



**SANTHIRAM ENGINEERING COLLEGE :: NANDYAL**

**(AUTONOMOUS)**

Approved by A.I.C.T.E., New Delhi, Permanently Affiliated to JNT University, Ananthapuramu  
Accredited by NAAC with Grade-A, Accredited by NBA (ECE & CSE)  
An ISO 9001:2015 Certified Institution, 2(f) & 12(B) recognition by UGC Act, 1956  
NH-40, NANDYAL-518501 (Dist), A.P.

**Learn-Grow-Empower**



# **ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI**

**M.TECH (COMPUTER SCIENCE & ENGINEERING)**

**REGULAR TWO YEAR PG DEGREE COURSE**  
(Applicable for the Batches Admitted from 2024-25)

**REGULATIONS:**

**R-23**



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[www.srecnandyal.edu.in](http://www.srecnandyal.edu.in)





**SANTHIRAM ENGINEERING COLLEGE**

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**DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

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# M.Tech III & IV-Semester Course Structure

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING****M.Tech. III Sem. - Course Structure**

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23D13203	PE	REINFORCEMENT LEARNING	3	0	0	3	40	60	100
2	23D58301A	CC	HIGH PERFORMANCE COMPUTING	3	0	0	3	40	60	100
3	23D58301B	CC	DATA ENGINEERING	3	0	0	3	40	60	100
4	23D58302A	OE	OPTIMIZATION TECHNIQUES	3	0	0	3	40	60	100
5	23D57302A	OE	INDUSTRIAL SAFETY	3	0	0	3	40	60	100
6	23D58302B	CC	DIGITAL MARKETING	3	0	0	3	40	60	100

**M.Tech. IV Sem. - Course Structure**

S.No	Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
			Lecture	Tutorial	Practical		Internal	External	Total
1.	23D58401	INDUSTRIAL INTERNSHIP	0	0	0	2	100	0	100
2.	23D58402	CO-CURRICULAR ACTIVITIES	0	0	0	2	100	0	100
3.	23D58403	DISSERTATION PHASE-II	0	0	32	16	100	100	200



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# M.Tech

## III Semester Syllabus

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M.Tech. III Sem.

L	T	P	C
3	0	0	3

**(23D13203) REINFORCEMENT LEARNING**

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. Understand the fundamentals of Reinforcement Learning (RL) and its elements
2. Analyze and solve multi-armed bandit problems using exploration vs. exploitation strategies.
3. Master Markov Decision Processes (MDPs) and dynamic programming techniques for RL.
4. Apply Monte Carlo and Temporal Difference methods for prediction and control in RL.
5. Utilize eligibility traces and function approximation methods for advanced RL algorithms.

**UNIT-I INTRODUCTION**

Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).

**UNIT-II EVALUATIVE FEEDBACK - MULTI-ARM BANDIT PROBLEM**

An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs

**UNIT-III INTRODUCTION TO MARKOV DECISION PROCESS (MDP), DYNAMIC PROGRAMMING (DP)**

Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations. Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP, Generalized Policy Iteration

**UNIT-IV MONTE CARLO METHODS FOR PREDICTION AND CONTROL, TEMPORAL DIFFERENCE METHODS**

Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monte Carlo Control, On policy and off policy learning, Importance sampling. Temporal Difference Methods: TD Prediction, Optimality of TD(0), TD Control methods - SARSA, Q-Learning and their variants.



# SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## UNIT-V ELIGIBILITY TRACES, FUNCTION APPROXIMATION METHODS

Eligibility Traces: n-Step TD Prediction, Forward and Backward view of TD( $\lambda$ ), Sarsa( $\lambda$ ), Watkins's Q( $\lambda$ ), Off policy eligibility traces using importance of sampling. Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods.

### TEXT BOOKS:

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction
2. Csaba Szepesvari Algorithms for Reinforcement Learning - Morgan & Claypool, 2010.

### REFERENCE BOOKS:

1. Reinforcement Learning By Richard S. (University Of Alberta) Sutton, Andrew G. (Co-Director Autonomous Learning Laboratory) Barto.

### e-Resources and Digital Material:

1. [https://onlinecourses.nptel.ac.in/noc24\\_cs102/preview](https://onlinecourses.nptel.ac.in/noc24_cs102/preview)

### COURSE OUTCOMES:

1. Understand the fundamentals of Reinforcement Learning (RL) and its distinction from supervised and unsupervised learning.
2. Analyze evaluative feedback mechanisms, including the multi-armed bandit problem and Bellman equations.
3. Apply Markov Decision Processes (MDP) and dynamic programming techniques for policy optimization.
4. Implement Monte Carlo and Temporal Difference methods for model-free RL solutions.
5. Explore advanced topics such as Deep RL, multi-agent systems, and safe RL strategies.

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

M.Tech. III Sem.

L	T	P	C
3	0	0	3

**(23D58301A) HIGH PERFORMANCE COMPUTING**

Course Category	Core Course (CC)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. To understand various parallel programming models
2. To analyze the performance and modeling of parallel programs
3. To demonstrate the different techniques for parallelizing the algorithm.
4. To implement parallel communication operations.
5. To differentiate CUDA Architecture from its components.
6. Understanding the Scope of Parallel Computing and Its Search Algorithms.

**UNIT-I INTRODUCTION TO PARALLEL COMPUTING, PARALLEL PROGRAMMING PLATFORMS**

Introduction to Parallel Computing: Motivating Parallelism, Modern Processor: Stored-program computer architecture, General-purpose Cache-based Microprocessor architecture. Parallel Programming Platforms: Implicit Parallelism, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines. Levels of parallelism, Models: SIMD, MIMD, SIMT, SPMD, Data Flow Models, Demand-driven Computation.

**UNIT-II PRINCIPLES OF PARALLEL ALGORITHM DESIGN, PARALLEL ALGORITHM MODELS, COMPLEXITIES.**

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models: Data, Task, Work Pool and Master Slave Model, Complexities: Sequential and Parallel Computational Complexity, Anomalies in Parallel Algorithms.

**UNIT-III BASIC COMMUNICATION**

Basic Communication: One-to-All Broadcast, All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Collective Communication using MPI: Scatter, Gather, Broadcast, Blocking and non blocking MPI, All-to-All Personalized Communication, Circular Shift, Improving the speed of some communication operations.

**UNIT-IV PERFORMANCE MEASURES AND ANALYSIS**

Performance Measures and Analysis: Amdahl's and Gustafson's Laws, Speedup Factor and Efficiency, Cost and Utilization, Execution Rate and Redundancy, The Effect of Granularity on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost, Optimal Execution Time, Asymptotic Analysis of Parallel Programs.





# SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## UNIT-V INTRODUCTION TO GPU, PARALLEL SEARCH ALGORITHMS, PARALLEL SORTING.

Introduction to GPU: Introduction to GPU Architecture overview, Introduction to CUDA C- CUDA programming model, write and launch a CUDA kernel, Handling Errors, CUDA memory model, Manage communication and synchronization, Parallel programming in CUDA- C. Parallel Search Algorithms: Depth First Search(DFS), Breadth First Search(BFS), Parallel Sorting: Bubble and Merge

### TEXT BOOKS:

1. .Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar,
2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009

### REFERENCE BOOKS:

1. Kai Hwang,, "Scalable Parallel Computing", McGraw Hill 1998.
2. George S. Almasi and Alan Gottlieb, "Highly Parallel Computing", The Benjamin and Cummings Pub. Co., Inc

### e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/106108055>

### COURSE OUTCOMES:

1. Understand different Parallel Paradigms.
2. Formulate and implement an effective parallel algorithm for resolving the given problem
3. Illustrate data communication operations on different parallel architecture
4. Analyze and measure performance of current parallel computing systems
5. Apply CUDA architecture for parallel programming



**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

M.Tech. III Sem.

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3	0	0	3

**(23D58301B) DATA ENGINEERING**

Course Category	Core Course (CC)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. To understand the Entity resolution and declarative taxonomy.
2. To analyze Transitive closure and data matching.
3. To understand data generator and grid based services.
4. To analyze parallel file system and grids.
5. To implement switched networks.
6. To understand textual databases

**UNIT-I INTRODUCTION, A DECLARATIVE APPROACH TO ENTITY RESOLUTION, THE DECLARATIVE TAXONOMY**

Introduction: Data Integration and Data Management, A Declarative Approach to Entity Resolution: Introduction, Background, The Declarative Taxonomy: The Nouns, The Adjectives. The Verbs, A Declarative Representation

**UNIT-II TRANSITIVE CLOSURE OF DATA RECORDS, SEMANTIC DATA MATCHING.**

Transitive Closure of Data Records: Introduction. Problem Definition, Sequential Algorithms, Parallel and Distributed Algorithms Semantic Data Matching: Introduction, Problem Statement: Data Matching for Customer Data Integration. Semantic Data Matching, Effect of Shared Terms

**UNIT-III PARALLEL GENERAL-PURPOSE SYNTHETIC DATA GENERATOR, A GRID OPERATING ENVIRONMENT FOR CDI**

Parallel General-Purpose Synthetic Data Generator : Introduction. SDDL, Parallel Data Generation. Performance and Applications. A Grid Operating Environment for CDI: Introduction, Grid-Based Service Deployment. Grid-Based Batch Processing

**UNIT-IV PARALLEL FILE SYSTEMS, PERFORMANCE MODELLING OF ENTERPRISE GRIDS**

Parallel File Systems: Introduction. Commercial Data and Access Patterns . Basics of Parallel File Systems. Design Challenges Performance Modelling of Enterprise Grids: Introduction and Background, Measurement Collection and Preliminary Analysis. Workload Characterization



# SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## UNIT-V DELAY CHARACTERISTICS OF PACKET SWITCHED NETWORKS, KNOWLEDGE DISCOVERY IN TEXTUAL DATABASES.

Delay Characteristics of Packet Switched Networks: Introduction, High-Speed Packet Switching Systems, Technical Background. Delay Characteristics of Output Queuing Switches, Delay Characteristics of Buffered Crossbar Switches, Delay Comparison of Output Queuing to Buffered Crossbar. Knowledge Discovery in Textual Databases: Introduction, Method. Experiments and Results.

### TEXT BOOKS:

1. Data Engineering Mining, Information and Intelligence Edited by Yupo Chan John R. Talburt Terry M. Talley
2. Data Engineering with Python Work with massive datasets to design data models and automate data pipelines using Python Paul Crickard

### REFERENCE BOOKS:

1. <https://github.com/letthedataconfess/Data-Engineering-Books/blob/main/Book1.pdf>

### COURSE OUTCOMES:

1. Understand the entity resolution and different declarative taxonomies.
2. Analyzed Transitive closure with problem definition and data matching with problem statement.
3. Understand SDDL and grid based service deployment and batch processing.
4. Analyze parallel file system and data access patterns.
5. Implemented High-Speed Packet Switching Systems and understand textual data bases.

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

M.Tech. III Sem.

L	T	P	C
3	0	0	3

**(23D58302A) OPTIMIZATION TECHNIQUES**

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. To enumerate the fundamental knowledge of Linear Programming and Dynamic
2. To programming problems.
3. To learn classical optimization techniques and numerical methods of optimization.
4. To know the basics of different evolutionary algorithms.
5. To explain Integer programming techniques and apply different optimization
6. To explore techniques to solve various models arising from engineering areas.

**UNIT-I LINER PROGRAMMING (L.P), DYNAMIC PROGRAMMING (D.P)**

LINER PROGRAMMING (L.P): Revised Simplex Method, Dual simplex Method, Sensitivity Analysis DYNAMIC PROGRAMMING (D.P): Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.

**UNIT-II CLASSICAL OPTIMIZATION TECHNIQUES, NUMERICAL METHODS FOR OPTIMIZATION**

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions. NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method

**UNIT-III MODERN METHODS OF OPTIMIZATION, GENETIC ALGORITHM (GA)**

MODERN METHODS OF OPTIMIZATION:MODULE I GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation

**UNIT-IV MODERN METHODS OF OPTIMIZATION, GENETIC PROGRAMMING (GP), INTEGER PROGRAMMING**

MODERN METHODS OF OPTIMIZATION:MODULE II GENETIC PROGRAMMING (GP):Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems INTEGER PROGRAMMING:Graphical Representation, Gomory's Cutting Plane Method,Balas' Algorithm for Zero-One Programming, Branch-and-Bound Method.



# SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## UNIT-V APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS:

Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

### TEXT BOOKS:

1. Engineering Optimization (4th Edition) by S.S. Rao, New Age International,

### REFERENCE BOOKS:

1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers
2. Genetic algorithms in Search, Optimization, and Machine learning – D.E. Goldberg, Addison-Wesley Publishers
3. Operations Research by Hillar and Liberman, TMH Publishers
4. Optimal design – JasbirArora, McGraw Hill (International) Publisher

### COURSE OUTCOMES:

1. Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
2. Use classical optimization techniques and numerical methods of optimization.
3. Describe the basics of different evolutionary algorithms.
4. Compare GM and GP for generative fuzzy system optimization.
5. Enumerate fundamentals of Integer programming techniques and solve various optimization problems arising from engineering areas.

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

M.Tech. III Sem.

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3	0	0	3

**(23D57302A) INDUSTRIAL SAFETY**

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. To know about Industrial safety programs and toxicology, Industrial laws ,regulations and source models
2. To understand about fire and explosion, preventive methods, relief and its sizing methods
3. To analyse industrial hazards and its risk assessment
4. To know about the industrial safety Act.

**UNIT-I INDUSTRIAL SAFETY**

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.

**UNIT-II FUNDAMENTALS OF MAINTENANCE ENGINEERING**

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

**UNIT-III WEAR AND CORROSION AND THEIR PREVENTION**

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods

**UNIT-IV FAULT TRACING**

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automatic thermal and electrical equipment's like, i.Any one machine tool, ii.pump iii.Air compression iv.Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes



# SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## UNIT-V PERIODIC AND PREVENTIVE MAINTENANCE

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Electrical Hazards and Safety, Radiation Hazard & Safety, Industrial Safety Act and Law, Industrial Disaster Management and Safety

### TEXT BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company

### REFERENCE BOOKS:

1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

### e-Resources and Digital Material:

1. [https://onlinecourses.nptel.ac.in/noc24\\_mg110/preview](https://onlinecourses.nptel.ac.in/noc24_mg110/preview)

### COURSE OUTCOMES:

1. list out important legislations related to health, Safety and Environment.
2. Understand about tools used for maintenance engineering
3. Understand about reasons for corrosion and its prevention
4. Understand about the false tracing
5. To list out requirements mentioned in factories act for the prevention of accidents and Understand the Industrial safety Act and Law

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING**

M.Tech. III Sem.

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3	0	0	3

**(23D58302B) DIGITAL MARKETING**

Course Category	Core Course (CC)
Course Enrichment Relevance	Employability

**COURSE OBJECTIVES:**

1. Understand the importance of digital marketing in today's rapidly changing business environment.
2. To analyze the Digital advertising Market in India
3. To implement the Search Engine optimization
4. To apply E-Mail marketing in business.
5. To understand Social media for brand conversations and buzz and implement recent trends in Digital marketing.

**UNIT-I FUNDAMENTALS OF DIGITAL MARKETING AND ITS SIGNIFICANCE**

Fundamentals of Digital marketing and Its Significance- Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities.

**UNIT-II THE DIGITAL USERS IN INDIA, DIGITAL MARKETING STRATEGY**

The Digital users in India, Digital marketing Strategy- Consumer Decision journey, POEM Framework, Segmenting & Customizing messages, Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan.

**UNIT-III SEARCH ENGINE OPTIMIZATION**

Search Engine optimization - Keyword Strategy- SEO Strategy - SEO success factors - On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works.

**UNIT-IV E- MAIL MARKETING, SOCIAL MEDIA MARKETING**

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based. Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns.

**UNIT-V ENGAGEMENT MARKETING, DIGITAL TRANSFORMATION & CHANNEL ATTRIBUTION**

Engagement Marketing-Building Customer relationships - Creating Loyalty drivers - Influencer Marketing. Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing





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(AUTONOMOUS)

DEPARTMENT OF CSE - COMPUTER SCIENCE ENGINEERING

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## TEXT BOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia Publisher: Pearson Education; First edition (July 2017)
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press ( April 2015)

## REFERENCE BOOKS:

1. Digital and Social Media Marketing: Emerging Applications and Theoretical
2. Development, Nripendra P. Rana 2019

## e-Resources and Digital Material:

1. Advanced Certificate in Digital Marketing and Communication
2. MICA, upGrad

## COURSE OUTCOMES:

1. To examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
2. To focus on how digital marketing can be utilized by organizations and how its effectiveness can be measured.
3. To know the Search Engine Marketing.
4. To study the Measuring and maximizing email campaign effectiveness.
5. To demonstrate advanced skills in common digital marketing tools and implement recent trends in Digital marketing.



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### **VISION**

- ✿ To become a nucleus for pursuing technical education and pool industrial research and developmental activities with social-conscious and global standards.

### **MISSION**



- M1:** To provide Advanced Educational Programs and prepare students to achieve success and take leading roles in their chosen fields of specialization by arising a self-sustained University.
- M2:** To establish postgraduate programs in the current and Advanced Technologies.
- M3:** To establish an R&D Consultancy through developing Industry Institute Interaction, building up exceptional infrastructure.
- M4:** To propel every individual, realize and act for the technical development of the society.

### **MOTTO**

- ✿ Education for Peace and Progress



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