CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

M. Tech–Computer Science and Engineering

CBCS & OUTCOME BASED COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2025-26)

SEMESTER - I							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	B558301	Mathematical Foundations of Computer Science	PCC	3	0	0	3
2	B558302	Advanced Data Structures	PCC	3	0	0	3
3	B558401	Database Programming with PL/SQL	PEC	3	0	0	3
	B558402	**Deep Learning**	**PEC**				
	B558403	Natural Language Processing	PEC				
4	B558404	Applied Cryptography	PEC	3	0	0	3
	B558405	**Software Quality Engineering**	**PEC**				
	B558406	Mining Massive Datasets	PEC				
5	B520303	Research Methodology & IPR	PCC	2	0	0	2
6	B558501	Advanced Data Structures Lab	PCC	0	0	4	2
7	PEC Lab	Professional Elective - I Lab	PEC	0	0	4	2
8	Audit	Audit Course-1	VAC	2	0	0	0
			Total:	**16**	**0**	**8**	**18**
			Total hours per week:	**24**			

SEMESTER - II							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	B558303	Advanced Algorithms	PCC	3	0	0	3
2	B558304	Advanced Computer Architecture	PCC	3	0	0	3
3	B558407	Enterprise Cloud Concepts	PEC	3	0	0	3
	B558408	Cybersecurity					
	B558409	Parallel Computing					
4	B558410	Bioinformatics	PEC	3	0	0	3
	B558411	Generative AI					
	B558412	Robotic Process Automation					
5	B558502	Advanced Algorithms Lab	PCC	0	0	2	1
6	PEC Lab	Professional Elective - III Lab	PEC	0	0	2	1
7	B558801	Mini Project with Seminar	PROJ	0	0	4	2
8	Audit	Audit Course- II	VAC	2	0	0	0
			Total:	**14**	**0**	**12**	**18**
			Total hours per week:	**26**			
Total Number of Credits M.Tech I Year: 36							

SEMESTER – III							
S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	B558413	Digital Forensics	PEC	3	0	0	3
	B558414	Prompt Engineering	PEC				
	B558415	Quantum Computing	PEC				
2	OEC	Open Elective	OEC	3	0	0	3
3	B558803	Dissertation Work Review – II	PROJ	0	0	12	6
			Total:	**6**	**0**	**12**	**12**
			Total hours per Week:	**18**			

SEMESTER – IV							
S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	B558804	Dissertation Work Review – III	PCC	0	0	12	6
2	B558805	Dissertation Viva-Voce	PCC	0	0	28	14
			Total:	**0**	**0**	**40**	**20**
			Total hours per Week:	**40**			
Total Number of Credits M.Tech II Year: 68							

Audit Course I & II

Code	Subject
B500701	English for Research Paper Writing
B500702	Disaster Management
B500703	Value Education
B500704	Constitution of India

Open Elective offered for other departments

Code	Subject
B555601	Embedded System Design
B543601	Photovoltaic Systems
B520601	Green Building Technology
B558601	Intrusion Detection Systems

Professional Elective Laboratory

Code	Subject
B558503	Database Programming with PL/SQL
B558504	Deep Learning
B558505	Natural Language Processing
B558506	Enterprise Cloud Concepts
B558507	Cyber Security
B558508	Parallel Computing

(B558301) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (PCC-I)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes: After learning the contents of this paper the student must be able to
1. Ability to understand and construct precise mathematical proofs.
2. Ability to use logic and set theory to formulate precise statements.
3. Ability to analyze and solve counting problems on finite and discrete structures.
4. Ability to describe and manipulate sequences.
5. Ability to apply graph theory in solving computing problems.

UNIT-I

The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT-III

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT-IV

Discrete Probability and Advanced Counting Techniques:
An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques:
Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT-V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.
Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCES:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

(B558302) ADVANCED DATA STRUCTURES (PCC-II)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes
1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to understand how the choice of data structures impact the performance of programs.
3. Design programs using a variety of data structures, including hash tables, search structures and digital search structures.

UNIT - I
Heap Structures
Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.
UNIT - II
Hashing and Collisions
Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions
UNIT - III
Search Structures
OBST, AVL trees, Red-Black trees, Splay trees,
Multiway Search Trees
B-trees, 2-3 trees
UNIT - IV
Digital Search Structures
Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries
UNIT - V
Pattern matching
Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

TEXT BOOKS:
1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

REFERENCES:
1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

(B558401)DATABASE PROGRAMMING WITH PL/SQL(PEC)

(Common to CSE,CSM,andCSD)

	L	T	P	C
M.Tech(CSE):I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:

1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

Unit I

PL/SQL Basics

Block Structure, Behavior of Variables in Blocks, Basic Scalar and Composite Data Types, Control Structures, Exceptions, Bulk Operations, Functions, Procedures, and Packages, Transaction Scope

Unit II

Language Fundamentals & Control Structures

Lexical Units, Variables and Data Types, Conditional Statements, Iterative Statements, Cursor Structures, Bulk Statements, Introduction to Collections, Object Types: Varray and Table Collections, Associative Arrays, Oracle Collection API

Unit III

Functions and Procedures

Function and Procedure Architecture, Transaction Scope, Calling Subroutines, Positional Notation, Named Notation, Mixed Notation, Exclusionary Notation, SQL Call Notation, Functions, Function Model Choices, Creation Options, Pass-by-Value Functions, Pass-by-Reference Functions, Procedures, Pass-by-Value Procedures, Pass-by-Reference Procedures, Supporting Scripts.

