems.
5. To study, analyze and design applications on embedded systems.
6. To learn how to handle large data sets in main memory and learn the various clustering techniques applicable to Big Data

UNIT I EMBEDDED PROCESSORS **9**

Embedded Computers – Characteristics of Embedded Computing Applications – Challenges in Embedded Computing System Design – Embedded System Design Process- Formalism for System Design – Structural Description – Behavioural Description – ARM Processor – Intel ATOM Processor.

UNIT II EMBEDDED COMPUTING PLATFORM **9**

CPU Bus Configuration – Memory Devices and Interfacing – Input/Output Devices and Interfacing – System Design – Development and Debugging – Emulator – Simulator – JTAG Design Example – Alarm Clock – Analysis and Optimization of Performance – Power and Program Size.

UNIT III EMBEDDED NETWORK ENIVIRONMENT **9**

Distributed Embedded Architecture – Hardware And Software Architectures – Networks for Embedded Systems – I2C – CAN Bus – SHARC Link Supports – Ethernet – Myrinet – Internet – Network-based Design – Communication Analysis – System Performance Analysis – Hardware Platform Design – Allocation and Scheduling – Design Example – Elevator Controller.

UNIT IV REAL-TIMECHARACTERISTICS **9**

Clock Driven Approach – Weighted Round Robin Approach – Priority Driven Approach – Dynamic versus Static Systems – Effective Release Times and Deadlines – Optimality of the Earliest Deadline First (EDF) Algorithm – Challenges in Validating Timing Constraints in Priority Driven Systems – Off-Line versus On-Line Scheduling.

UNIT V SYSTEM DESIGN TECHNIQUES **9**

Design Methodologies – Requirement Analysis – Specification – System Analysis and Architecture Design – Quality Assurance – Design Examples – Telephone PBX – Ink jet printer – Personal Digital Assistants – Set-Top Boxes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On the completion of the course, the students will be able to

CO1: Understand different architectures of embedded processor, microcontroller and peripheral devices. Interface memory and peripherals with embedded systems.

CO2: Interface memory and peripherals with embedded systems.

CO3: Work with embedded network environment.

CO4: Understand challenges in Real time operating systems.

CO5: Design and analyse applications on embedded systems.

CO6: Create real time applications like PDA, Telephone PBX.

REFERENCES:

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing SystemDesign”, Third Edition , Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.(unit I & II)
2. Michael J. Pont, “Embedded C”, Pearson Education,2nd Edition, 2008.(Unit IV & V)
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things" Wiley Publication, First edition, 2013.
4. Andrew N Sloss, D. Symes, C. Wright, “Arm system developers guide”, Morgan Kauffman/Elsevier, 1st Edition, 2006.
5. ArshdeepBahga, Vijay Madisetti, " Internet of Things: A Hands-on-Approach" VPT, First Edition, 2014.