ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.E COMPUTER SCIENCE AND ENGINEERING (AI & ML)
REGULATIONS –2023

I TO IV SEMESTERS OF CURRICULA AND I SEMESTER SYLLABI

Semester I

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact Periods	Credits
				L	T	P		
Theory								
1.	MA3154	Advanced Mathematics for Scientific Computing	FC	4	0	0	4	4
2.	RM3151	Research Methodology and IPR	RMC	2	1	0	3	3
3.	CP3151	Data Structures and Algorithms	PCC	3	0	0	3	3
4.	ML3101	Foundations of Artificial Intelligence	PCC	3	0	0	3	3
5.	ML3102	Next Generation Networks	PCC	3	0	3	6	4.5
6.	CP3152	Database Technologies	PCC	3	0	0	3	3
Practicals								
7.	CP3161	Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
			Total	**18**	**1**	**7**	**26**	**22.5**

Semester II

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact periods	Credits
				L	T	P		
Theory								
1.		Advanced Operating Systems	PCC	3	0	0	3	3
2.		Multi Core Architectures	PCC	3	0	2	5	4
3.		Machine Learning	PCC	3	0	3	6	4.5
4.		Professional Elective I	PEC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
Practicals								
6.		Professional Practices	EEC	0	0	4	4	2
			Total	**15**	**0**	**9**	**24**	**19.5**

Semester III

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact periods	Credits
				L	T	P		
Theory								
1.		Deep Learning	PCC	3	0	0	3	3
2.		Professional Elective III	PEC	3	0	2	5	4
3.		Professional Elective IV	PEC	3	0	0	3	3
4.		Professional Elective V	PEC	3	0	0	3	3
Practicals								
5.		Project Work I	EEC	0	0	12	12	6
			Total	**12**	**0**	**14**	**26**	**19**

Semester IV

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact periods	Credits
				L	T	P		
Practicals								
1.		Project Work II	EEC	0	0	24	24	12
			Total	**0**	**0**	**24**	**24**	**12**

Total No. of credits: 73

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.		Research Methodology and IPR	RMC	2	1	0	3	3

FOUNDATION COURSE (FC)

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.		Advanced Mathematics for Scientific Computing	FC	4	0	0	4	4

Programme Core Course (PCC)

S. No.	Course code	Course title	Category	Periods Per week			Total Contact periods	Credits
				L	T	P		
1.		Data Structures and Algorithms	PCC	3	0	0	3	3
2.		Foundations of Artificial Intelligence	PCC	3	0	0	3	3
3.		Next Generation Networks	PCC	3	0	3	6	4.5
4.		Database Technologies	PCC	3	0	0	3	3
5.		Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
6.		Advanced Operating Systems	PCC	3	0	0	3	3
7.		Multicore Architectures	PCC	3	0	2	5	4
8.		Machine Learning	PCC	3	0	3	6	4.5
9.		Deep Learning	PCC	3	0	0	3	3

Employability Enhancement Courses (EEC)

S. No.	Course code	Course title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.		Professional Practices	EEC	0	0	4	4	2
2.		Project Work I	EEC	0	0	12	12	6
3.		Project Work II	EEC	0	0	24	24	12
							Total Credits	**20**

Professional Elective Courses (PEC)

S. No.	Course code	Course title	Cate Gory	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.		Cloud Computing Technologies	PEC	3	0	2	5	4
2.		Ethical Hacking	PEC	3	0	0	3	3
3.		Generative Artificial Intelligence and Prompt Engineering	PEC	3	0	2	5	4
4.		Principles of Cryptography	PEC	3	0	0	3	3
5.		Internet of Things (IOT) and AI Systems	PEC	3	0	2	5	4

6.		Advanced Software Engineering	PEC	3	0	0	3	3
7.		Quantum Computing	PEC	3	0	0	3	3
8.		Cyber Security	PEC	3	0	2	5	4
9.		MLOps: Machine Learning Operations and Deployment	PEC	3	0	2	5	4
10.		Natural Language Processing	PEC	3	0	2	5	3
11.		Multimodal Agentic Artificial Intelligence	PEC	3	0	2	5	3
12.		Blockchain Technologies	PEC	3	0	0	5	4
13.		Information Retrieval Techniques	PEC	3	0	0	3	3
14.		Big Data Analytics	PEC	3	0	0	3	3
15.		Parallel Algorithms	PEC	3	0	0	3	3
16.		Soft Computing	PEC	3	0	0	3	3
17.		Game Theory	PEC	3	0	0	3	3
18.		Digital Image and Video Processing	PEC	3	0	0	3	3
19.		Data Warehousing and Data Mining Techniques	PEC	3	0	0	3	3
20.		Foundations of Data Science	PEC	3	0	0	3	3
21.		Full Stack Web Application Development	PEC	3	0	2	5	4

MA3154 ADVANCED MATHEMATICS FOR SCIENTIFIC COMPUTING L T P C
4 0 0 4

UNIT I LINEAR PROGRAMMING 12

Formulation – Graphical solution – Simplex method – Two phase method -Transportation and Assignment Problems

UNIT II SIMULATION 12

Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to real time problems.

UNIT III ESTIMATION THEORY 12

Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Estimation of parameters - Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion, 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

OUTCOMES:

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

CO1 Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.

CO2 Simulate appropriate application/distribution problems.

CO3 Obtain the value of the point estimators using the method of moments and method of maximum likelihood.

CO4 Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.

CO5 Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Cengage Learning, 9th Edition, Boston, 2016.
2. Johnson, R.A, Irwin Miller and John Freund., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, 9th Edition, New York, 2016.
3. Johnson, R.A., and Wichern, D.W., “Applied Multivariate Statistical Analysis”, Pearson Education, Sixth Edition, New Delhi, 2013.
4. Ross. S.M., “Probability Models for Computer Science”, Academic Press, SanDiego, 2002.
5. Taha H.A.,, “Operations Research: An Introduction”, Prentice Hall of India Pvt. Ltd. 10th Edition, New Delhi, 2017.
6. Winston, W.L., “Operations Research”, Thomson – Brooks/Cole, Fourth Edition, Belmont, 2003.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	3	3	2	2
CO5	3	3	3	3	2	2

RM3151 RESEARCH METHODOLOGY AND IPR L T P C
2 1 0 3

UNIT I RESEARCH PROBLEM FORMULATION 9

Objectives of research, types of research, research process, approaches to research; conducting literature review- information sources, information retrieval, tools for identifying literature, Indexing and abstracting services, Citation indexes, summarizing the review, critical review, identifying research gap, conceptualizing and hypothesizing the research gap

UNIT II RESEARCH DESIGN AND DATA COLLECTION 9

Statistical design of experiments- types and principles; data types & classification; data collection - methods and tools

UNIT III DATA ANALYSIS, INTERPRETATION AND REPORTING 9

Sampling, sampling error, measures of central tendency and variation,; test of hypothesis- concepts; data presentation- types of tables and illustrations; guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript; guidelines for writing thesis, research proposal; References – Styles and methods, Citation and listing system of documents; plagiarism, ethical considerations in research

UNIT IV INTELLECTUAL PROPERTY RIGHTS 9

Concept of IPR, types of IPR – Patent, Designs, Trademarks and Trade secrets, Geographical indications, Copy rights, applicability of these IPR; , IPR & biodiversity; IPR development process, role of WIPO and WTO in IPR establishments, common rules of IPR practices, types and features of IPR agreement, functions of UNESCO in IPR maintenance.

UNIT V PATENTS 9

Patents – objectives and benefits of patent, concept, features of patent, inventive steps, specifications, types of patent application; patenting process - patent filling, examination of patent, grant of patent, revocation; equitable assignments; Licenses, licensing of patents; patent agents, registration of patent agents.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the student can

CO1: Describe different types of research; identify, review and define the research problem

CO2: Select suitable design of experiment s; describe types of data and the tools for collection of data

CO3: Explain the process of data analysis; interpret and present the result in suitable form
CO4: Explain about Intellectual property rights, types and procedures
CO5: Execute patent filing and licensing

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Soumitro Banerjee, “Research methodology for natural sciences”, IISc Press, Kolkata, 2022,
3. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
4. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
5. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

CP3151 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

UNIT I BASIC STRUCTURES AND ALGORITHM 9

Stack- Queue - Linked List Implementation - Min/Max heap – Algorithm Analysis- Asymptotic Analysis- Solving Recurrence Relation – Amortized Analysis

UNIT II BALANCED TREE STRUCTURES 9

Binary Search Trees – AVL Trees – Red-Black Trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries

UNIT III MELDABLE HEAP STRUCTURES 9

Leftist Tree- Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps –Deap

UNIT IV NP COMPLETENESS 9

NP Classes- Polynomial Time Verification – Theory of Reducibility - NP Completeness Proof for Vertex Cover & Hamiltonian Cycle

UNIT V APPROXIMATION ALGORITHMS 9

Approximation Algorithms: Vertex Cover & Euclidean Travelling Salesperson Problem- Randomized Algorithms: Closest Pair Problem & Minimum Spanning Trees

TOTAL: 45 PERIODS

REFERENCES

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
2. Ellis Horowitz and Sartaj Sahni, “Fundamental of Computer Algorithms”, Galgotia, 1985.
3. R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, “Introduction to the Design and Analysis of Algorithms”, Tata McGraw-Hill Edition, 2012.
4. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Third Edition, Prentice Hall, 2010.

COURSE OUTCOMES:

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

CO1: Understand, design and implement balanced search structures

CO2: Analyse algorithms for time complexity

CO3:Understand and implement different meldable priority queues

CO4: Appreciate Approximation and randomized algorithm design

CO5:Apply various data structures for solving problems

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1			3	2		
CO2				2		
CO3			3	2		
CO4	3		3	2		
CO5	2		3	3		

ML3101 FOUNDATIONS OF ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

UNIT I — INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MATHEMATICAL FOUNDATIONS FOR LEARNING 9

Definition, history, and evolution of AI — Classical vs. Modern AI — Characteristics of Intelligent Agents — Agents and Environments- Concept of Rationality-Nature of Environment-Structure of Agents-Introduction to learning paradigm- Supervised Learning, Unsupervised Learning-Reinforcement Learning-Rewards, Exploration vs. Exploitation. Mathematical Foundations for AI- Sets, Functions and Logic — Basics of Graph Theory — Linear Algebra essentials — Probability and Bayes’ Theorem — Elementary Calculus.

UNIT II — PROBLEM SOLVING AND SEARCH TECHNIQUES 9

Problem formulation — State space representation — Uninformed Search: Breadth First Search (BFS), Depth First Search (DFS), Uniform Cost Search —Heuristic or Informed Search: Greedy Best First Search, A* Algorithm — Iterative Deepening — Local Search for Optimization Problems — Hill Climbing, Simulated Annealing — Local Search in Continuous Spaces — Genetic Algorithms, Swarm Intelligence — Metaheuristic Approaches for Large Search Spaces-Adversarial Search: Game Playing, Minimax, Alpha-Beta Pruning — Constraint Satisfaction Problems (CSPs).

UNIT III — KNOWLEDGE REPRESENTATION AND REASONING **9**

Propositional Logic and Predicate Logic – Inference Mechanisms: Forward and Backward Chaining, Resolution – Knowledge Representation Schemes: Semantic Networks, Frames, Scripts, Ontologies – Introduction to Knowledge Graphs – Planning: Planning Problem, Classical Planning using State-Space Search, Partial-Order Planning.

UNIT IV — REASONING, LEARNING AND ACTING WITH UNCERTAINITY **9**

Quantifying Uncertainty- Probabilistic Reasoning — Bayesian Networks — Probabilistic Reasoning Over Time: Dynamic Bayesian Networks (DBNs), Hidden Markov Models (HMMs) — Making Simple Decisions: Utility Theory-Utility Functions- Decision Networks-Value of Information — Sequential Decision Problems: Markov Decision Processes (MDPs), Partially Observable MDPs -Introduction to Fuzzy Logic & Fuzzy Inference Systems.

UNIT V — APPLICATIONS AND ETHICS IN AI **9**

Applications of AI: Natural Language Processing— Robotics: Robotic Perception, Localization, Mapping, Motion Planning, Robotic Agents —Computer Vision- Responsible AI: Bias, Fairness, Explainability, Transparency — Societal and Ethical Impact of AI — AI for Social Good.

TOTAL: 45 HOURS

TEXT BOOKS

1. David L. Poole and Alan K. Mackworth, *Artificial Intelligence: Foundations of Computational Agents*, 2nd Edition, Cambridge University Press, 2017
2. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson Education, 2021.
3. Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.
4. J.S.R. Jang, C.T. Sun, and E. Mizutani, *Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence*, Pearson, 2004
5. Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, *Mathematics for Machine Learning*, Cambridge University Press, 2020. (For Mathematical Foundations Unit)

COURSE OUTCOMES (COs)

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

CO1: Explain the fundamentals and evolution of Artificial Intelligence.
CO2: Apply essential mathematical concepts to AI problem-solving.
CO3: Implement various search strategies and solve constraint satisfaction problems.
CO4: Represent knowledge and perform reasoning under uncertainty.
CO5: Demonstrate basic Machine Learning and Deep Learning algorithms.
CO6: Analyze recent trends, applications, and ethical considerations in deploying AI systems.

CO-PO Mapping

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

ML3102 NEXT GENERATION NETWORKS L T P C
3 0 3 4.5

UNIT I NETWORKING AND WIRELESS COMMUNICATION FUNDAMENTALS 9

IP Addressing and Subnetting – TCP and UDP - Flow and Congestion Control - Socket Programming - Spread Spectrum - Introduction to Wireless Communication Systems: IEEE 802.11be & bn - LoRa - HIPERLAN - WPA2 - WPA3.

UNIT II 4G AND 5G MOBILE NETWORKS 9

GSM - UMTS - 4G LTE: EPC - Protocol Stack - Handover and Mobility Management - 5G NR: gNB - Scheduling - Control and User Plane Separation - Mobile Edge Computing.

UNIT III BEYOND 5G AND PROGRAMMABLE NETWORKS 9

SDN - NFV - SON - Open RAN Architecture - SMO - Near-RT RIC: xApps/rApps - Testbed Tools: Open5GS, OAI, UERANSIM - RF and Optical Spectrum - Massive MIMO - Resource Allocation - Terahertz Communications.

UNIT IV AI AND ML FOR NETWORK INTELLIGENCE 9

AI Enhanced PHY Layer - AI Supported MAC Layer - Network Optimization, ML Enhanced OFDM Systems - Intelligent Transportation Systems - Next Generation Networking Paradigms - Federated Learning - Graph Neural Networks - Q-Learning - Adversarial Learning - Auto-encoders and Transformers.

UNIT V 6G VISION AND SMART SYSTEMS 9

6G: KPIs, Standards, Security - Use Cases: Smart Cities, Health Care - QoE, Autonomous Mobility - RIS - ISAC - TSN - ITU - 3GPP - Global 6G initiatives.

SUGGESTED LIST OF EXPERIMENTS: 45

1. Analyze the TCP server and TCP client functions to create a TCP/IP client and server in MATLAB and then send data between them.

2. Create a multinode WLAN system-level simulation consisting of an IEEE 802.11 access point (AP) and a station (STA) using the WLAN Toolbox.
3. Demonstrate IEEE 802.11 physical layer abstraction for system-level simulation.
4. Analyze the 5G NR waveform generation workflows and the waveform types that can be generated
5. Create a Convolutional Neural Network (CNN) to be used for spectrum sensing to classify wireless signals
6. Demonstrate the effectiveness of Long Short-Term Memory (LSTM) networks in predicting handover events based on user mobility data in a simulated RAN environment.
7. Create a Deep Q-Network (DQN) to perform beam selection tasks using the Deep MIMO dataset.

TOTAL: 90 PERIODS

REFERENCES

1. Mobile Communications, Jochen Schiller, Pearson Education, 2nd Edition, 2003.
2. 5G NR: The Next Generation Wireless Access Technology, Erik Dahlman, Stefan Parkvall, Johan Sköld, Academic Press (Elsevier), 2nd Edition, 2020.
3. Machine Learning for Future Wireless Communications, Edited by Fa-Long Luo, Wiley – IEEE Press, 1st Edition, 2020.
4. 6G: The Road to the Future Wireless Technologies 2030, Paulo Sergio Rufino Henrique, Ramjee Prasad, River Publishers, 1st Edition, 2021.
5. The Road Towards 6G: Opportunities, Challenges, and Applications – A Comprehensive View of the Enabling Technologies, Editors: Valeria Loscri, Luca Chiaraviglio, Anna Maria Vegni, Springer Nature Switzerland, 1st Edition, 2022.
6. Artificial Intelligence for Wireless Communication Systems: Technology and Applications, Sur, Imoize, Bhattacharya et al. CRC/Routledge, 2024.
7. Wireless Communications: Principles and Practice, Theodore S. Rappaport, Pearson Education, 2nd Edition, 2002.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

CO1: Analyze and implement secure and efficient IP-based wireless communication networks by integrating socket programming, TCP/UDP, and modern protocols (e.g., WPA3, LoRa, 5G).

CO2: Evaluate the evolution of cellular technologies from GSM to 5G NR and compare mobility management, protocol stacks, and edge computing architectures.

CO3: Design and simulate programmable and disaggregated network architectures using SDN, NFV, Open RAN, and testbeds (Open5GS, OAI, UERANSIM) for beyond-5G experimentation.

CO4: Apply AI/ML models (e.g., GNNs, Q-Learning, Autoencoders) to optimize PHY/MAC layers and traffic in intelligent transportation and wireless systems.

CO5: Critically evaluate 6G system design goals (KPIs, standards, security) and propose innovative smart applications in areas like smart cities and autonomous mobility.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	2		2
CO2	3	2	3	3	2	2
CO3	3	3	3	3	2	3
CO4	3	3	3	2	1	3
CO5	3	3	3	2	3	3

CP3152 DATABASE TECHNOLOGIES L T P C
3 0 0 3

UNIT I RELATIONAL MODEL 9

Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Fourth Normal Form – Fifth Normal Form.

UNIT II PARALLEL AND DISTRIBUTED DATABASES 9

Parallel Databases – I/O Parallelism - Inter-Query and Intra-Query Parallelism– Inter-Operation and Intra-operation Parallelism – Performance evaluation for Parallel DB Systems –Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Load balancing tools for DDB – DDB Security.

UNIT III ADVANCED DATABASES 9

XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity – Java Database Connectivity – Accessing Relational Database using PHP – Analytical Operations involved in Processing Spatial Data –Spatial Data Types and Models– Spatial Operators and Spatial Queries–Spatial Data Indexing–Multimedia Database Concepts - Introduction to Deductive Databases–Prolog/Datalog Notation– Clausal Form and Horn Clauses–Interpretations of Rules.

UNIT IV ACTIVE TEMPORAL AND DEDUCTIVE DATABASES 9

Event Condition Action Model – Design and Implementation Issues for Active Databases – Termination, Confluence, Determination and Modularization – Temporal Databases – Interpreting Time in Relational Databases – Deductive Databases – Data log Queries

UNIT V NOSQL DATABASES 9

NoSQL Database vs.SQL Databases – CAP Theorem –Migrating from RDBMS to NoSQL – MongoDB – CRUD Operations– MongoDB Sharding – MongoDB Replication – Web Application Development using MongoDB with PHP and Java.

TOTAL: 45 PERIODS

REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Seventh Edition, McGraw Hill Education 2020.
3. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, 2014.
4. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
5. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt. Ltd.,2001.
6. C.J.Date, A.KannanandS.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
7. ShashankTiwari, ”Professional NoSQL”, Wiley, 2011.
8. David Lane, Hugh.E.Williums, Web Database Applications with PHP and MySQL, O’Reilly Media; 2nd edition, 2004

COURSE OUTCOMES:

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

CO1:Design a Relational Database for an Enterprise.

CO2:Design a Distributed Database, Active Database and Temporal Database for an Enterprise.

CO3:Gain the knowledge in advanced databases.

CO4:Comprehend the use of XML Database, Web Database, Spatial Database, Multimedia Database and Deductive Database.

CO5:Use MongoDB NoSQL Database to Maintain Data of an Enterprise.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	3	1	-	2
CO2	1	1	3	1	-	2
CO3	3	1	3	3	-	2
CO4	2	1	3	3	-	3
CO5	2	1	3	3	-	2

CP3161 DATA STRUCTURES AND ALGORITHMS LABORATORY **L T P C**
0 0 4 2

LIST OF EXPERIMENTS:

1. Linked list implementation of Stack and Queue ADTs
2. Binary Search tree
3. Min/Max Heap
4. AVL tree
5. Red- Black tree
6. Splay Tree
7. Leftist Heap
8. Binomial Heap

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1:Apply suitable data structures in problem solving.
CO2:Select suitable search structures for an application
CO3:Understand priority queue implementations
CO4:Differentiate between approximation and Randomized algorithms
CO5:Understand NP complete problem solutions

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-		3	-	-	-
CO2			3	-	-	-
CO3	-		2	2	-	-
CO4	-		2	2	-	-
CO5	2		2	3	-	-