Unit IV

Packages

Package Architecture, Package Specification, Prototype Features, Serially Reusable Precompiler Directive, Variables, Types, Components: Functions and Procedures, Package Body, Prototype Features, Variables, Types, Components: Functions and Procedures, Definer vs. Invoker Rights Mechanics, Managing Packages in the Database Catalog, Finding, Validating, and Describing Packages, Checking Dependencies, Comparing Validation Methods: Timestamp vs. Signature.

Unit V

Triggers

Introduction to Triggers, Database Trigger Architecture, Data Definition Language Triggers, Event Attribute Functions, Building DDL Triggers, Data Manipulation Language Triggers, Statement-Level Triggers, Row-Level Triggers, Compound Triggers, INSTEAD OF Triggers, System and Database Event Triggers, Trigger Restrictions, Maximum Trigger Size, SQL Statements, LONG and LONG RAW Data Types.

TEXT BOOKS:

1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGraw Hill Education.

REFERENCES:

1. Benjamin Rosenzweig, Elena Silvestrova Rakhimov, Oracle PL/SQL by example Fifth Edition.

2. Dr. P. S. Deshpande, SQL & PL / SQL for Oracle 11g Black Book.

(B558402) DEEP LEARNING (PROFESSIONAL ELECTIVE - I)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:
1. Implement deep learning algorithms, understand neural networks and traverse the layers of data
2. Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces
3. Understand applications of Deep Learning to Computer Vision
4. Understand and analyze Applications of Deep Learning to NLP

UNIT - I
Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization,
Dropout

UNIT - II
Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

UNIT - III
Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

UNIT -IV
Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model(CBOW), Glove, Evaluations and Applications in word similarity

UNIT -V
Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

TEXT BOOKS:
1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:
1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

(B558403) NATURAL LANGUAGE PROCESSING (PROFESSIONAL ELECTIVE - I)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:
1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms Able to design different language modeling Techniques.
5. Able to design different language modeling Techniques.

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches
UNIT - II
Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues
UNIT - III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.
UNIT - IV
Predicate-Argument Structure, Meaning Representation Systems, Software.
UNIT - V
Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross Lingual Language Modeling
TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.
REFERENCES:
1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

(B558404) APPLIED CRYPTOGRAPHY (PROFESSIONAL ELECTIVE - II)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:
1. Understand the various cryptographic protocols
2. Analyze key length and algorithm types and modes
3. Illustrate different public key algorithms in cryptosystems
4. Understand special algorithms for protocols and usage in the real world.

Unit I
Foundations:
Terminology, Steganography, Substitution Ciphers and Transposition Ciphers, Simple XOR, One-Time Pads, Computer Algorithms, Large Numbers,
Cryptographic Protocols: Protocol Building Blocks
Introduction to Protocols, Communications Using Symmetric Cryptography, One-Way Functions, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation
Unit II Cryptographic Techniques
Key length: Symmetric Key length, Public key length, comparing symmetric and public key length.
Algorithm types and modes: Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Cipher, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mod, Counter Mode, Other Block-Cipher Modes.
Unit III Public-Key Algorithms
Background, Knapsack Algorithms, RSA, Pohlig-Hellman, Rabin, ElGamal, McEliece, Elliptic Curve Cryptosystems, LUC, Finite Automaton Public-Key Cryptosystems
Public-Key Digital Signature Algorithms: Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, ESIGN
Unit IV Special Algorithms for Protocols
Multiple-Key Public-Key Cryptography, Secret-Sharing Algorithms, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Computing with Encrypted Data, Fair Coin Flips, One-Way Accumulators, All-or-Nothing Disclosure of Secrets, Fair and Failsafe Cryptosystems, Zero-Knowledge Proofs of Knowledge, Blind Signatures, Oblivious Transfer, Secure Multiparty Computation, Probabilistic Encryption, Quantum Cryptography
Unit V Real World Approaches
IBM Secret key management protocol, ISDN, Kerberos, KryptoKnight, Privacy enhanced mail (PEM), Message security protocol (MSP), PGP, Public-Key Cryptography Standards (PKCS), Universal Electronic Payment System (UEPS).

TEXT BOOKS:
1. Bruce Schneier, Applied Cryptography, Second Edition: Protocols, Algorithms, and Source Code in C (cloth).

(B558405) SOFTWARE QUALITY ENGINEERING (PROFESSIONAL ELECTIVE - II)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:
1. Understand software quality and its perspectives
2. Analyze defect prevention and defect reduction in software quality assurance
3. Illustrate software quality engineering activities and its process

Unit I Software Quality
Quality: perspectives and expectations, Quality frameworks and ISO-9126, correctness and defects: Definitions, properties and Measurements, A historical perspective of quality, software quality.

Unit II Quality Assurance
Classification: QA as dealing with defects, Defect prevention- Education and training, Formal method, Other defect prevention techniques, Defect Reduction - Inspection: Direct fault detection and removal, **Testing:** Failure observation and fault removal, other techniques and risk identification, Defect Containment- software fault tolerance, safety assurance and failure containment

Unit III Quality Engineering
Quality Engineering: Activities and process, Quality planning: Goal setting and Strategy formation, Quality assessment and Improvement, Quality engineering in software process.

Unit IV Test **Activities, Management and Automation**
Test planning and preparation, Test execution, Result checking and measurement, Analysis and follow- up, Activities People and Management, Test Automation.

Unit V Coverage and usage testing based on checklist and partitions
Checklist based testing and its limitations, Testing for partition Coverage, Usage based Statistical testing with Musa's operational profiles, Constructing operational profiles
Case Study: OP for the cartridge Support Software

TEXT BOOKS:
1. Jeff Tian, Software Quality Engineering, Testing, Quality Assurance, and Quantifiable improvement
2. Richard N. Taylor, Software Architecture: Foundations, Theory, and Practice.

(B558406)MINING MASSIVE DATASETS(PEC)
(Common to CSE,CSM,andCSD)

M.Tech(CSE):IYear I Semester

L	T	P	C
3	0	0	3

Course Outcomes:
1. Handle massive data using MapReduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large datasets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT I
Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining, MapReduce and the New Software Stack-Distributed File Systems, MapReduce, Algorithms Using MapReduce.

UNIT II
Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, Filtering Streams

UNIT III
Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism

UNIT IV
Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation.
Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

UNIT V
Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles

TEXT BOOKS:
1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

REFERENCE BOOKS:
1. Jiawei Han & Micheline Kamber , Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques,MorganKaufmann.

(B520303)RESEARCHMETHODOLOGY&IPR(PCC)
(Common to CSE,CSM,andCSD)

	L	T	P	C
M.Tech(CSE):I Year I Semester	**2**	**0**	**0**	**2**

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

UNIT-I

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

UNIT-II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III

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

UNIT-IV

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

UNIT-V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. C.R. Kothari, Research Methodology, methods & techniques, 2nd edition, New age International publishers

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

(B558501)ADVANCED DATA STRUCTURES LABORATORY
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year I Semester	L	T	P	C
	0	0	4	2

Prerequisites: A course on Computer Programming & Data Structures

List of Experiments:

1. Write a program to perform the following operations:
a) Insert an element into a binary search tree.
b) Delete an element from a binary search tree.
c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
a) Merge sort b) Heap sort c) Quick sort

3. Write a program to perform the following operations:
a) Insert an element into a B- tree.
b) Delete an element from a B- tree.
c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
a) Insert an element into a Min-Max heap
b) Delete an element from a Min-Max heap
c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
a) Insert an element into a Lefiist tree
b) Delete an element from a Leftist tree
c) Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
a) Insert an element into a binomial heap
b) Delete an element from a binomial heap.
c) Search for a key element in a binomial heap

7. Write a program to perform the following operations:
a) Insert an element into a AVL tree.
b) Delete an element from a AVL search tree.
c) Search for a key element in a AVL search tree.

8. Write a program to perform the following operations:
a) Insert an element into a Red-Black tree.
b) Delete an element from a Red-Black tree.
c) Search for a key element in a Red-Black tree.

9. Write a program to implement all the functions of a dictionary using hashing.

10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.

11. Write a program for implementing Brute Force pattern matching algorithm.

12. Write a program for implementing Boyer pattern matching algorithm.

TEXTBOOKS:

1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
3. Introduction to Data Structures in C, Ashok Kamthane, 1st Edition, Pearson

REFERENCE BOOKS:

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Data structures: A Pseudocode Approach with C, R.F. Gilberg And B.A. Forouzan, 2nd Edition, Cengage Learning

Course Outcomes:

On completion of the course students will be able to

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	3	-	-	-	1	-	2
CO2	3	3	2	2	3	-	-	-	2	2	2
CO3	3	3	2	2	3	-	-	-	2	2	2
CO4	3	3	2	2	3	-	-	-	2	2	2
CO5	3	3	3	2	3	2	-	-	2	2	2

END

(B558503)DATABASE PROGRAMMING WITH PL/SQL LABORATORY

(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year I Semester

L	T	P	C
0	0	4	2

Course Outcomes:

On completion of the course students will be able to

1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

List of Experiments:

1. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
2. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID), write a cursor to select the five highest paid employees from the table.
3. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.
4. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.
5. Write a PL/SQL program to demonstrate Exceptions.
6. Write a PL/SQL program to demonstrate Cursors.
7. Write a PL/SQL program to demonstrate Functions.
8. Write a PL/SQL program to demonstrate Packages.
9. Write PL/SQL queries to create Procedures.
10. Write PL/SQL queries to create Triggers.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

END

(B558504)DEEP LEARNING LABORATORY
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year I Semester

L	T	P	C
0	0	4	2

Course Outcomes:
On completion of the course students will be able to
1. Learn the Fundamental Principles of Deep Learning.
2. Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
3.Implement Deep Learning Algorithms and Solve Real-world problems

List of Experiments:

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks

TEXT BOOKS:

1.Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

END

(B558505)NATURAL LANGUAGE PROCESSING LAB(LAB-II)
(Common to CSE,CSM,andCSD)

M.Tech(CSE):I Year I Semester

L	T	P	C
0	0	4	2

Course Outcomes:
1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
3. Able to design, implement, and analyze NLP algorithms

List of Experiments
Implement the following using Python
1. Tokenization
2. Stemming
3. Stop word removal (a, the, are,.)
4. Word Analysis
5. Word Generation
6. Pos tagging
7. Morphology
8. chunking
9. N-Grams
10. N-Grams Smoothing

TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCES:
1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

(B558303) ADVANCED ALGORITHMS
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: After completion of course, students would be able to:
1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.

UNIT – I

Sorting:
Review of various sorting algorithms, topological sorting

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

UNIT – II

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

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

UNIT - III

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

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

UNIT - IV

Shortest Path in Graphs:
Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.
Modulo Representation of integers/polynomials:
Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.
Discrete Fourier Transform (DFT):
In complex field, DFT in modulo ring.Fast Fourier Transform algorithm.Schonhage-Strassen Integer Multiplication algorithm.

UNIT - V

Linear Programming: Geometry of the feasibility region and Simplex algorithm
NP-completeness: Examples, proof of NP-hardness and NP-completeness.
Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

REFERENCES:
1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms".
2. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms".
3. Kleinberg and Tardos."Algorithm Design".

(B558304) ADVANCED COMPUTER ARCHITECTURE
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year II Semester	**3**	**0**	**0**	**3**

Course Outcomes: Gain knowledge of
1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors

UNIT - I
Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT - II
Principles of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors

UNIT - III
Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT - IV
Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers.

UNIT - V
Vector Processing Principles, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5

TEXT BOOK:
1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

REFERENCES:
1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition, ELSEVIER.
2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

(B558407)ENTERPRISE CLOUD CONCEPTS (PROFESSIONAL ELECTIVE - III)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): I Year II Semester	**3**	**0**	**0**	**3**

Course Outcomes:
1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

Unit - I

Understanding Cloud Computing:
Origins and influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges.
Fundamental Concepts and Models:
Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

Unit - II

Cloud-Enabling Technology:
Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology
CLOUD COMPUTING MECHANISMS:
Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication

Unit - III

Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System, Case Study Example
Cloud Computing Architecture
Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example

Unit - IV

Cloud-Enabled Smart Enterprises
Introduction, Revisiting the Enterprise Journey, Service-Oriented Enterprises, Cloud Enterprises, Smart Enterprises, The Enabling Mechanisms of Smart Enterprises
Cloud-Inspired Enterprise Transformations
Introduction, The Cloud Scheme for Enterprise Success, Elucidating the Evolving Cloud Idea, Implications of the Cloud on Enterprise Strategy, Establishing a Cloud-Incorporated Business Strategy
UNIT-V Transitioning to Cloud-Centric Enterprises
The Tuning Methodology, Contract Management in the Cloud
Cloud-Instigated IT Transformations
Introduction, Explaining Cloud Infrastructures, A Briefing on Next-Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure Solutions, Clouds for Business Continuity, The Relevance of Private Clouds, The Emergence of Enterprise Clouds

TEXT BOOKS:
1. Erl Thomas, Puttini Ricardo, MahmoodZaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press
REFERENCE:
1. James Bond, The Enterprise Cloud, O'Reilly Media, Inc.

(B558408) CYBER SECURITY (PROFESSIONAL ELECTIVE - III)
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester	L	T	P	C
	3	0	0	3

Course Outcomes:

1. Analyze and evaluate the cyber security needs of an organization.
2. Understand Cyber Security Regulations and Roles of International Law
3. Design and develop a security architecture for an organization.
4. Understand fundamental concepts of data privacy attacks

UNIT -I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

(B558409) PARALLEL COMPUTING (PROFESSIONAL ELECTIVE - III)
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes

1. Ability to understand the concepts of parallel architectures
2. Ability to select the data structures that efficiently model the information in a problem.
3. Ability to develop an efficient parallel algorithm to solve it.
4. Ability to implement an efficient and correct code to solve it, analyse its performance

Unit I

Parallel Computing: Introduction, Motivation and scope - Parallel Programming Platforms – Basic Communication Operations

Unit II

Principles of Parallel Algorithm Design - Analytical Modelling of Parallel Programs

Unit III

Programming using Message Passing Paradigm (MPI) – Programming Shared Address Space Platforms (PThreads)

Unit IV

Dense Matric Algorithms (Matrix-Vector Multiplication, Matrix-Matrix Multiplication) – Sorting Algorithms (Issues, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

Unit V

Graph Algorithms (Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm) Search Algorithms (DFS, BFS)

TEXT BOOK:

1. Introduction to Parallel Computing, Second Edition, AnanthGrama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

REFERENCES:

1. Parallel Computing – Theory and Practice, Second Edition, Michaek J. Quinn, Tata McGraw-Hill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI.

(B558410) BIOINFORMATICS (PROFESSIONAL ELECTIVE - IV)
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester	L	T	P	C
	3	0	0	3

Course Outcomes:
1. Understand the Central Dogma & XML (Bio XML) for Bioinformatics
2. Analyze Perl (Bioperl) for Bioinformatics
3. Illustrate Databases technology, architecture and its interfaces
4. Understand Sequence Alignment Algorithms, Phylogenetic Analysis

UNIT -I :The Central Dogma & XML (Bio XML) for Bioinformatics: Watson's definition, information flow, from data to knowledge, Convergence, the organization of DNA, the organization of Proteins, Introduction, Differences between HTML and XML, fundamentals of XML, fundamentals of XML namespaces. Introduction to DTDs, Document type Declarations, Declaring elements, declaring attributes, working with entities XML Schemas, Essential Concepts, working with simple types, working with complex types, Basic namespaces issues.
UNIT -II : Perl (Bioperl) for Bioinformatics: Representing sequence data, program to store a DNA sequence, concatenating DNA fragments, Transcription, Calculating the reverse complement in Perl, Proteins, files, reading proteins in files, Arrays, Flow control, finding motifs, counting Nucleotides, exploding strings into arrays, operating on strings, writing to files, subroutines and bugs.
UNIT -III : Databases: Flat file, Relational, object oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.
UNIT -IV : Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models for sequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.
UNIT -V : Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor- Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Other methods, Tree evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

TEXT BOOKS:
1. S.C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications, 2004
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001
REFERENCE BOOKS:
1. D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003)
2. Att Wood, "Bioinformatics" Pearson Education, 2004
3. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education, 2003

(B558411) GENERATIVE AI (PROFESSIONAL ELECTIVE - IV)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M.Tech(CSE):I Year IISemester	**3**	**0**	**0**	**3**

Course Outcomes

1. Demonstrate knowledge of AI foundations, generative models, and advanced neural architectures.
2. Apply generative AI techniques to create solutions for text, image, video, and multimodal tasks.
3. Design, fine-tune, and optimize Large Language Models for specific applications.
4. Evaluate ethical, social, and legal implications of Generative AI deployments and propose mitigation strategies.

UNIT 1

Foundations of AI and Generative Models

Introduction and historical evolution to Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP)and Deep Learning (DL), Structure of Artificial Neural Networks (ANNs), Mathematical and computational foundations of generative modeling, Overview of generative models and their applications across various domains; Importance of Generative AI in modern applications, Transfer learning and in advancing Generative AI

UNIT 2

Advanced Neural Architectures for Generative AI

VariationalAutoencoders (VAEs): principles and applications, Generative Adversarial Networks (GANs): architecture and working principles; Transformer architecture and attention mechanisms (in detail); Long Short-Term Memory Networks (LSTMs) and the limitations of traditional RNNs/LSTMs, Advanced Transformer architectures and techniques, Pre-training and transfer learning strategies for generative models

UNIT 3

Large Language Models and Prompt Engineering

Overview of Large Language Models (LLMs), GPT architecture, variants, and working principles, Prétraining and fine-tuning GPT models for applications (e.g., chatbots, text generation), Case study: GPT-based customer support chatbot, BERT architecture, pre-training objectives, and fine-tuning, Prompt Engineering: Designing effective prompts, controlling model behavior, and improving output quality, Fine-tuning language models for creative writing and chatbot development

UNIT 4

Multi-Agent Systems and Generative AI Applications

Introduction to Multi-Agent Systems (MAS),Types of agents: reactive, deliberative, hybrid, and learning agents, Multi-agent collaboration and orchestration for generative tasks, Use cases: autonomous research assistants, cooperative creative generation, distributed problem-solving, Frameworks and tools: AutoGen, CrewAI, Hugging GPT for LLM-powered multi-agent systems, Generative AI applications: Art, Creativity, Image/Video generation, Music composition, Healthcare, Finance, Real-world case studies and deployment challenges

UNIT 5

Frameworks, Multimodal Applications, and Ethics

LangChain framework: components and LLM application development, Retrieval-Augmented Generation (RAG), Embeddings, Indexing networks, and Vector databases, Generative AI across **modalities:** Text, Code, Image, and Video generation, Image and Video generation using GANs and R25 M.Tech CSE/CS JNTU Hyderabad

VAEs, Multimodal Generative AI: integration and training strategies, Ethical considerations: bias,

fairness, trust, and responsible AI deployment, Social and legal implications of Generative AI, Risk mitigation strategies and real-world ethical case studies

TEXT BOOKS

1. AltafRehmani, Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology.
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook. Joseph Babcock, Raghav Bali, Generative AI with Python and TensorFlow 2, 2024.

REFERENCE BOOKS

1. Josh Kalin, Generative Adversarial Networks Cookbook.
2. Jesse Sprinter, Generative AI in Software Development: Beyond the Limitations of Traditional Coding, 2024.

ONLINE REFERENCES

1. Fabian Gloeckle et al., Better & Faster Large Language Models via Multi-token Prediction, arXiv:2404.19737v1, 2024.Vaswani et al., Attention Is All You Need, NeurIPS 2017.

(B558412)Robotic Process Automation(PEC)
(Common to CSE,CSM,andCSD)

M.Tech(CSE): I Year IISemester	L	T	P	C
	3	0	0	3

Course Outcomes:
1. Describe RPA, where it can be applied and how it's implemented.
2. Identify and understand Web Control Room and Client Introduction
3. Understand how to handle various devices and the workload
4. Understand Bot creators, Web recorders and task editors

Unit I
Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots

Unit II
Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials)

Unit III
Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

Unit IV
Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command

Unit V
Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer

TEXT BOOKS:
1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition.

REFERENCES:
1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

(B558502)ADVANCED ALGORITHMS LABORATORY
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement a solution for the knapsack problem using the Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement the Rabin Karp algorithm.
8. Implement the KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flow problem.

TEXTBOOKS:

1.Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

REFERENCE BOOKS:

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C.Stein,PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
3.Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education

Course Outcomes:

On completion of the course students will be able to
1.The student can able to analyze the performance of algorithms

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

*****END****

(B558506)ENTERPRISE CLOUD CONCEPTS LABORATORY
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java..
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
6. Install Hadoop single node cluster and run simple applications like word count.

Course Outcomes:

On completion of the course students will be able to
1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

END

(B558507)CYBER SECURITY LAB
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester	L	T	P	C
	0	0	2	1

List of Experiments:

1. Perform an Experiment for port scanning with NMAP.
2. Setup a honeypot and monitor the honeypot on the network
3. Install Jcrpt /Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetriccrypto algorithm, Hash and Digital/PKI signatures.
4. Generate minimum 10 passwords of length 12 characters using open SSL command
5. Perform practical approach to implement Foot printing-Gathering target information usingDmitry-Dmagic, UAtester.
6. Working with sniffers for monitoring network communication (Wireshark).
7. Use Snort to perform real time traffic analysis and packet logging.
8. Perform email analysis using Autopsy tool.
9. Perform Registry analysis and get boot time logging using process monitor tool
10. Perform File type detection using Autopsy tool
11. Perform Memory capture and analysis using FTK imager tool
12. Perform Network analysis using the Network Miner tool

TEXT BOOKS

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010

REFERENCES:

1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.

Course Outcomes:

On completion of the course students will be able to

1. Get the skill to identify cyber threats/attacks.
2. Get the knowledge to solve security issues in day to day life.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

END

(B558508)PARALLEL COMPUTING LABORATORY
(Common to CSE, CSM, and CSD)

M. Tech (CSE): I Year II Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Design a parallel program to implement Matrix-Vector and Matrix-Matrix Multiplication using MPI library.
2. Design a parallel program to implement Bubble Sort using OpenMP and Pthread Programming Constructs.
3. Design a parallel program to implement Quick Sort using OpenMP and Pthread Programming Constructs.
4. Design a parallel program to implement Bucket Sort using OpenMP and Pthread Programming Constructs.
5. Design a parallel program to implement Prim's Algorithm using OpenMP and Pthread Programming Constructs.
6. Design a parallel program to implement DFS Algorithm using OpenMP and Pthread Programming Constructs.
7. Design a parallel program to implement BFS Algorithm using OpenMP and Pthread Programming Constructs.
8. Design a parallel program to implement Dijkstra's Algorithm using MPI library.

Course Outcomes:

On completion of the course students will be able to
1. Ability to understand the concepts of parallel architectures
2. Ability to select the data structures that efficiently model the information in a problem.
3. Ability to develop an efficient parallel algorithm to solve it.
4. Ability to implement an efficient and correct code to solve it, analyze its performance

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	1	-	1
CO2	3	3	2	2	3	-	-	-	1	1	2
CO3	3	3	2	2	3	-	-	-	1	2	2
CO4	3	3	2	2	3	2	-	-	1	2	2
CO5	3	3	2	2	3	2	-	-	1	2	2

*****END*****

(B558413) DIGITAL FORENSICS (PROFESSIONAL ELECTIVE - V)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): II Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes: On completion of the course the student should be able to
1. Understand relevant legislation and codes of ethics.
2. Computer forensics and digital detective and various processes, policies and procedures.
3. E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Email and web forensics and network forensics.

UNIT - I

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

UNIT - II

Cyber Crime Scene Analysis:
Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT - III

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT - IV

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,
Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT - V

Mobile Forensics: mobile forensics techniques, mobile forensics tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

TEXT BOOKS:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

REFERENCES:

1. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence, Packt Publishing; 1st edition (30 April 2020), ISBN : 1838648178.
2. Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar , Cybercrime and Digital Forensics: An Introduction, Routledge.

(B558414) PROMPT ENGINEERING (PROFESSIONAL ELECTIVE - V)
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): II Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes:

1. Explain and apply the core principles of prompt engineering for guiding generative AI outputs effectively.
2. Describe the underlying architecture and functionality of state-of-the-art large language models (LLMs).
3. Generate and manipulate structured outputs (JSON, YAML, CSV) using ChatGPT with advanced prompting techniques.
4. Implement text chunking, tokenization, and format control using tools like SpaCy, Tiktoken, and Python.
5. Utilize vector databases such as FAISS and Pinecone in Retrieval-Augmented Generation (RAG) pipelines for efficient information retrieval.

UNIT – I

Fundamentals and Principles of Prompting Overview of the Five Principles of Prompting: Give Direction, Specify Format, Provide Examples, Evaluate Quality, Divide Labor.

UNIT – II

Introduction to Large Language Models for Text Generation What Are Text Generation Models, Vector Representations: The Numerical Essence of Language, Transformer Architecture: Orchestrating Contextual Relationships, Probabilistic Text Generation: The Decision Mechanism, Historical Underpinnings: The Rise of Transformer Architectures, OpenAI's Generative Pretrained Transformers, GPT-3.5-turbo and ChatGPT, GPT-4, Google's Gemini, Meta's Llama and Open Source.

UNIT – III

Standard Practices for Text Generation with ChatGPT- Part-A Generating Lists, Hierarchical List Generation, When to Avoid Using Regular Expressions, Generating JSON, YAML Filtering YAML Payloads, Handling Invalid Payloads in YAML, Diverse Format Generation with ChatGPT, Mock CSV Data, Universal Translation Through LLMs, Ask for Context, Text Style Unbundling, Identifying the Desired Textual Features, Generating New Content with the Extracted Features, Extracting Specific Textual Features with LLMs.

UNIT – IV

Standard Practices for Text Generation with ChatGPT- Part-B Chunking Text, Benefits of Chunking Text, Scenarios for Chunking Text, Poor Chunking Example, Chunking Strategies, Sentence Detection Using SpaCy, building a Simple Chunking Algorithm in Python, Sliding Window Chunking, Text Chunking Packages, Text Chunking with Tiktoken, Encodings, Understanding the Tokenization of Strings.

UNIT – V

Vector Databases with FAISS and Pinecone Retrieval Augmented Generation (RAG), Introducing Embeddings, Document Loading Memory Retrieval with FAISS, RAG with Lang Chain, Hosted Vector Databases with Pinecone, Self Querying, Alternative Retrieval Mechanisms.

TEXTBOOK:

1. Phoenix J, Taylor M. Prompt engineering for generative AI. " O'Reilly Media, Inc."; 2024 May 16.

REFERENCES:

1. Tunstall L, Von Werra L, Wolf T. Natural language processing with transformers. " O'Reilly Media, Inc."; 2022 Jan 26.
2. Foster D. Generative deep learning. " O'Reilly Media, Inc."; 2022 Jun 28.

(B558415)QUANTUM COMPUTING
(Common to CSE, CSM, and CSD)

	L	T	P	C
M. Tech (CSE): II Year I Semester	**3**	**0**	**0**	**3**

Course Outcomes
1. Understand basics of quantum computing
2. Understand physical implementation of Qubit
3. Understand Quantum algorithms and their implementation
4. Understand the Impact of Quantum Computing on Cryptography

Unit I

Introduction to Essential Linear Algebra

Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory

Complex Numbers, Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers

Unit II

Basic Physics for Quantum Computing

The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement

Basic Quantum Theory

Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE

Unit III

Quantum Architecture

Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture

Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials

Unit IV

Quantum Algorithms

What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm

Unit V

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve, The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications.

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCES:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.Basic Concepts, Vol
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

(B500701) ENGLISH FOR RESEARCH PAPER WRITING

(Audit- I & II)

M. Tech (CSE): I Year I Semester

L	T	P	C
2	0	0	0

Prerequisite: None

Course objectives:

- To Understand that how to improve your writing skills and level of readability
- To Learn about what to write in each section
- To Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

UNIT-VI:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXTBOOKS/ REFERENCES:

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

(B500702) DISASTER MANAGEMENT

(Audit- I & II)

M. Tech (CSE): I Year I Semester

L	T	P	C
2	0	0	0

UNIT-I:
Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:
Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life,
Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:
Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:
Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

(B500703) VALUE EDUCATION
(Audit- I & II)

M. Tech (CSE): I Year II Semester

L	T	P	C
2	0	0	0

Course Objectives:

- To understand value of education and self- development
- To imbibe good values in students
- To know about the importance of character

Course outcomes: After completion of the course, students will be able to:

- Get Knowledge of self-development
- Learn the importance of Human values
- Develop the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness -Avoid fault Thinking. Free from anger, Dignity of labor-Universal brotherhood and religious tolerance - True friendship - Happiness Vs suffering, love for truth - Aware of Self-destructive habits – Association and Cooperation - Doing best for saving nature

UNIT-IV:
Character and Competence –Holy books vs. Blind faith - Self-management and good health – Science of reincarnation - Equality, Nonviolence, Humility, Role of Women - All religions and same message - Mind your Mind, Self-control - Honesty, Studying effectively

TEXTBOOKS/ REFERENCES:
1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

(B00704) CONSTITUTION OF INDIA
(Audit- I & II)

M. Tech (CSE): I Year II Semester

L	T	P	C
2	0	0	0

Course Objectives:

- To understand the premises informing the twin themes of liberty and freedom from a civil rights
- perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: After completion of the course, students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the
- leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)
UNIT-II:
Philosophy of the Indian Constitution: Preamble, Salient Features
UNIT-III:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality, Right to Freedom, right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
UNIT-IV:
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions
UNIT-V:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy
UNIT-VI:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

(B555601) EMBEDDED SYSTEMS
(Open Elective)

	L	T	P	C
M.Tech (ES)	**3**	**0**	**0**	**3**

Course Outcomes:
After the Completion of the course, the students will be able to
1. Explain the Embedded design process and CPU Fundamentals
2. Understand Embedded computing platform and program design.
3. Explain Scheduling policies and inter process mechanisms in Embedded systems
4. Evaluate the Hardware accelerators & networks for Embedded system.
5. Explain various System design methodologies and quality assurance.

UNIT-I: Embedded Computing & CPU fundamentals
Embedded Computing: Microprocessors, embedded design process, system description formalisms. Instruction sets- CISC and RISC;
CPU fundamentals: programming I/Os, co-processors, supervisor mode, exceptions, memory management units and address translation, pipelining, super scalar execution, caching, CPU power consumption.

UNIT-II: **Embedded computing platform & Program design and analysis**
Embedded Computing platform: CPU bus, memory devices, I/O devices, interfacing, designing with microprocessors, debugging techniques.
Program design and analysis: models of program, assembly and linking, compilation techniques, analysis and optimization of execution time, energy, power and size.

UNIT-III: Processes and operating systems
Multiple tasks and multiple processes, context switching, scheduling policies, inter-process communication mechanisms.

UNIT-IV: Hardware accelerators & Networks
Hardware accelerators: CPUs and accelerators, accelerator system design.
Networks: Distributed embedded architectures, networks for embedded systems, network-based design and Internet-enabled systems.

UNIT-V: System design techniques
Design methodologies, requirements analysis, system analysis and architecture design, quality assurance.

Text Books:
1. Wolf, W. Computers as components- Principles of embedded computing system design. Academic Press (Indian edition available from Harcourt India Pvt. Ltd., 27M Block market, Greater Kailash II, New Delhi-110 048.)
Reference Books
1. Manuel Jiménez Rogelio, Palomera Isidoro Couvertier “Introduction to Embedded Systems Using Microcontrollers and the MSP430” Springer Publications, 2014.
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002.
3. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.

(B543601) PHOTOVOLTAIC SYSTEMS

(OpenElective.6)

M.Tech–II Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: None

Course Objectives:

- To introduce photovoltaic systems
- To deal with various technologies of solar PV cells
- To understand details about manufacture, sizing and operating techniques
- To have knowledge of design considerations.

Course Outcomes: After completion of the course, students will be ablet o:

- Identify photovoltaic system components and system types
- Calculate electrical energy and power
- Correctly size system components, design considerations of solar equipment
- Design a basic grid-tie PV system.

UNIT-I:

SOLAR ENERGY

Sun and Earth, Solar Spectrum, Solar Geometry, Solar radiation on horizontal and inclined planes, Instruments for measurement of solar radiation, Solar cell, Equivalent circuit, V-I characteristics, Performance improvement.

UNIT-II:

SOLAR CELLS

Manufacture of Solar Cells-Technologies, Design of Solar cells, Photo voltaic modules, Design requirements, Encapsulation systems, Manufacture, Power rating, Hotspot effect, Design qualifications.

UNIT-III:

PROTECTION AND MEASUREMENTS

Flat plate arrays, Support structures, Module interconnection and cabling, Lightning protection, Performance measurement using natural sun light and simulator, Determination of temperature coefficients, Internal series resistance, Curve correction factor.

UNIT-IV:

PHOTOVOLTAIC SYSTEMS

Photovoltaic systems, Types, General design considerations, System sizing, Battery sizing, Inverter sizing, Design examples, Balance of PV systems.

UNIT-V:

MAXIMUM POWERPOINT TRACKERS

Maximum power point trackers, Perturb and observe, Incremental conductance method, Hill climbing method, Hybrid and complex methods, Databased and other approximate methods, Instrument design, Other MPP techniques, Grid interactive PV system.

TEXTBOOKS:

1. F.C.Treble, “Generating electricity from Sun”, Pergamon Press.
2. A.K.Mukherjee, Nivedita Thakur,” Photovoltaic systems: Analysis and design”,PHI,2011.

REFERENCES:

1. C.S.Solanki, ”Solar Photovoltaic’s: Fundamentals, Technologies and applications”,PHI,2009.
2.

(B520601)GREEN BUILDING TECHNOLOGIES
(Open Elective)

M.Tech–II Year I Semester

L	T	P	C
3	0	0	3

UNIT- I

Introduction
Environmental implications of buildings energy, carbon emissions, water use, waste Disposal. Building materials: sources, methods of production and environmental Implications. Green cover and built environment.

UNIT- II

Implications of Resources Implication of resources for Building Materials and alternative concepts. Recycling of Industrial and Building Wastes. Biomass Resources for buildings.

UNIT- III

Comforts in Building
Comforts in Building: Thermal Comfort in Buildings-Issues; Heat Transfer Characteristics of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings.

UNIT- IV

Energy Conservation
Utility of Solar energy is buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT- V
Green Composites for Buildings & Waste Management
Green Composites for buildings. Concepts of Green Composites. Water Utilization in Buildings. Waste Management: Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage water and Sewage.

TEXT BOOKS:

1. K.S. Jagadish, B.U. Venkatarama Reddy and K.S. Nanjundarao. Alterative Building Materials and Technologies. New Age International, 2007.
R22 B.Tech. Civil Engineering JNTUH Hyderabad
Page 85 of 132
2. Michael Bauer, Peter Mosle and Michael Schwarz “Green Building-Guide book for Sustainable Architecture “Springer, 2010.

REFERENCE BOOKS:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design McGraw Hill, 2009.
4. Mili M.Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes, 2001/2002

(B558601)INTRUSION DETECTION SYSTEMS (OPEN ELECTIVE)

M. Tech : I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand fundamental knowledge of intrusion detection and prevention
2. Understand different types of attacks in network layer and code injection human layer
3. Analyze different anomaly detection algorithms

UNIT - I

The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's -Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS

UNIT - II

Classes of attacks - Network layer: scans, denial of service, penetration Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sop Hesitated groups-Automated: Drones, Worms, Viruses

UNIT - III

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS

UNIT - IV

Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection

UNIT - V

Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detection - Obfuscation, polymorphism- Document vectors. Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security

TEXT BOOKS:

1. Peter Szor, The Art of Computer Virus Research and Defense, Symantec Press ISBN 0-321-30545-3.
2. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacks and Defenses.

REFERENCE BOOKS:

1. Saiful Hasan, Intrusion Detection System, Kindle Edition.
2. Ankit Fadia, Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection