ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2024-25 onwards

M. Tech. Two Year Degree Course
(MR24 Regulations)
in
Computer Science and Engineering (CSE)
Department of
Computer Science and Engineering

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

MALLA REDDY ENGINEERING COLLEGE (Autonomous)
COMPUTER SCIENCE AND ENGINEERING (CSE)

Proposed Course Structure for PG - M.Tech. (Computer Science and Engineering) Programme (MR-24 Regulations)

S. No	Category	Course Code	Name of the course		L	T	P	Credits
			I YEAR - I SEMESTER					
1	PCC	D5101	Mathematical Foundations of Computer Science		3	0	0	3
2	PCC	D5102	Advanced Data Structures		3	0	0	3
3	PEC - I	D5103 D5104 D5105	1. Database Programming with PL/SQL 2. Deep Learning 3. Natural Language Processing		3	0	0	3
4	PEC - II	D5106 D5107 D5108	1. Applied Cryptography 2. Software Quality Engineering 3. Mining Massive Datasets		3	0	0	3
5	PCC	D5109	Advanced Data Structures Lab		0	0	4	2
6	PCC	D5110 D5111 D5112	1. Database Programming with PL/SQL Lab 2. Deep Learning Lab 3. Natural Language Processing Lab	PEC-1 Lab	0	0	4	2
7	HSMC	D0H08	Research Methodology and IPR		2	0	0	2
8	AC		Audit Course- I		2	0	0	0
			Total		16	0	8	18
			Total Contact Hours			24		

Professional Elective- I and Professional Elective- I Lab must be of same course.

S. No	Category	Course Code	Name of the course		L	T	P	Credits
			I YEAR - II SEMESTER					
1	PCC	D5113	Advanced Algorithms		3	0	0	3
2	PCC	D5114	Advanced Computer Architecture		3	0	0	3
3	PEC-III	D5115 D5116 D5117	1. Enterprise Cloud Concepts 2. Advanced Computer Networks 3. Edge Analytics		3	0	0	3
4	PEC-IV	D5118 D5119 D5120	1. Bioinformatics 2. Nature Inspired Computing 3. Robotic Process Automation		3	0	0	3
5	PCC	D5121	Advanced Algorithms Lab		0	0	4	2
6	PEC	D5122 D5123 D5124	1. Enterprise Cloud Concepts Lab 2. Advanced Computer Networks Lab 3. Edge Analytics	PEC-III Lab	0	0	4	2
7	PROJ	D51P1	Mini Project with Seminar		0	0	4	2
8	AC		Audit Course- II		2	0	0	0
			Total		14	0	12	18
			Total Contact Hours			26		

Professional Elective- III and Professional Elective- III Lab must be of same course.

			II YEAR - I SEMESTER				
S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	PEC-V	D5125 D5126 D5127	1. Digital Forensics 2. High Performance Computing 3. Quantum Computing	3	0	0	3
2	OEC		Open Elective	3	0	0	3
3	PROJ	D51P2	Dissertation Work Review - II	0	0	12	6
			Total	6	0	12	12
		Total Contact Hours		18			

			II YEAR - II SEMESTER				
S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	PROJ	D51P3	Project /Dissertation Phase - III	0	0	12	6
2	PROJ	D51P4	Dissertation Viva-Voce	0	0	28	14
			Total	0	0	40	20
		Total Contact Hours		40			

			Open Electives for other Departments				
S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	OEC	D5128	IPR	3	0	0	3
2	OEC	D5129	Fault Tolerance Systems	3	0	0	3
3	OEC	D5130	Intrusion Detection Systems	3	0	0	3
4	OEC	D5131	Digital Forensics	3	0	0	3
5	OEC	D5132	Optimization Techniques	3	0	0	3
6	OEC	D5133	Cyber Physical Systems	3	0	0	3
7	OEC	D5134	Graph Analytics	3	0	0	3

			Audit Course I & II				
S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	AC	DA001	English for Research Paper Writing	2	0	0	0
2	AC	DA002	Disaster Management	2	0	0	0
3	AC	DA003	Sanskrit for Technical Knowledge	2	0	0	0
4	AC	DA004	Value Education	2	0	0	0
5	AC	DA005	Constitution of India	2	0	0	0
6	AC	DA006	Pedagogy Studies	2	0	0	0
7	AC	DA007	Stress Management by yoga	2	0	0	0
8	AC	DA008	Personality Development Through Life Enlightenment Skills	2	0	0	0

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech I Sem	
Code: D5101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P
Credits: 3		3	-	-

Pre-requisites: An understanding of Math in general is sufficient.

Course Objectives: To learn
1. Introduces the elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generatingfunctions.

Module -I: [9 Periods]

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.

Module -II: [10 Periods]

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.

Module -III: [9 Periods]

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.

Module -IV: [10 Periods]

Discrete Probability and Advanced Counting Techniques:

An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value andVariance. Advanced Counting Techniques:

Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

Module -V: [10 Periods]

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, Pearsoneducation, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

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.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3		2			
CO2			3	2		
CO3					3	1
CO4	3	2				
CO5			3			2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: D5102	**ADVANCED DATA STRUCTURES**	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites: A course on "Data Structures"

Course Objectives:
1. Introduces the heap data structures such as leftist trees, binomial heaps, Fibonacci and min-max heaps
2. Introduces a variety of data structures such as disjoint sets, hash tables, search structures anddigital search structures

Module I: Heap Structures [10 Periods]
Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

Module II: Hashing and Collisions [9 Periods]
Introduction, Hash Tables, Hash Functions, different Hash Functions: Division Method, MultiplicationMethod, Mid-Square Method, Folding Method, Collisions

Module III: [9 Periods]
Search Structures: OBST, AVL trees, Red-Black trees, Splay trees,
Multiway Search Trees: B-trees, 2-3 trees

Module IV: Digital Search Structures [10 Periods]
Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, CompressedTries

Module V: Pattern matching [10 Periods]
Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

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 structuresand digital search structures
4. Ability to understand various Searching techniques
5. Ability to understand Pattern matching techniques

TEXT BOOKS

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

REFERENCE BOOKS

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.

E-RESOURCES

1. https://www.cise.ufl.edu/~sahni/cop3530/presentations.htm
2. https://books.google.co.in/books?id=KK3DAgAAQBAJ&printsec=frontcover&dq=data+ structures+and+algorithm+analysis+in+java
3. https://www.cse.msu.edu/~cse802/Papers/sammon.pdf
4. http://nptel.ac.in/courses/106102064/1/

COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2			
CO2			3	2		
CO3					3	1
CO4		2				1
CO5	2		1		3	

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: D5103	DATABASE PROGRAMMING WITH PL/SQL	L	T	P
Credits: 3	(Professional Elective – I)	3	-	-

Prerequisites: Nil
Course Objectives:

1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

MODULE – I [9 Periods]
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.

MODULE – II [9 Periods]
Language Fundamentals & Control Structures: Lexical Modules, 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.

MODULE – III [10 Periods]
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.

MODULE – IV [10 Periods]
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.

MODULE – V [10 Periods]
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 RAWData Types.

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

TEXT BOOKS:

1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGrawHill 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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2	3	3	3	2	3	3
CO3	3	1	1		2	2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech I Sem	
Code: D5104	DEEP LEARNING		L	T	P
Credits: 3	(Professional Elective – I)		3	-	-

Prerequisites: Nil

Course Objectives: students will be able
1. To understand complexity of Deep Learning algorithms and their limitations
2. To be capable of performing experiments in Deep Learning using real-world data.

MODULE – I   [10 Periods]
Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Module 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

MODULE – II   [10 Periods]
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

MODULE – III   [10 Periods]
Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text withLSTM models, Attention Models for computer vision tasks

MODULE – IV   [10 Periods]
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-Wordsmodel (CBOW), Glove, Evaluations and Applications in word similarity

MODULE – V   [10 Periods]
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

Course Outcomes:
1. Implement deep learning algorithms, understand neural networks and traverse the layers ofdata
2. Learn topics such as convolutional neural networks, recurrent neural networks, training deepnetworks and high-level interfaces

3. Understand applications of Deep Learning to Computer Vision
4. Understand and analyze Applications of Deep Learning to NLP

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 (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2			3	2	3	3
CO3	3	3	2		2	1
CO4	3	2	3	1	2	1

Prerequisites:
1. Data structures, finite automata and probability theory.

Course Objectives:
1. Introduction to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

MODULE – I   **[10 Periods]**
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

MODULE – II   **[10 Periods]**
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.

MODULE – III   **[10 Periods]**
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

MODULE – IV   **[10 Periods]**
Predicate-Argument Structure, Meaning Representation Systems, Software.

MODULE – V   **[10 Periods]**
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.

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

languagemodeling Techniques.
5. Able to design different language modeling Techniques.

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

REFERENCE:
1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, PearsonPublications

COs	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		3	
CO2	3	3	3	2	3	3
CO3	1	3	2		2	1
CO4	2	2	3			1
CO5	1		1			

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: D5106	APPLIED CRYPTOGRAPHY	L	T	P
Credits: 3	(Professional Elective – II)	3	-	-

Course Objectives: Knowledge on significance of cryptographic protocols and symmetric and publickey algorithms

MODULE – I   [10 Periods]
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

MODULE – II   [10 Periods]
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.

MODULE – III   [9 Periods]
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

MODULE – IV   [10 Periods]
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

MODULE – V   [9 Periods]
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).

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.

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		3		2	
CO2	1	2	1	2	3	2
CO3	1	3	2		2	1
CO4	2	2	3	1		1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech I Sem	
Code: D5107	SOFTWARE QUALITY ENGINEERING		**L**	**T**	**P**
Credits: 3	(Professional Elective – II)		3	-	-

Course Objectives: Knowledge on significance of Quality, quality assurance, quality engineering.

MODULE – I [9 Periods]
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.

MODULE – II [10 Periods]
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

MODULE – III [9 Periods]
Quality Engineering: Activities and process, Quality planning: Goal setting and Strategy formation, Quality assessment and Improvement, Quality engineering in software process.

MODULE – IV [10 Periods]
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.

MODULE – V [10 Periods]
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

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

TEXT BOOKS:

1. Jeff Tia`n, Software Quality Engineering, Testing, Quality Assurance, and Quantifiableimprovement
2. Richard N. Taylor, Software Architecture: Foundations, Theory, and Practice

CO- PO Mapping					
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
COs	**Program Outcomes (POs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		1			1
CO2		3		2	3	2
CO3	2		3			

Prerequisites:
1. Students should be familiar with Data mining, algorithms, basic probability theory and Discrete math.

Course Objectives:
1. This course will cover practical algorithms for solving key problems in mining of massive datasets.
2. This course focuses on parallel algorithmic techniques that are used for large datasets.
3. This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied indetail.

MODULE - I: [9 Periods]
Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,
MapReduce and the New Software Stack-Distributed File Systems, MapReduce, Algorithms UsingMapReduce.

MODULE - II: [10 Periods]
Similarity Search: Finding Similar Items**-**Applications of Near-Neighbor Search, Shingling ofDocuments, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, FilteringStreams.

MODULE - III: [10 Periods]
Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, CountingFrequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams andParallelism.

MODULE - IV: [10 Periods]
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.

MODULE - V: [9 Periods]
Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs,Partitioning of Graphs, Simrank, Counting Triangles.

Course Outcomes:

1. Handle massive data using MapReduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context ofdata 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.

TEXT BOOK:

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

REFERENCES:

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,Morgan Kaufmann.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2		1		2		2
CO3	1	2	2		2	1
CO4	3	2	1			2
CO5	1		1			

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: D5109	**ADVANCED DATA STRUCTURES LAB**	**L**	**T**	**P**
Credits: 2		**-**	**-**	**4**

Prerequisites: A course on Computer Programming & Data Structures

Software Requirement: JDK 1.8

Course Objectives:
1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs,and B-trees.
4. Introduces sorting and pattern matching algorithms.

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.

Course Outcomes:
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 orcombinations.
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 generaltree structures, search trees, tries, heaps, graphs, and B-trees.

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

REFERENCES:
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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
Cos	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3					
CO2					3	1
CO3			2	1		
CO4	3	2				

Software Requirement: MySQL

Course Objectives:
1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

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 toselect 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.

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

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
Cos	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3					
CO2					3	1
CO3			2	1		

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5111	**DEEP LEARNING LAB**	**L**	**T**	**P**
Credits: 2	(Professional Elective-I Lab)	**-**	**-**	**4**

Prerequisites: Nil

Software Requirement: Python 3.10.4

Course Objectives:
1. To Build The Foundation Of Deep Learning.
2. To Understand How To Build The Neural Network.
3. To enable students to develop successful machine learning concepts.

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.

Course Outcomes:
1. Upon the Successful Completion of the Course, the Students would be able to:
2. Learn The Fundamental Principles Of Deep Learning.
3. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in variousdomains.
4. Implement Deep Learning Algorithms And Solve Real-world problems.

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.

Extensive Reading:

- http://www.deeplearning.net
- https://www.deeplearningbook.org/
- https://developers.google.com/machine-learning/crash-course/ml-intro
- www.cs.toronto.edu/~fritz/absps/imagenet.pdf
- http://neuralnetworksanddeeplearning.com/

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	1	2		2	
CO2	3	2	1	2	3	3
CO3			2		2	
CO4	1	2		2		1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5112	NATURAL LANGUAGE PROCESSING LAB	L	T	P
Credits: 2	(Professional Elective-I Lab)	-	-	4

Prerequisites: Data structures, finite automata and probability theory
Software Requirement: Python 3.10.4

Course Objectives:
1. To Develop and explore the problems and solutions of NLP.

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

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

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, PearsonPublications.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		2	
CO2	3	3	3	2	3	2
CO3	3	3	2		2	1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech. I Semester		
Code: D0H08	RESEARCH METHODOLOGY AND IPR	L	T	P
Credits: 2		2	-	-

PREREQUISITES: Nil

Course Objectives:
1. To understand the research problem
2. To know the literature studies, plagiarism and ethics
3. To get the knowledge about technical writing
4. To analyze the nature of intellectual property rights and new developments
5. To know the patent rights

Module I: [6 Periods]

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

Module II: [7 Periods]

Effective literature studies approaches, analysis, Plagiarism, Research ethics

Module III: [6 Periods]

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

.
Module IV: [6 Periods]

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.

Module V: Case Studies [7 Periods]

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.

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 tomorrowworld 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 andinvestment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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 TechnologicalAge", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E-RESOURCES:
1. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
2. https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm7_e.htm
3. http://nptel.ac.in/courses/110999906/
4. http://nptel.ac.in/courses/109105112/

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 tomorrowworld 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.

COs	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		3	
CO2	2			2	2	3
CO3	3	3	2			
CO4		2	2		1	
CO5	3		1			
CO6		2		3	1	2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech. I Semester	
Code: DXXXX	AUDIT COURSE - I	L	T	P
Credits: 2		2	-	-

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5113	**ADVANCED ALGORITHMS**	L	T	P
Credits: 3		3	-	-

Pre-Requisites: UG level course in Algorithm Design and Analysis

Course Objectives:
1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advancedalgorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

MODULE – I [10 Periods]
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.

MODULE – II [9 Periods]
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.

MODULE – III [10 Periods]
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.

MODULE – IV [10 Periods]
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.

MODULE – V   [9 Periods]

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 applyingrecently proposed data structures.

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.

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".

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2	3	3	3	2	3	3
CO3			2		2	

Prerequisites: Computer Organization

Course Objectives:

1. To impart the concepts and principles of parallel and advanced computer architectures.
2. To develop the design techniques of Scalable and multithreaded Architectures.
3. To Apply the concepts and techniques of parallel and advanced computer architectures todesign modern computer systems

MODULE – I   [10 Periods]

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.

MODULE – II   [10 Periods]

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

MODULE – III   [9 Periods]

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.

MODULE – IV   [10 Periods]

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.

MODULE – V   [9 Periods]

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

Course Outcomes: Gain knowledge of

1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors

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.

COs	Program Outcomes (POs)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	3	2		1	
CO2	3	2	3	2	2	3
CO3			2		2	1
CO4	2	1	2			1
CO5		1	1		2	

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Course Objectives: Knowledge on significance of cloud computing and its fundamental conceptsand models.

MODULE – I   [10 Periods]
Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goalsand Benefits, Risks and Challenges.
Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud DeliveryModels, Cloud Deployment Models.

MODULE – II   [9 Periods]
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.

MODULE – III   [10 Periods]
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, RedundantStorage Architecture, Case Study Example

MODULE – IV   [10 Periods]
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

MODULE – V   [9 Periods]
Transitioning to Cloud-Centric Enterprises: The Tuning Methodology, Contract Management in theCloud
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

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.

TEXT BOOKS:
1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology &Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press

REFERENCES:
1. James Bond,The Enterprise Cloud, O'Reilly Media, Inc.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	1		3	
CO2	2	1	3	2	3	3
CO3	2		2		2	1
CO4		1	3	1		1

Prerequisites: Data Communication, Basic Networking Principles, Computer Networks

Course Objective: This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

MODULE – I   **[10 Periods]**

Data-link protocols: Ethernet, Token Ring and Wireless (802.11). Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs), Multiple access schemes Routing and Internetworking: Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer.

MODULE – II   **[10 Periods]**

Transport and Application Layer Protocols: Client-Server and Peer-To-Peer Application Communication, Protocols on the transport layer, reliable communication. Routing packets through a LAN and WAN. Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control. Principles of Network Applications,

MODULE- III   **[10 Periods]**

The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, building a Simple Web Server Creating simulated networks and passing packets through them using different routing techniques. Installing and using network monitoring tools.

MODULE – IV   **[10 Periods]**

Wireless and Mobile Networks: Introduction, Wireless links and Network Characteristics - CDMA, Wifi: 802.11 Wireless LANS, Cellular internet access, Mobility management: Principles

MODULE – V   **[10 Periods]**

Multimedia networking: Multimedia networking applications, streaming stored video, Voice-over-IP, Protocols for real-time conversational applications.

Course Outcomes:

1. Understanding of holistic approach to computer networking

2. Ability to understand the computer network protocols and their applications
3. Ability to design simulation concepts related to packet forwarding in networks.

TEXT BOOKS:
1. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson,6th Edition, 2012.
2. Computer Networks and Internets, Duglas E. Comer, 6th Edition, Pearson.

REFERENCES:
1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and Piyasat Nilkaew, Pearson,3rd Edition, 2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Prentice Hall.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	3		2	1
CO2	1	2	2	2	3	3
CO3	3	3	2	1	2	

Prerequisites
- A basic knowledge of "Python Programming"

Course Objectives
1. The aim of the course is to introduce the fundamentals of Edge Analytics.
2. The course gives an overview of – Architectures, Components, Communication Protocols andtools used for Edge Analytics.

MODULE – I   **[9 Periods]**
Introduction to Edge Analytics
What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

MODULE – II   **[10 Periods]**
Basic edge analytics components, Connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics, Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long-distance communication using LoRa and Signfox for edge analytics.

MODULE – III   **[10 Periods]**
Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure ioT Hub, Using the Raspberry Pi with Azure IoT edge, Connecting our Raspberry Pi edgedevice, adding a simulated temperature sensor to our edge device.

MODULE – IV   **[10 Periods]**
Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

MODULE – V   **[9 Periods]**
Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code, creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protectingour edge analytics applications

Course Outcomes

1. Understand the concepts of Edge Analytics, both in theory and in practical application.
2. Demonstrate a comprehensive understanding of different tools used at edge analytics.
3. Formulate, Design and Implement the solutions for real world edge analytics .

TEXT BOOK:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edgeanalytical solutions including Azure IoT Edge by Colin Dow

REFERENCES:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source usingMicrosoft Azure by Ashish Mahajan

COs	Program Outcomes (POs)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		2	2		3
CO2		3		3	2	
CO3	1		1		1	2

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech II Sem		
Code: D5118	BIOINFORMATICS		L	T	P
Credits: 3	(Professional Elective – IV)		3	-	-

Prerequisites: Nil

Course Objectives: Knowledge on concepts of bioinformatics and biological motivations of sequenceanalysis

MODULE -I: [10 Periods]
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.

MODULE -II: [10 Periods]
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.

MODULE -III: [10 Periods]
Databases: Flat file, Relational, object-oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.

MODULE -IV: [10 Periods]
Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models forsequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.

MODULE -V: [10 Periods]
Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor- Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Othermethods, Tree evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

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

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	1
CO2	3	3	3	2	3	3
CO3	2	1	2		2	1
CO4	2	2	1		1	

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech II Sem	
Code: D5119	NATURE INSPIRED COMPUTING	L	T	P
Credits: 3	(Professional Elective – IV)	3	-	-

Prerequisites: Nil

Course Objectives: Knowledge on significance of intelligence, genetic algorithms Ant Colonyalgorithms

MODULE - I: [10 Periods]

Models of Life and Intelligence - Fundamentals of bio-inspired models and bio-inspired computing. Evolutionary models and techniques, Swarm models and its self-organization, swarm and evolutionary algorithms. Optimisation problems – single and multi-objective optimisation, heuristic, meta-heuristic and hyper heuristic functions.

MODULE - II: [10 Periods]

Genetic algorithms - Mathematical foundation, Genetic problem solving, crossover and mutation. genetic algorithms and Markov process, applications of genetic algorithms

MODULE - III: [10 Periods]

Ant Colony Algorithms - Ant colony basics, hybrid ant system, ACO in combinatorial optimisation, variations of ACO, case studies.

MODULE - IV: [10 Periods]

Particle Swarm algorithms - particles moves, particle swarm optimisation, variable length PSO, applications of PSO, case studies. Artificial Bee Colony algorithms - ABC basics, ABC in optimisation,multi-dimensional bee colony algorithms, applications of bee algorithms, case studies.

MODULE - V: [10 Periods]

Selected nature inspired techniques - Hill climbing, simulated annealing, Gaussian adaptation, Cuckoo search, Firey algorithm, SDA algorithm, bat algorithm, case studies. Other nature inspired techniques - Social spider algorithm, Cultural algorithms, Harmony search algorithm, Intelligent water drops algorithm, Artificial immune system, Flower pollination algorithm, case studies.

Course Outcomes:
1. Familiar with Genetic algorithm and its applications.
2. Compare different Ant Colony Optimization algorithmic models.
3. Compare different Artificial Bee Colony Optimization algorithmic models.
4. Illustrate Particle swam optimization algorithm with an example.

TEXT BOOKS:
1. Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006
2. Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence: Theories, methods, andTechnologies" IT Press, 2008

REFERENCES:
1. Leandro Nunes de Castro - " Fundamentals of Natural Computing, Basic Concepts, Algorithmsand Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Marco Dorrigo, Thomas Stutzle -" Ant Colony Optimization", Prentice Hall of India, New Delhi,2005
3. Vinod Chandra S S, Anand H S - "Machine Learning: A Practitioner's Approach", Prentice Hallof India, New Delhi, 2020

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		3		3	
CO2	1	2		1	2	2
CO3	2	1	2	2	2	1
CO4	2	2	3			1

Prerequisites: Nil

Course Objectives: Aim of the course is to make learners familiar with the concepts of RoboticProcess Automation.

MODULE – I [10 Periods]

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

MODULE – II [10 Periods]

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)

MODULE – III [10 Periods]

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.

MODULE – IV [10 Periods]

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

MODULE – V [10 Periods]

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

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

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 RPAtool – UiPath Kindle Edition.

REFERENCES:

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3			3	
CO2		2	1	2	2	2
CO3	1	2	2		1	
CO4	1		2		2	

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5121	ADVANCED ALGORITHMS LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: Algorithms
Software Requirement: JDK 1.8

Course Objective: The student can able to attain knowledge in advanced algorithms.

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.

Course Outcomes:
1. The student can able to analyze the performance of algorithms
2. Able to implement the appropriate data structure for solving a particular set of problems.
3. Able to deal with different problems in various classes according to their complexity

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

REFERENCES:
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.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3		1	
CO2	3	2	3	2	3	3
CO3	1	3	2		2	1

Prerequisites: Nil

Software Requirement: VMware, JDK 1.8, Python 3.10.4 and Hadoop

Course Objectives: Knowledge on significance of cloud computing and its fundamental conceptsand models.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows 10.
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 usingpython/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:
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.

E-Resources:
1. https://www.iitk.ac.in/nt/faq/vbox.htm
2. https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUK EwjqrNG0za73Ah XZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu %2F~sedwards%2F classes%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz
3. https://www.cloudsimtutorials.online/cloudsim/
4. https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/
5. https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	2	3		1	
CO2	3	2	3	2	3	3
CO3	1	3	2		2	1
CO4	1		1		2	

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5123	ADVANCED COMPUTER NETWORKS LAB	L	T	P
Credits: 2	(Professional Elective-III Lab)	-	-	4

Prerequisites: Data communication, Basic networking principles, Computer Networks

Software Requirement: JDK 1.8

Course Objectives:
1. Understand and analyze the existing protocols
2. Understand the use of network packet capturing tools

List of Experiments:
1. Implement the IP fragmentation and reassembly algorithm.
2. Implement the IP forwarding algorithm.
3. Implement the simplest sliding window protocol of TCP.
4. Connect two systems using a switch and configure private IP addresses to the systems and ping them from each other. Using Wireshark, capture packets and analyze all the header information in the packets captured.
5. Install Telnet on one of the systems connected by a switch and telnet to it from the other system. Using Wireshark, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.
6. Start packet capture in wireshark application and then open your web browser and type in an URL of the website of your choice. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received for the web page you visited in your web browser.

Course Outcomes:
1. Ability of acquiring the practical exposure to existing protocols
2. Ability to implement the computer network protocols and their applications
3. Ability to implement simulation concepts related to packet forwarding in networks.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		2	1
CO2	3	3	3	2	2	3
CO3	2	1	2		2	

Software Requirement: Arduino IDE and Raspberry Pi

Course Objectives:
1. Understand the concept of edge computing
2. Understand the Edge computing Architecture
3. Implement the edge computing in IOT
4. Understand the concept of multi-access edge computing
5. Implement edge computing in MEC

List of Experiments:
1. Set up the Arduino IDE for ESP8266-12 module and program it to blink a LED light.
2. Installation tools to create and manage ECN's
3. Deploy micro services and writing your own microservices
4. Setup the Communication Parameters
5. Implement any two Communications protocols
6. Deploy modules to a Windows IoT Edge device
7. Create an IoT hub.
8. Register an IoT Edge device to your IoT hub.
9. Install and start the IoT Edge for Linux on Windows runtime on your device.
10. Remotely deploy a module to an IoT Edge device and send telemetry.
11. Python based basic programs using Raspberry Pi.
12. Deploy a module Manage your Azure IoT Edge device from the cloud to deploy a module thatsends telemetry data to IoT Hub.
13. Publishing Data using HTTP.
14. Sensor Interfacing and Logging using MQTT.
15. File IO Example - # Example code to demonstrate writing and reading data to/from files
16. write code to turn on one of the LEDs on the board (Breadboard)

Additional Exercises on IOT Edge Analytics Applications
17. Temperature Logger
18. Home Automation

Course Outcomes:
1. Identify the benefits of edge computing
2. Develop the microservices in iofog
3. Develop user defined services in the edge
4. Create use cases in IOT with edge computing

5. Develop services in MEC
6. Implement use cases in MEC

TEXT BOOKS:
1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edgeanalytical solutions including Azure IoT Edge by Colin Dow
2. MicroPython for the Internet of Things A Beginner's Guide to Programming with Python onMicrocontroller, Charles Bell, A Press.

REFERENCE BOOKS:
1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source usingMicrosoft Azure by Ashish Mahajan
2. Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications usingRaspberry Pi 3", First Edition, Packt Publishing, 2018
3. John C. Shovic, "Raspberry Pi IoT Projects: Prototyping Experiments for Makers", PacktPublishing, 2016
4. Python for Microcontrollers: Getting Started with MicroPython Paperback – 16 December 2016,by Donald Norris, McGraw-Hill Education TAB
5. Programming with MicroPython: Embedded Programming with Microcontrollers and Python, byNicholas H. Tollervey, OReilly
6. R. Buyya, S.N. Srirama (2019), Fog and Edge Computing: Principles and Paradigms, Wiley-Blackwell, 2019.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		2	1
CO2	3	3	3	2	2	3
CO3	2	1	2		2	
CO4	3	2	3		2	
CO5	1		1		2	
CO6		2	1		3	2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D51P1	**Mini Project with Seminar**	L	T	P
Credits: 2		-	-	4

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: DXXXX	AUDIT COURSE- II	**L**	**T**	**P**
Credits: Nil		2	-	-

Pre-Requisites: Computer Networks

Course Objectives:
1. provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect andprevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures,data acquisition and validation, e-discovery tools
4. E-evidence collection and preservation, investigating operating systems and file systems,network forensics, art of steganography and mobile device forensics

MODULE – I [10 Periods]
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalisticsarea, holistic approach to cyber-forensics

MODULE – II [10 Periods]
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.

MODULE – III [10 Periods]
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 andapply probable cause.

MODULE – IV [10 Periods]
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.

MODULE – V [10 Periods]
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

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.

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

	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		1	
CO2	3	2	3	2	3	3
CO3	2	3	2		2	
CO4	3		1			

Prerequisites:
1. Computer Organization & Architecture
2. Operating System Programming

Course Objectives:
1. To Improve the system performance
2. To learn various distributed and parallel computing architecture
3. To learn different computing technologies

MODULE – I   [10 Periods]

Grid Computing: Data & Computational Grids, Grid Architectures And Its Relations To Various Distributed Technologies. Autonomic Computing, Examples Of The Grid Computing Efforts (IBM).

MODULE – II   [10 Periods]

Cluster Computing at a Glance: Introduction, A Cluster Computer and its Architecture, Cluster Classifications, Commodity Components for clusters, Network Services/Communication SW, Cluster Middleware and SSI, RMS, Programming Environments and Tools, Cluster Applications.

Lightweight Messaging Systems: Introduction, Latency Bandwidth Evaluation of Communication performance, Traditional Communication Mechanisms for clusters, Lightweight Communication Mechanisms.

MODULE – III   [10 Periods]

Job and Resource Management Systems: Need of Job management, Components and Architecture. Scheduling Parallel Jobs on Clusters: Introduction, Rigid Jobs with process migration, Malleable Jobs with Dynamic Parallelism, Communication-Based Coscheduling, Batch Scheduling.

Cluster Operating Systems: COMPaS.

MODULE – IV   [10 Periods]

Pervasive Computing Concepts & Scenarios: Hardware & Software; Human – Machine Interface.

Device Connectivity: Java For Pervasive Devices; Application Examples.

MODULE – V   [10 Periods]

Classical Vs Quantum Logic Gates: One, Two & Three Qubit Quantum Gates; Fredkin & Toffoli Gates; Quantum Circuits; Quantum Algorithms.

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.

TEXT BOOKS:
1. Grid Computing, J. Joseph & C. Fellenstien, Pearson Education
2. High Performance Cluster Computing, Raj kumar Buyya, pearson Education.
3. Pervasive Computing, J. Burkhardt et.al, Pearson Education
4. Approaching Quantum Computing Marivesar, Pearson Education.

REFERENCES:
1. The Grid 2: Blue Print for a New Computing Infrastructure, Ian Foster and Carl Kesselman, 2nd Edition, The Elsevier Series.
2. Quantum computing and Quantum Information, Neilsen & Chung L, Cambridge UniversityPress.
3. A networking approach to Grid Computing, Minoli, Wiley

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2	2	2	3	2	1	3
CO3	2	2	2		1	
CO4	3		1		2	

Prerequisites: Nil

Course Objectives:
1. To introduce the fundamentals of quantum computing
2. The problem-solving approach using finite dimensional mathematics

MODULE – I   [10 Periods]

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 NumbersGraphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers.

MODULE – II   [10 Periods]

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.

MODULE – III   [10 Periods]

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, TheD-Wave Quantum Architecture.

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

MODULE – IV   [10 Periods]

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

MODULE – V   [10 Periods]

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve

The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications

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

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 QuantumComputing Algorithms

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	2	3		3	1
CO2	2	1		2		3
CO3		3	2		1	
CO4	2	2			2	

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech III Sem		
Code: DXXXX	OPEN ELECTIVE		L	T	P
Credits: 3			3	-	-

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: D51P2	**DISSERTATION WORK REVIEW - II**	**L**	**T**	**P**
Credits: 6		-	-	12

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech IV Sem		
Code: D51P3	**DISSERTATION WORK REVIEW - III**	L	T	P
Credits: 6		-	-	12

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech IV Sem		
Code: D51P4		L	T	P
Credits: 14	DISSERTATION VIVA-VOCE	-	-	28

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech II Sem	
Code: D5128	IPR	L	T	P
Credits: 3	(OPEN ELECTIVE)	3	-	-

Prerequisites: Nil

Course Objectives:
1. To explain the art of interpretation and documentation of research work
2. To explain various forms of intellectual property rights
3. To discuss leading International regulations regarding Intellectual Property Rights

MODULE- I [10 Periods]
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

MODULE – II [10 Periods]
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

MODULE – III [10 Periods]
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

MODULE – IV [10 Periods]
Trade Secrets: Trade secret law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

MODULE – V [10 Periods]
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand types of Intellectual Property
2. Analyze trademarks and its functionality
3. Illustrate law of copy rights and law of patents

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd.

COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	3		3	1
CO2	2	2	2	2	3	3
CO3	3		1			

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5129	FAULT TOLERANCE SYSTEMS	L	T	P
Credits: 3	(OPEN ELECTIVE)	3	-	-

Prerequisites: Nil

Course Objectives:
1. To know the different advantages and limits of fault avoidance and fault tolerance techniques.
2. To impart the knowledge about different types of redundancy and its application for the design of computer system being able to function correctly even under presence of faults and data errors.
3. To understand the relevant factors in evaluating alternative system designs for a specific set of requirements.
4. To understand the subtle failure modes of "fault-tolerant" distributed systems.

MODULE – I [10 Periods]
Introduction to Fault Tolerant Computing: Basic concepts and overview of the course; Faults and their manifestations, Fault/error modeling, Reliability, availability and maintainability analysis, System evaluation, performance reliability tradeoffs.

MODULE – II [10 Periods]
System level fault diagnosis: Hardware and software redundancy techniques. Fault tolerant system design methods, Mobile computing and Mobile communication environment, Fault injection methods.

MODULE – III [10 Periods]
Software fault tolerance: Design and test of defect free integrated circuits, fault modeling, built in self-test, data compression, error correcting codes, simulation software/hardware, fault tolerant system design, CAD tools for design for testability.

MODULE – IV [10 Periods]
Information Redundancy and Error Correcting Codes: Software Problem. Software Reliability Models and Robust Coding Techniques, Reliability in Computer Networks Time redundancy. Re execution in SMT, CMP Architectures, Fault Tolerant Distributed Systems, Data replication.

MODULE – V [10 Periods]
Case Studies in FTC: ROC, HP Non-Stop Server. Case studies of fault tolerant systems and current research issues.

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:

1. Become familiar with general and state of the art techniques used in design and analysis offault tolerant digital systems.
2. Be familiar with making system fault tolerant, modeling and testing, and benchmarking toevaluate and compare systems.

TEXT BOOK:
1. Fault Tolerant Computer System Design by D. K. Pradhan, Prentice Hall.

REFERENCES:
1. Fault Tolerant Systems by I. Koren, Morgan Kauffman.
2. Software Fault Tolerance Techniques and Implementation by L. L. Pullum, Artech HouseComputer Security Series.
3. Reliability of Computer Systems and Networks: Fault Tolerance Analysis and Design by M. L.Shooman, Wiley.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	1		3	
CO2	2	3	3	2	3	2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech II Sem		
Code: D5130	**INTRUSION DETECTION SYSTEMS**		**L**	**T**	**P**
Credits: 3	**(OPEN ELECTIVE)**		3	-	-

Prerequisites: Computer Networks, Computer Programming

Course Objectives:
1. Compare alternative tools and approaches for Intrusion Detection through quantitative analysisto determine the best tool or approach to reduce risk from intrusion.
2. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

MODULE – I   **[10 Periods]**
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 Detectionand Intrusion Prevention, Network and Host-based IDS

MODULE – II   **[10 Periods]**
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/sopHesitated groups-Automated: Drones, Worms, Viruses

MODULE – III   **[10 Periods]**
A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS,Cost sensitive IDS

MODULE – IV   **[10 Periods]**
Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)- Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection

MODULE – V   **[10 Periods]**
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

Course Outcomes: After completion of the course, students will be able to:
1. Possess a fundamental knowledge of Cyber Security.
2. Understand what vulnerability is and how to address most common vulnerabilities.

3. Know basic and fundamental risk management principles as it relates to Cyber Security andMobile Computing.
4. Have the knowledge needed to practice safer computing and safeguard your information usingDigital Forensics.
5. Understand basic technical controls in use today, such as firewalls and Intrusion Detectionsystems.
6. Understand legal perspectives of Cyber Crimes and Cyber 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.

Online Websites/Materials:
1. https://www.intechopen.com/books/intrusion-detection-systems/

Online Courses:
1. https://www.sans.org/course/intrusion-detection-in-depth
2. https://www.cybrary.it/skill-certification-course/ids-ips-certification-training-course

COs	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
	Program Outcomes (POs)
	PO1	PO2	PO3	PO4	PO5	PO6
CO1		3	2		3	1
CO2	2	1	1	2	3	3
CO3	1	3	2			
CO4	2	2	3			
CO5	3		1		2	
CO6		2	1	1		3

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5131	**DIGITAL FORENSICS**	**L**	**T**	**P**
Credits: 3	**(OPEN ELECTIVE)**	3	-	-

Pre-Requisites: Cybercrime and Information Warfare, Computer Networks

Course Objectives:
1. provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect andprevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures,data acquisition and validation, e-discovery tools
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

MODULE – I [10 Periods]

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

MODULE – II [10 Periods]

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.

MODULE – III [10 Periods]

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

MODULE – IV [10 Periods]

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 forpreservation of network data.

MODULE – V [10 Periods]

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

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.

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 DigitalForensics: An Introduction, Routledge.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2	2	3	3	2	3	3
CO3	2	3	2		2	
CO4	2	2	1			1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: D5132	OPTIMIZATION TECHNIQUES (OPEN ELECTIVE)	L	T	P
Credits: 3		3	-	-

Prerequisite: Mathematics –I, Mathematics –II

Course Objectives:

1. To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
2. Constrained and unconstrained optimization techniques for solving and optimizing electrical and electronic engineering circuits design problems in real world situations.
3. To explain the concept of Dynamic programming and its applications to project implementation.

MODULE – I   [10 Periods]

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surface classification of Optimization problems.

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

MODULE – II   [10 Periods]

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

MODULE – III   [10 Periods]

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints: Kuhn – Tucker conditions.

Single Variable Nonlinear Unconstrained Optimization: Elimination methods: Uni Model function-its importance, Fibonacci method & Golden section method.

MODULE – IV   [10 Periods]

Multi variable nonlinear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hooke - Jeeves, Rosenbrock's search methods. Gradient methods:Gradient of function & its importance, Steepest descent method, Conjugate

direction methods: Fletcher-Reeves method & variable metric method.

MODULE - V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Course Outcomes: After completion of this course, the student will be able to:
1. explain the need of optimization of engineering systems.
2. understand optimization of electrical and electronics engineering problems.
3. apply classical optimization techniques, linear programming, simplex algorithm, transportationproblem.
4. apply unconstrained optimization and constrained non-linear programming and dynamicprogramming.
5. Formulate optimization problems.

TEXT BOOKS:
1. Optimization Techniques & Applications by S.S.Rao, New Age International.
2. Optimization for Engineering Design by Kalyanmoy Deb, PHI

REFERENCES:
1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series inOperations Research 3rd edition, 2003.
2. H. A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Optimization Techniques by Belegundu & Chandrupatla, Pearson Asia.
4. Optimization Techniques Theory and Practice by M.C. Joshi, K.M. Moudgalya, Narosa Publications

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	
CO2	2	3	3	2	3	2
CO3	2	3	2			
CO4	3	2	1		2	
CO5	2				2	

Prerequisites: Nil

Course Objective: To learn about design of cyber-physical systems

MODULE – I [10 Periods]
Symbolic Synthesis for Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of SymbolicModels, Continuous-Time Controllers, Software Tools

MODULE – II [10 Periods]
Security of Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches

MODULE – III [10 Periods]
Synchronization in Distributed Cyber-Physical Systems: Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time-Triggered Architecture, Related Technology, Advanced Techniques

MODULE – IV [10 Periods]
Real-Time Scheduling for Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty

MODULE – V [10 Periods]
Model Integration in Cyber-Physical Systems
Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, ForSpec, The Syntax ofCyPhyML, Formalization of Semantics, Formalization of Language Integration.

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand the core principles behind CPS
2. Identify Security mechanisms of Cyber physical systems
3. Understand Synchronization in Distributed Cyber-Physical Systems

TEXT BOOKS:

1. Raj Rajkumar, Dionisio De Niz, and Mark Klein, Cyber-Physical Systems, Addison-WesleyProfessional.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015

COs	Program Outcomes (POs)					
CO- PO Mapping **(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3		3	
CO2	3	3	3	2	1	1
CO3	3	1	2		2	

Prerequisites: Nil

Course Objectives:
1. To explore the concept of Graphs and related algorithms.
2. To learn new ways to model, store, retrieve and analyze graph-structured data.
3. To be aware of advanced concepts in graph analytic techniques and its applications.

MODULE – I   [10 Periods]
Introduction and Application of Large-scale Graph: Characteristics, Complex Data Sources - Social Networks, Simulations, Bioinformatics; Categories- Social, Endorsement, Location, Co-occurrence graphs; Graph Data structures, Parallel, Multicore and Graph Algorithms

MODULE - II Algorithms: Search and Paths   [10 Periods]
A Work-Efficient Parallel Breadth-First Search Algorithm (or How To Cope With the Nondeterminism ofReducers), Multi-Objective Shortest Paths

MODULE - III Algorithms: Structure   [10 Periods]
Multicore Algorithms for Graph Connectivity Problems, Distributed Memory Parallel Algorithms for Massive Graphs, Massive-Scale Distributed Triangle Computation and Applications

MODULE - IV Models   [10 Periods]
Recent Advances in Scalable Network Generation, Computational Models for Cascades in Massive Graphs, Executing Dynamic Data-Graph Computations Deterministically Using Chromatic Scheduling.

MODULE - V Frameworks and Software   [10 Periods]
Graph Data Science Using Neo4j, A Cloud-Based Approach to Big Graphs, Interactive Graph Analyticsat Scale in Arkouda

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand Large-scale Graph and its Characteristics
2. Analyze Breadth-First Search Algorithm
3. Illustrate Recent Advances in Scalable Network Generation

TEXT BOOKS:

1. David A. Bader, Massive Graph Analytics, CRC Press

REFERENCES:

1. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods and Applications",(Structural Analysis in the Social Sciences), Cambridge University Press, 1995.
2. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press, 2010.
3. Tanja Falkowski, "CommModuley Analysis in Dynamic Social Networks", (Dissertation), UniversityMagdeburg, 2009.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3		3	1
CO2	3	1	3	2	1	2
CO3	3	1	2		2	

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech. I/II Semester	
Code: DA001	ENGLISH FOR RESEARCH PAPER WRITING (Audit Course- I & II)	L	T	P
Credits: 0		2	-	-

Prerequisites: None

Course Objectives: Students will be able to:
- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time Submission

Module I [5 Periods]
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Module II [6 Periods]
Clarifying Who Did What, Highlighting Your Findings, Hedging and criticizing, paraphrasing and plagiarism, sections of a paper, abstracts. Introduction.

Module III [5 Periods]
Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Module IV [5 Periods]
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.

Module V [6 Periods]
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Module VI [5 Periods]
Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

TEXT BOOKS/ REFERENCE BOOKS
1. Goldbort R (2006) Writing for Science, Yale University Press.
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'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

Course Outcomes:
At the end of the course, students will be able to
1. Will be able to understand how to write a research paper.
2. Will outline the drafting of an abstract.
3. Will acquire the skills of various elements of research.
4. Will be in a position to write a good paper.
5. Will result in increasing the chance of publication.

<table>
<tr><td colspan="7" align="center">CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="6" align="center">Program Outcomes (POs)</td></tr>
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<tr><td>CO1</td><td>1</td><td>2</td><td></td><td></td><td>1</td><td>2</td></tr>
<tr><td>CO2</td><td></td><td></td><td>3</td><td>1</td><td></td><td></td></tr>
<tr><td>CO3</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td>2</td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO5</td><td>3</td><td>2</td><td>1</td><td></td><td>1</td><td>1</td></tr>
</table>

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

Module -I: Introduction: [5 Periods]
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Module -II: Repercussions of Disasters and Hazards: [6 Periods]
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.

Module -III: Disaster Prone Areas in India: [5 Periods]
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

Module -IV: Disaster Preparedness and Management: [6 Periods]
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.

Module -V: Risk Assessment Disaster Risk: [5 Periods]
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.

Module -VI: Disaster Mitigation: [5 Periods]

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Course Outcomes:

1. Understand the need and significance of studying disaster management
2. Understand the different types of disasters and causes for disasters.
3. Gain knowledge on the impacts Disasters on environment and society
4. Study and assess vulnerability of a geographical area.
5. Students will be equipped with various methods of risk reduction measures and risk mitigation.

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.

<table>
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<tr><td rowspan="2">COs</td><td colspan="6">Program Outcomes (POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td></tr>
<tr><td>CO1</td><td>1</td><td>2</td><td></td><td></td><td>1</td><td>2</td></tr>
<tr><td>CO2</td><td></td><td>2</td><td>3</td><td>1</td><td></td><td></td></tr>
<tr><td>CO3</td><td>2</td><td>2</td><td></td><td></td><td></td><td>2</td></tr>
<tr><td>CO4</td><td></td><td>2</td><td></td><td>2</td><td>1</td><td></td></tr>
<tr><td>CO5</td><td></td><td>2</td><td>1</td><td></td><td>1</td><td>1</td></tr>
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2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I/II Sem		
Code: DA003	SANSKRIT FOR TECHNICAL KNOWLEDGE (AUDIT COURSE- I & II)	L	T	P
Credits: 0		2	-	-

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Module -I: Alphabets in Sanskrit,   **[6 Periods]**

Module -II: Past/Present/Future Tense, Simple Sentences   **[7 Periods]**

Module -III: Order, Introduction of roots,   **[6 Periods]**

Module -IV: Technical information about Sanskrit Literature   **[6 Periods]**

Module -V: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics   **[7 Periods]**

Course Outcomes: Students will be able to
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

TEXT BOOKS/ REFERENCES:
1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
1. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
2. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	2			1	2
CO2		2		2	1	
CO3		2	1		1	1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech I/II Sem	
Code: DA004	VALUE EDUCATION (AUDIT COURSE- I & II)	L	T	P
Credits: 0		2	-	-

Prerequisite: None

Course Objectives: Students will be able to
- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Module -I: [6 Periods]

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

Module -II: [7 Periods]

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

Module -III: [6 Periods]

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

Module -IV: [7 Periods]

Avoid fault Thinking. Free from anger, Dignity of labour. 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

Module -V: [6 Periods]

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

Course outcomes: Students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

TEXT BOOKS / REFERENCES:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2				2
CO2		2		2	1	
CO3		2	1		1	1

Table heading: CO- PO Mapping — (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisite: None

Course Objectives: Students will be able 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.

Module -I: **[5 Periods]**
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

UNIT-II: **[5 Periods]**
Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT-III: **[6 Periods]**
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.

Module -IV: **[5 Periods]**
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

Module -V: **[6 Periods]**
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.Pachayati raj: Introduction, PRI: Zila Pachayat. 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

Module -VI: [5 Periods]

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.

Course Outcomes: Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. 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.
4. Discuss the passage of the Hindu Code Bill of 1956.

TEXT BOOKS/ REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COs	Program Outcomes (POs)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	2			1	2
CO2		2	3	1		
CO3	2	2				2
CO4		2		2	1	

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisite: None

Course Objectives: Students will be able to:

• Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.

• Identify critical evidence gaps to guide the development.

Module -I: **[7 Periods]**

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

Module -II: **[6 Periods]**

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

Module -III: **[7 Periods]**

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

Module -IV: **[6 Periods]**

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

Module -V: **[6 Periods]**

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

Course Outcomes: Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

TEXT BOOKS/ REFERENCES:

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2			1	2
CO2		2	3	1		
CO3		2	1		1	1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		M.Tech I/II Sem	
Code: DA007	**STRESS MANAGEMENT BY YOGA**	**L**	**T**	**P**
Credits: 0	**(AUDIT COURSE- I & II)**	**2**	**-**	**-**

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Module -I: [6 Periods]

Definitions of Eight parts of yog. (Ashtanga)

Module -II: [6 Periods]

Yam and Niyam.

Module -III: [7 Periods]

Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Module -IV: [6 Periods]

Asan and Pranayam

Module -V: [7 Periods]

i) Various yog poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types of pranayam

Course Outcomes: Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	2			1	2
CO2		2	3	1		

Prerequisite: None

Course Objectives:
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Module -I: **[6 Periods]**

Neetisatakam-Holistic development of personality
- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

Module -II: **[6 Periods]**

Neetisatakam-Holistic development of personality
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Module -III: **[7 Periods]**

Approach to day to day work and duties.
- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

Module -IV: **[7 Periods]**

Statements of basic knowledge.
- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

Module -V: **[6 Periods]**
- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Course Outcomes: Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

COs	Program Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2			1	2
CO2		2		2	1	
CO3		2	1		1	1

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak