

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech., INDUSTRIAL ENGINEERING AND MANAGEMENT**  
**EFFECTIVE FROM ACADEMIC YEAR 2025-26 ADMITTED BATCH**  
**R25 COURSE STRUCTURE AND SYLLABUS**

**I Year I Semester**

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Industrial Engineering and Management	3	0	0	3
Professional Core-II	Statistical Quality Control	3	0	0	3
Professional Elective - I	1. Optimization Techniques and Applications 2. Artificial Intelligence in Manufacturing 3. Materials Management	3	0	0	3
Professional Elective - II	1. Plant Maintenance and Reliability Engineering 2. Six Sigma and Taguchi Approach 3. Marketing Management	3	0	0	3
	Research Methodology and IPR	2	0	0	2
Lab - I	Industrial Engineering Practices Lab	0	0	4	2
Lab - II	Statistical Quality Control System Lab	0	0	4	2
Audit - I	Audit Course- I	2	0	0	0
<b>Total</b>		<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**I Year II Semester**

Course Code	Course Title	L	T	P	Credits
Professional Core - III	Manufacturing Systems: Simulation Modelling and Analysis	3	0	0	3
Professional Core - IV	Supply Chain Management	3	0	0	3
Professional Elective - III	1. Total Quality Management 2. IoT in Manufacturing 3. Energy Management	3	0	0	3
Professional Elective - IV	1. Data Analytics 2. Strategic Management 3. Lean Manufacturing	3	0	0	3
	Mini Project with Seminar	0	0	4	2
Lab - III	Simulation of Manufacturing Systems Lab	0	0	4	2
Lab - IV	Supply Chain Management Lab	0	0	4	2
Audit - II	Audit Course - II	2	0	0	0
<b>Total</b>		<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**II Year I Semester**

Course Code	Course Title	L	T	P	Credits
Professional Elective - V	1. Product data Management 2. Financial Management 3. Leadership and Change Management	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	18	6
<b>Total</b>		<b>6</b>	<b>0</b>	<b>18</b>	<b>12</b>

**II YEAR II - SEMESTER**

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	18	6
Dissertation	Dissertation Viva-Voce	0	0	42	14
<b>Total</b>		<b>0</b>	<b>0</b>	<b>60</b>	<b>20</b>

**\*For Dissertation Work Review- I, please refer R25 Academic Regulations.**

**Audit Course I:**

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education

**Audit Course II:**

1. Constitution of India
2. Pedagogy Studies
3. Stress Management by Yoga
4. Personality Development through Life Enlightenment Skills

**Open Electives:**

1. Business Analytics
2. Waste to Energy
3. E- Commerce Management and Digital Communication
4. Industrial Safety

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****INDUSTRIAL ENGINEERING AND MANAGEMENT**

L	T	P	C
3	0	0	3

**(Professional Core - I)**

**Prerequisites:** Manufacturing Engineering, Engineering Economics and Costing

**Course Objectives:**

1. To understand the concept of management and organizational structure.
2. To gain knowledge on work-study and allowances in work management.
3. To understand workplace designs.
4. To acquire knowledge of job evaluation and various wage schemes.
5. To estimate the cost of production in various manufacturing processes.

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

1. Make managerial decisions for effective business administration.
2. Explore various methods of work study and evaluate standard time
3. Design various types of workspaces.
4. Explain and implement various job evaluation methods.
5. Evaluate the overall cost of production for a product.

**UNIT- I: Work Study and Measurement**

Introduction, Definition, Objectives, Steps in Work-Study. Method study: Definition, Objectives, Steps of Method Study, Outline Process Charts and Flow Process Charts.

Work Measurement, Purpose, Types of Study, Stopwatch Methods, Steps, Key rating, Allowances, Standard Time Calculations and Work Sampling.

**UNIT- II: Workplace and Human Factors Engineering**

Work Place Design, Layout, Types of Layouts, Cellular Layouts FMS Layout, ALDEP CORE LAP, Anthropometry. Structural Body Dimensions, Use of Anthropometry Data, Work Space Dimensions, Work Space for Personal when Seated, Minimum Requirement for restricted Spaces Work Surfaces, Work Surfaces when Seated, Standing Science of Seating, Principles of Seat Design.

Nature of Man, Machine System, Fundamental Man, Machine System Assumptions, Types of Systems. Data Base if Human Factors, Human performance, Types of Human Error in System Tasks, Task Data, Empirical Task Data and Judgmental Task Data.

Visual Displays, Process Of Seeing, Types of Visual Activity, Conditions That Affect Visual Discriminations, Quantitative Visual Display, Basic Design Of Dynamic Quantitative Displays, Quantitative Visual Display, Strategy Indicators, Signal And Warning Lights.

**UNIT- III: Job Design and Wage Systems**

Job Design, Job Evaluation, Methods of Job Evaluation, Simple Outing Objective Systems, Classification Method, Factor Comparison Method, Point Method, Benefits of Job Evaluation and Limitations, Merit Rating, Job Evaluation Vs Merit Rating, Objectives of Merit Rating, Method for Merit Rating, Ranking Method, Paid Company Method, Checklist Method.

Wages, Wage Incentive Scheme, and Objectives of a Good Wage Incentive Plan, Basis of Good Wage, Incentive Plan, Types of Wage, Incentive Plans, Time Method, Straight Piece Rate Method, and Differential Piece Rate Method. Hasley Premium Plan, Emerson Efficiency Plan, Bedeaux Point Plan.

**UNIT- IV: Estimating and Costing**

Importance, Aims, Functions, Qualities Of Estimator, Cost, Definition Aims Standard Cost, Difference between Estimating and Costing, Costing Methods, Elements of Costs, Mensuration. Estimating of Material Cost and Overheads, Machine Shop, Sheet Metal Shop, Forging, Welding Shop-Selling Price Calculations.

**UNIT- V: Business and Process Models**

Business Process Outsourcing (BPO) refers to contracting business tasks like onshore, offshore, or nearshore services. It includes selecting, transitioning, and managing outsourced processes. Key benefits are cost savings and improved focus, governed by service level agreements (SLA). BPO involves risks that need mitigation and affects company structure and culture. Successful case studies demonstrate its advantages.

Business Process Reengineering (BPR): Introduction And History of BPR, Key Principles and Objectives of BPR, Difference Between BPR and Continuous Improvement, Steps and Methodology for Implementing BPR, Role of Technology in BPR, Challenges and Critical Success Factors in BPR and Real-World Examples of BPR in Organizations.

Concurrent Engineering (CE): The Concept and Significance of Concurrent Engineering, Comparison Between Traditional and Concurrent Approaches, CE in Product and Process Development, Cross-Functional Teams And Collaboration Models, Tools Supporting CE Including CAD, Product Data Management (PDM) and Product Lifecycle Management (PLM), Benefits And Limitations of CE, And Case Studies Illustrating CE In Industry.

Process Management (PM): Fundamentals of Business Process Management (BPM), Process Identification, Mapping and Documentation, Performance Measurement And Process Metrics, Process Improvement Techniques Such As Lean, Six Sigma, And Kaizen, Process Automation And Workflow Management Systems (WMS), Change Management And Governance in Process Management, Emerging Trends Like Process Mining and Robotic Process Automation (RPA) and Examples of Successful Process Management Initiatives.

**TEXT BOOKS:**

1. Industrial Engineering and Management, N. V. S. Raju, Cengage Publications, 1st Edition, 2013.
2. Mechanical Estimating and Costing, T. T. Banga, S. C. Sharma, Khanna Publishers, 1st Edition, 1988.

**REFERENCE BOOKS:**

1. Motion and Time Study, Ralph M. Barnes, John Wiley and Sons, 1st Edition, 1937.
2. Work Study, International Labour Organization (ILO), 4th Edition, 1992.
3. Human Factors in Engineering and Design, Ernest J. McCormick, Tata McGraw-Hill (TMH), 1st Edition, 1982.
4. Production and Operations Management, Paneer Selvam, PHI Learning, 1st Edition, 2005.
5. Industrial Engineering Handbook, H. B. Maynard, McGraw-Hill, 3rd Edition, 1971.
6. Industrial Engineering and Production Management, Martand Telsang, S. Chand Publishing, 4th Edition, 2013.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech., I Year, I Semester**  
**STATISTICAL QUALITY CONTROL**  
**(Professional Core - II)**

L	T	P	C
3	0	0	3

**Prerequisites:** Quality Management, Statistics and Probability

**Course Objectives:**

1. To understand the concept of underlying statistical quality control.
2. To acquire knowledge of various process control methods.
3. To understand various charts for control limits.
4. To gain knowledge on the establishment of tolerances and limits.
5. To understand various sampling methods.

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

1. Difference between quality control and inspection.
2. Make various charts for process control.
3. Implement various types of chart attributes.
4. Explain various methods of establishing tolerance limits.
5. Explain and apply various sampling methods.

**UNIT – I: Quality and Statistical Foundations**

Definition, Difference between Quality Control and Inspection, Variable, Attribute Assignable and Non-Assignable causes. Description of Patterns of Variation, Averages, Measures of Desperations, Sampling Statistics, Universe Parameters, Normal Curves, Theory of Probability, Random Variables and there Distributions, Standard Distributions, Binomial Hyper Geometry, Estimator, Properties of Estimator, Estimate, Point Estimate, Confidence Interval, Limits.

**UNIT – II: Control Charts and Process Capability**

X and R Charts, Necessary Steps, Decisions Preparatory to Charts, Making and Recording, Trail Control Limits, Calculations Drawings of Preliminary Conclusions, Relations between Processes out of Control and Specifications Limits use of Charts, Process Capability, Definition in Analysis of Process Capability, Sources of Variability.

**UNIT – III: Attribute Control Charts**

Charts for Fraction Rejected Need for Charts and Attributes, Control Limits for the P Chart, Necessary Steps and Decision Preparation to Control, Decision on the Selection of Sub Groups, Choice between Charts P and Chart for NP Interpretation of Lack of Causes, Reports and Action, Sensitivity of P Charts.

**UNIT – IV: Non-Conformity Charts and Tolerances**

Control Charts for Non-Conformities, Conditions Favorable, Control Limits for C and U Charts, U Charts for Non-Conformities. Aspects of Specification, Tolerance, Purpose, Content, Design and Inspection, Statistical Methods Setting better Specification Limit, Establishment of Tolerance Limit by Pilot Runs, Two Statistical Theorems Precisions.

**UNIT – V: Acceptance Sampling and AQL Systems**

Acceptance Sampling, Need Concept, Economics, Symbols and Terminology, Formation of Lot for Acceptance, Lot-By-Lot Don Roaming System for Lot-By-Lot, Acceptance Sampling by Attributes. An AQL System for Lot-By-Lot Acceptance, Sampling by Attributes, Selection of Acceptance Sampling System, Determining the Sample Size Code Letter, Probability of Acceptance of Lot Having AQL Percent Defective, O.C. Curves under Normal, Tightened and Reduced Inspections, Calculating Probability of Switching N.T.N.

**TEXT BOOKS:**

1. Introduction to Statistical Quality Control, Douglas C. Montgomery, Wiley, 7th Edition, 2012.
2. Statistical Quality Control, Walter A. Shewhart, D. Van Nostrand Company, 1st Edition, 1931.

**REFERENCE BOOKS:**

1. Statistical Quality Control, Eugene L. Grant and Richard S. Leavenworth, McGraw-Hill, 7th Edition, 1996.
2. Statistical Quality Control, M. Mahajan, Dhanpat Rai and Co., 1st Edition, 2016.
3. Statistical Quality Control, M. Jeya Chandra, CRC Press, 1st Edition, 2001.
4. Statistical Quality Control, E. L. Grant (earlier edition), McGraw-Hill, 1964.
5. Quality Control, Dale H. Besterfield, Pearson Education, 8th Edition, 2009.
6. Introduction to Statistical Quality Control, Douglas C. Montgomery, Wiley India, 7th Edition, 2013.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****OPTIMIZATION TECHNIQUES AND APPLICATIONS**  
**(Professional Elective - I)**

L	T	P	C
3	0	0	3

**Pre-requisites:** Operations Research**Course Objectives:**

1. To introduce the fundamentals of optimization and its role in engineering and decision-making.
2. To develop the ability to formulate optimization problems for real-world applications.
3. To familiarize students with classical, numerical, and modern optimization techniques.
4. To enable analysis and comparison of various optimization algorithms for efficiency and accuracy.
5. To apply optimization methods to solve practical problems in manufacturing, design, and management.

**Course Outcomes:** At the end of the course, the student will be able to

1. Apply suitable optimization techniques to solve single-variable and multivariable problems.
2. Perform sensitivity analysis for parameter changes in Linear Programming Problems.
3. Solve integer and stochastic programming problems using appropriate algorithms.
4. Formulate and solve Goal Programming models for multi-objective optimization.
5. Apply metaheuristic methods such as Genetic Algorithm, Simulated Annealing, and Particle Swarm Optimization to real-world problems.

**UNIT-I: Linear Programming**

Formulation, Simplex Method and Artificial Variable Optimization Techniques: Big M and Two-Phase Methods. Sensitivity Analysis: Changes in the Objective Coefficients, Constants and Coefficients of the Constraints. Addition of Variables, Constraints. Simulation, Introduction, Types, Steps, Applications. Inventory and Queuing, Advantages and Disadvantages.

**UNIT-II: Integer and Stochastic Programming Techniques**

Integer Programming: Introduction, Formulation, Geometry Cutting Plane Algorithm, Zero or One Algorithm, Branch and Bound Method.

Stochastic Programming: Basic Concepts of Probability Theory, Random Variables, Distributions - Mean, Variance, Correlation, Co Variance, Joint Probability Distribution.

Stochastic Linear Programming: Chance Constrained Algorithm.

**UNIT-III: Single Variable Non-Linear Unconstrained Optimization**

Elimination Methods: Uni-Model Function, Its Importance. Fibonacci Method and Golden Section Method. Interpolation Methods: Quadratic and Cubic Interpolation Methods.

**UNIT-IV: Multi variable non-linear unconstrained optimization**

Direct Search Methods, Univariant Method, Pattern Search Methods, Powell's, Hook Jeeves, Rosenbrock Search Methods. Gradient Methods: Gradient Of Function and its Importance, Steepest Descent Method, Conjugate Direction Methods: Fletcher- Reeves Method Variable Metric Method.

**UNIT-V: Geometric Programming and Modern Optimization Methods**

Geometric Programming: Posynomials, Arithmetic, Geometric Inequality, Unconstrained G.P, Constrained G.P ( $\leq$  Type Only).

Non-Traditional Optimization Algorithms: Genetics Algorithm, Working Principles, Similarities and Differences Between Genetic Algorithm and Traditional Methods. Simulated Annealing, Working Principle, Simple Problems. Introduction to Particle Swarm Optimization. (PSO).

**TEXTBOOKS:**

1. Engineering Optimization: Theory and Practice, S. S. Rao, New Age International Pvt. Ltd Publishers, 3<sup>rd</sup> Edition, 2013.
2. Optimization for Engineering Design: Algorithms and Examples, Kalyanmoy Deb, PHI, 2<sup>nd</sup> Edition, 2012.

**REFERENCE BOOKS:**

1. Operations Research: Theory and Applications, S. D. Sharma, Kedar Nath Ram Nath Publisher, 4<sup>th</sup> Edition, 2022.
2. Operations Research: An Introduction, H. A. Taha, Pearson Publisher, 10<sup>th</sup> Edition, 2019.
3. Optimization in operations research, R. L Rardin, Pearson Imprint, 3<sup>rd</sup> Edition, 2016.
4. Optimization Techniques, Chakraverty and P.R. Chandraputla, Pearson Asia, 1<sup>st</sup> Edition, 2011.
5. Optimization: Theory and Practice, Mohan C. Joshi and Kannan M. Moudgalya, Narosa Publishing House, 1<sup>st</sup> Edition, 2004.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****ARTIFICIAL INTELLIGENCE IN MANUFACTURING  
(Professional Elective – I)**

L	T	P	C
3	0	0	3

**Prerequisite:** Production Systems, Fundamentals of Artificial Intelligence**Course Objectives:**

1. To introduce the fundamentals of artificial intelligence and its relevance in manufacturing.
2. To study AI techniques applicable to production planning, process control, and quality management.
3. To explore machine learning algorithms for predictive maintenance and process optimization.
4. To apply AI for real-time monitoring, robotics, and automation in manufacturing environments.
5. To familiarize students with case studies and industrial applications of AI in manufacturing.

**Course Outcomes:** After completion of this course the student will be able to

1. Understand the basic concepts of AI and its applications in manufacturing systems.
2. Apply machine learning techniques for manufacturing process optimization.
3. Analyze manufacturing data for predictive analytics and decision-making.
4. Implement AI-based solutions in robotics, automation, and process control.
5. Evaluate AI-driven manufacturing systems for productivity and quality improvement.

**UNIT - I: AI and Search Methods**

Definition, History, Present State of Artificial Intelligence (AI), Phases of AI, Approaches to AI - Hard or Strong AI, Soft or Weak AI, Applied AI, Cognitive AI, and Applications Domains Focused on Manufacturing-Role of AI in Industrial Revolution 4.0, Components, Advantages, Challenges. Problem Solving Methods- 1. Uninformed Search Includes Depth First Search (DFS), Breadth First Search (BFS), Uniform Cost Search (UCS), Depth Limited Search, Iterative Deepening Depth First Search (IDDFS) And Bidirectional Search. 2. Informed Search (Heuristic Search) Includes Greedy Best First Search, A\* Search, Memory Bounded Heuristic Search, Learning to Search Better, Simple Problems

**UNIT - II: Neural Networks**

Introduction to Perceptron and Neural Networks, Activation and Loss Functions, Single Neuron of Human and Human Brain Modelling, ANN Architecture-Input Layer, Hidden Layer and Output Layer, Types of Neural Networks- Single Layer Feed-Forward Network, Multilayer Feed-Forward Network, Multi-Layer Perceptron (MLP), Recurrent Networks or Feedback ANN, Characteristics of Neural Networks, Simple Problems on Back Propagation Algorithms to Minimize the Error.

**UNIT - III: Computer Vision and CNNs**

Introduction to Convolutional Neural Networks (CNNs), What is CNN, Common Uses for CNN, CNN's Basic Architecture- Lenet, Alexnet, Vggnet, Googlenet, Resnet, Introduction to Images, Representation, Image Extraction, Segmentation, Analysis, Simple Demonstration on Image Processing Using ANN - Face Detection, Fingerprint Recognition etc.

**UNIT - IV: Supervised and Unsupervised Learning**

Unsupervised Learning, Definition, Basic Concepts, Applications, K-Means Clustering, Hierarchical Clustering, Dimension Reduction-PCA, Simple Examples.

Supervised Learning: Definition, Basic Concepts, Applications, Linear Regression, Multiple Variable Linear Regression, Logistic Regression, Naive Bayes Classifiers, K-NN Classification, Support Vector Machine, Simple Examples.

**UNIT - V: Reinforcement and Ensemble Learning**

Reinforcement Learning: Reinforcement Learning (RL) Framework, Component of RL Framework, Types of RL Systems. Q-Learning, Simple Examples. Ensemble Learning Techniques: Introduction on Ensemble Methods, Decision Trees, Bagging, Random Forests, Boostin, Simple Examples.

**TEXT BOOK:**

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Prentice-Hall, 3<sup>rd</sup> Edition (2009)
2. Nature-Inspired Optimization in Advanced Manufacturing Processes and Systems, Ganesh M. Kakandikar and Dinesh G. Thakur, CRC press, 1<sup>st</sup> Edition, 2021.

**REFERENCES:**

1. Artificial Intelligence, Ela Kumar, Wiley-India, 1st Edition, 2020.
2. Artificial Intelligence: Concepts and Applications, Lavika Goel, Wiley-India, 1st Edition, 2021.
3. Artificial Intelligence for Robotics and Industrial Applications, Abhishek Arora and Sanjeev Kumar, Wiley India, 1st Edition, 2023.
4. Machine Learning for Manufacturing, Davide Polonio and Paolo Rizzi, Springer, 1st Edition, 2022.
5. Deep Learning for Vision Systems, Mohamed Elgendy, Manning Publications, 1st Edition, 2021.
6. Hands-On Artificial Intelligence for Smart Manufacturing, Francesco Carlo Morabito, Springer, 1st Edition, 2023.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester  
MATERIALS MANAGEMENT  
(Professional Elective - I)**

L	T	P	C
3	0	0	3

**Prerequisites:** Operations Management, Engineering Economics

**Course Objectives:**

1. To understand integrated material management.
2. To acquire knowledge on various inventory management.
3. To understand inventory control systems.
4. To gain knowledge of various types of store management.
5. To acquire knowledge on principles of material handling.

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

1. Explain importance of material management and purchasing.
2. Identify various Inventory Management.
3. Evaluate inventory control systems.
4. Explain Stores management.
5. Explain the Material handling process in production.

**UNIT- I: Concepts of Materials Management**

Introduction to Integrated Materials Management, Need, Scope, Functions, Objectives and Importance of Materials Management, Purchasing Function, Objectives and Scope of Purchasing, Purchase Budget and Materials Budget, Purchase Order Cycle, Source Selection and Development, Negotiations in Purchasing, Public Buying, Just In Time Concept.

**UNIT – II: Imports and Inventory Management**

Imports, Import Trade Control, Foreign Trade (Development And Regulations) Act and Rules, Import Procedures, Importation Cycle, Inventory Management, Functions, Associated Costs, Classification, ABC VED - FSN Analysis, Basic BOQ Model.

**UNIT – III: Inventory Control, MRP and ERP Systems**

Inventory Control Systems, Periodic Review, P System and Continuous Review Systems, Q Systems, Lead-Time Analysis, Reorder Point Level Calculations.

MRP: Introduction, Terminology, Types of Demand Input to the MRP, Working Principle of MRP, Output of MRP, Advantages and Disadvantages, ERP Concepts.

**UNIT-IV: Stores Management and Material Disposal**

Stores Management, Stores Function, Types of Stores, Storage Procedures, Stock Verification and Stock Accounting, Stores Records, Disposal of Surplus, Scrap, Reclamation and Salvage of Materials.

**UNIT-V: Material Handling**

Layout, Selection of Equipment, Principles of Materials Handling, Packaging, Types of Material Handling Equipment.

**TEXT BOOKS:**

1. Purchasing and Materials Management, P. Gopalakrishnan, Tata McGraw-Hill, reprint edition 2001.
2. Industrial Engineering and Management, Ravi Shankar, Galgotia Publications, 2nd Edition, 2009.

**REFERENCE BOOKS:**

1. Production and Operations Management: Manufacturing and Services, Richard B. Chase, McGraw-Hill/Irwin, 8th Edition, 1998
2. Purchasing and Materials Management: Text and Cases, Lamar Lee and Donald W. Dobler, McGraw-Hill, 4th Edition, 1984 (5th ed. 1990)
3. Materials Management: A Supply Chain Perspective (Text and Cases), A. K. Chitale and R. C. Gupta, PHI Learning, 3rd Edition, 2014
4. Purchasing and Materials Management, P. Gopalakrishnan, Tata McGraw-Hill, 1st Edition, 1990.
5. Materials Management: An Integrated Systems Approach, Prem Vrat, G.D. Sardana, B.S. Sahay, Springer, 1st Edition, 1993.
6. Modern Materials Management, M.C. Sharma, Sarup and Sons, 1st Edition, 2004.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., I Year, I Semester**  
**PLANT MAINTENANCE AND RELIABILITY ENGINEERING**  
**(Professional Elective - II)**

L	T	P	C
3	0	0	3

**Prerequisites:** Manufacturing and Production Systems, Operations Management

**Course objectives:**

1. The objective of plant maintenance and Reliability Engineering is to achieve minimum breakdown and to keep the plant in good working condition at the lowest possible cost.
2. Machines and other facilities should be kept in such a condition, which permits them to be used at their optimum (profit making) capacity without any interruption or hindrance.
3. Maintenance division of the factory ensures the availability of the machines, buildings and services required by other sections of the factory for the performance.
4. Their functions at optimum return on investment whether this investment be in material, machinery or personnel.
5. Functions and their role to enhance the plant reliability and improve the availability of the machine components.

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

1. Understand and describe various aspects of the plant maintenance.
2. Realize the importance of maintenance and reliability.
3. Analyze the various types of maintenance and their adoptability.
4. Understand the concepts of reliability engineering and its role in plant performance.
5. Understand reliability, availability and maintainability.

**UNIT - I: Maintenance and Reliability**

Introduction, Need for Maintainability, Maintenance and Reliability, History of Maintenance and Reliability, Maintenance and Reliability Terms and Definitions, Useful Information on Maintainability, Maintenance and Reliability Problems.

**UNIT - II: Maintenance Types and Reliability Analysis**

Maintenance and Reliability Mathematics, Types of Maintenance, Adoptability and Performance Aspects, Reliability Centered Maintenance, Predicted and Preventive Maintenance, Availability Maintainability and Reliability Functions.

**UNIT - III: Reliability Functions and Maintenance Strategies**

Functions and their usage in Maintenance and Reliability, Weibull Distribution, Normal Distribution and Beta Distribution and Calculations to Improve Plant Performance. Bathtub Curve, Stages of Life and Suitable Maintenance.

**UNIT - IV: Plant Reliability and Maintenance**

Reliability Availability and Maintainability calculations, TBF, TTR, CTBF, CTTR, OTBF, OTTR. Trend analysis, Homogenous and Non-homogeneous distribution. Calculations, Plant reliability and Adoption of maintenance.

**UNIT - V: Reliability Modeling and Maintenance Policies**

PEXE method, Alpha and Beta functions, KLM method, MLE method and Calculations Involving, Weibull Parameters for Enhancing the Components of Plant and Adopting Suitable Maintenance Policies.

**TEXT BOOKS:**

1. Maintainability, Maintenance, and Reliability for Engineers, B. S. Dhillon, CRC, 1st Edition, 2006.
2. Maintenance, Replacement, and Reliability: Theory and Applications, Andrew K. S. Jardine and Albert H. C. Tsang, CRC Press, 2nd Edition, 2013.

**REFERENCE BOOKS:**

1. Essentials of Plant Maintenance and Reliability Engineering, R. Wild, Holt, Rinehart and Winston, 2nd Edition, 1985.
2. Reliability and Maintenance, P. Kales, Prentice Hall, 1st Edition, 1998.
3. Plant Reliability and Maintenance, B. S. Dhillon, Springer Verlag, 1st Edition, 1991.
4. Maintenance Planning and Control, Anthony Kelly, Butterworth-Heinemann, 1st Edition, 1997.
5. Practical Reliability Engineering, Patrick D.T. O'Connor, Andre Kleyner, Wiley, 5th Edition, 2012.
6. Industrial Maintenance, H.P. Garg, S. Chand Publishing, 1st Edition, 1987.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****SIX SIGMA AND TAGUCHI APPROACH****(Professional Elective - II)**

L	T	P	C
3	0	0	3

**Prerequisites:** Statistics and Probability, Quality Control Fundamentals

**Course Objectives:**

1. Introduce the principles of Six Sigma methodology and its role in quality improvement.
2. Explain the DMAIC (Define, Measure, Analyze, Improve, Control) framework for process optimization.
3. Provide knowledge of statistical tools and techniques used in Six Sigma projects.
4. Introduce the Taguchi method for robust design and experimental optimization.
5. Develop the ability to implement data-driven quality improvement strategies in engineering and manufacturing systems.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Understand and apply the Six Sigma philosophy, tools, and DMAIC methodology.
2. Use statistical quality control techniques such as control charts, capability analysis, and hypothesis testing.
3. Design and analyze experiments using Taguchi methods for improving product and process robustness.
4. Identify sources of variation and reduce defects using data-driven decisions.
5. Plan and execute quality improvement projects in line with Six Sigma principles.

**UNIT-I: Statistical Quality Control (SQC) and Statistical Process Control (SPC)**

Concept of Quality, Quality Control, Quality Assurance, Inspection, Types of Inspection, Classical Seven Tools of SQC, Statistical Quality Control and SPC – SQC, Variables, Attributes, Control Charts,  $\bar{X}$  - R chart,  $\bar{X}$  -  $\sigma$  chart, P chart, Np chart, C-chart, Seven Modern Tools of TQM.

**UNIT-II: Acceptance Sampling and Cost of Quality (CoQ)**

Sampling: Types of Sampling, Methods of Sampling (Qualitative and Quantitative), Acceptance Sampling, Single Sampling, Double Sampling, Multiple Sampling, and OC Curves, Process Capability,  $3\sigma$  Limits, Producer's Risk, Consumers Risk, Effect of Parameters on Acceptance Sampling, Quality Indices.

Cost of Quality: Quality Costs, Quality Cost Trade off, Cost of Quality, Effect of Cost on Quality, Effect of Quality on Cost, COQ Approach to TQM, Feign Barm's – P-A-F Costs Model, Hidden Costs, COQ vs 6 sigma, Product Quality and Process Quality.

**UNIT-III: Statistical Fundamentals of Quality Engineering**

Applications of Statistical Fundamentals, Measures of Central Tendency, Deviations, Measures of Dispersion, Standard Deviation, Variance- Correlation, Regression, Statistical Distributions, Chi Square, F-Distribution, ANOVA- Testing of Hypothesis, Applications to Quality Engineering.

**UNIT-IV: Six Sigma**

Objectives, Evolution of  $6\sigma$ , Relation between Six Sigma and Process Capability Index, DPMO Analysis and DPMO Procedure, Six Sigma vs SPC,  $6\sigma$  vs Zero Defects,  $6\sigma$  vs Cost of Quality,  $6\sigma$  Methodology, DMAIC, Design for  $6\sigma$  (DFSS), DMADV – Merits and Limitation of  $6\sigma$  -  $6\sigma$  Participants, Hierarchy,  $6\sigma$  Approach to TQM.

**UNIT-V: Taguchi Approach**

Objectives, Features, QLF, Equation of QLF, Quality Robustness, Phases of Robust Design, Design of Experiments, Methodology, Orthogonal Arrays, Inner Arrays, Outer Arrays, Hit or miss method, One factor at a time method, Full factorial method, Orthogonal Array Method, Performance measures, Factors, Interactions, Noise – Signal to Noise Ratio, Types of SNR, Steps Involved in Taguchi Approach, Application, Field based work by applying Six Sigma or Taguchi approach.

**TEXT BOOKS:**

1. Statistical Quality Management and Six Sigma, N. V. S. Raju, BSP Publications, 1st Edition, 2014
2. Statistical Methods, S. P. Gupta, Sultan Chand and Sons, 46th Edition, 2021

**REFERENCE BOOKS:**

1. Total Quality Management: Key Concepts and Case Studies, D.R. Kiran, Butterworth-Heinemann (Elsevier), 1st Edition, 2016.
2. Six Sigma with R: Statistical Engineering for Process Improvement, Emilio L. Cano, Javier M. Moguerza, Andrés Redchuk, Springer, 1st Edition, 2012.
3. Fundamentals of Statistics, S. C. Gupta, S. Chand Publishing, latest edition around 2019–2021
4. Total Quality Management, N. V. S. Raju, Cengage Learning, 1st Edition, 2014.
5. Quality Engineering Using Robust Design, Madhav S. Phadke, Pearson Education, 1st Edition, 1995.
6. Six Sigma for Managers, Greg Brue, McGraw Hill, 1st Edition, 2002.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester  
MARKETING MANAGEMENT  
(Professional Elective -II)**

L	T	P	C
3	0	0	3

**Prerequisites:** Strategic Thinking and Branding**Course Objectives:** The objectives of this course are

1. To provide a detailed concept of marketing and demand analysis
2. To enable the student in breaking the market into segments.
3. Impart the knowledge about the product life cycle.
4. Pricing strategy and Sales techniques
5. To enable the student to understand various types of controls in marketing.

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

1. Understand the concept of marketing and forecasting
2. To identify the market segments according to strategy formulation.
3. To understand product management.
4. To utilise various pricing methods and execute sales techniques
5. Understand the concept of marketing and its implementations.

**UNIT-I: Marketing Basics and Demand Analysis**

Introduction to Marketing, Needs, Wants, Demands, Products, Exchange, Transactions Markets, Marketing, Production Concept, Sales Concept, Product Concept, Marketing Concept, Social Marketing Concept, Indian Marketing Environment.

Demand Analysis: Major Concepts in Demand Measurement, Components Of Modern Market Information Systems, Marketing Intelligence System, Marketing Decision System, Forecasting and Demand Measurement.

**UNIT-II: Market Segmentation and Targeting**

Identification of Market Segments, Consumer and Institutional / Corporate Clientele, Segmenting Consumer Markets, Segmentation Basis. Electing Target Market Segments, Segmentation 7 Targeting as a Basis for Strategy Formulation Developing and Communicating a Positioning Strategy

**UNIT-III: Product Management**

Product Life Cycle, PLC as a Tool Marketing Strategy, Constituents of a Product, Core Product, Augmented Product, Differentiated Product, Potential Product Line, Product Mix, Product Decisions, Brand Decisions, Classification of New Products and New Product Development, Idea Generation, Idea Screening, Concept Testing, Business Analysis Market Testing, Commercialization.

**UNIT-IV: Pricing Strategy**

Objectives of Pricing, Methods of Pricing, Selecting the Final Price, Adopting the Final Price, Initiating the Price Cuts, Imitating Price Increases, Responding to Competitors Price Changes. Sales and Distribution Management: Sales Techniques for Consumer / Industrial Clientele, Channel Function and Flows, Channel Levels, Channel Management Decision, Types of Retailers, Trends in Retailing, Growth and Trends in Wholesaling, Sales Force and Sales Agency, Advantages And Disadvantages.

**UNIT –V Marketing Communication**

Communication Process, Communication Mix, Managing Advertising Sales Promotion, Public Relations and Direct Marketing, Sales Force Objectives, Sales Force Structure and Size, Sales Force Compensation.

Marketing Organization and Control: Evolution of Marketing Department, Organizing the Marketing Department, Marketing Implementations, Control of Marketing Performance, Annual Plan Control, Profitability Control, Efficiency Control, Strategic Control.

**TEXT BOOKS:**

1. Marketing Management, Rajan Saxena, McGraw Hill Education, 2nd Edition, 2002.
2. Marketing: The Core, Kerin, Hartley and Rudelius, McGraw Hill/Irwin, 1st Edition, 2004.

**REFERENCE BOOKS:**

1. Marketing Management, Philip Kotler, Pearson Publishers, 11th Edition, 2003.
2. Marketing, Lamb, Hair and McDaniel, Thomson, 7th Edition, 2004.
3. Marketing: The Best Practices, Douglas, Hoffman and Czinkota, Thomson, 2nd Edition, 2004.
4. Marketing Management, V.S. Ramaswamy and S. Namakumari, Macmillan, 3rd Edition, 2003.
5. Basic Marketing, William D. Perreault Jr. and E. Jerome McCarthy, Tata McGraw Hill, 14th Edition, 2002.
6. Marketing Management, Czinkota and Kotabe, Thomson, 2nd Edition, 2002.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****RESEARCH METHODOLOGY AND IPR**

L	T	P	C
2	0	0	2

**Prerequisite:** Fundamentals of Statistics, Technical Writing Skills

**Course Objectives:**

1. To understand research fundamentals, methodologies, and the significance of research ethics.
2. To enable students to formulate research problems and conduct literature surveys effectively.
3. To introduce the principles of data collection, analysis, and interpretation in research.
4. To explain intellectual property rights, patents, copyrights, and trademarks.
5. To highlight the importance of IPR in protecting innovative ideas and research outcomes.

**Course Outcomes:** At the end of this course, students will be able to

1. Understand the research process, methodologies, and ethics involved in scholarly work.
2. Formulate and define research problems with appropriate objectives.
3. Apply suitable data collection and analysis techniques for research projects.
4. Understand the various forms of intellectual property rights and legal aspects related to patents and copyrights.
5. Apply the knowledge of IPR to safeguard their innovations and research findings.

**UNIT-I: Research Problem and Investigation Approaches**

Meaning of Research Problem, Sources of Research Problem and Criteria Characteristics of a Good Research Problem, Errors in Selecting a Research Problem, Scope and Objectives of Research Problem. Approaches of Investigation of Solutions for Research Problem, Data Collection, Analysis, Interpretation, Necessary Instrumentations.

**UNIT-II: Literature Review and Ethics**

Effective Literature Studies Approaches, Analysis, Plagiarism, Research Ethics.

**UNIT-III: Technical Writing and Proposals.**

Effective Technical Writing, How to Write Report, Paper Developing a Research Proposal, Format of Research Proposal, a Presentation and Assessment by A Review Committee.

**UNIT-IV: Intellectual Property and Patenting**

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process Of Patenting and Development: Technological Research, Innovation, Patenting, Development. International Scenario: International Cooperation on Intellectual Property. Procedure for Grants of Patents, Patenting Under PCT.

**UNIT-V: Patent Rights and Emerging IPR**

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. IPR of Biological Systems, Computer Software Etc., Traditional Knowledge Case Studies, IPR and IITs.

**TEXTBOOKS:**

1. Research methodology: an introduction for science and engineering students, Stuart Melville and Wayne Goddard, Juta and Co. Ltd, 1<sup>ST</sup> Edition, 1996.
2. Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar, SAGE, 2<sup>nd</sup> Edition, 2010.

**REFERENCE BOOKS:**

1. Resisting Intellectual Property, Debora J. Halbert, Routledge, Taylor and Francis, 1<sup>st</sup> Edition, 2005.
2. Industrial Design, W. H. (William Henry) Mayall, Iliffe Books (London), also McGraw-Hill editions, 1<sup>st</sup> Edition, 1974.
3. Intellectual Property in the New Technological Age, Robert P. Merges, Peter S. Menell and Mark A. Lemley, Aspen Casebook Series, Latest Edition, 2016.
4. Intellectual Property Rights under WTO, T. Ramappa, Wheeler Publishing, 1<sup>st</sup> Edition, 2000.
5. Research Methodology and IPR, P. N. Ganesan, Scitech Publications, 1st Edition, 2019.
6. Intellectual Property Rights: Unleashing the Knowledge Economy, Prabuddha Ganguli, Tata McGraw-Hill, 1st Edition, 2001.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****INDUSTRIAL ENGINEERING PRACTICES LAB**

L	T	P	C
0	0	4	2

**Prerequisites:** Fundamentals of industrial engineering, Manufacturing processes

**Course Objectives:** The course aims to:

1. Provide hands-on experience with industrial engineering tools and techniques.
2. Enable students to apply work measurement and method study in practical scenarios.
3. Introduce simulation and modeling of manufacturing systems.
4. Familiarize students with productivity improvement, facility layout planning, and material handling analysis.
5. Train students in the use of software tools for industrial engineering applications.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Apply method study and time study techniques to analyze and improve manual and machine-based operations.
2. Use tools such as stopwatches, time study boards, and work sampling to collect and analyze data.
3. Develop and evaluate facility layouts using process charts and flow diagrams.
4. Perform productivity and efficiency analyses using industrial engineering principles.
5. Use basic simulation software to model, analyze, and improve industrial systems and workflows.

**List of Experiments:**

1. Design of industrial layout by using ALDEP
2. Development of existing layout by using CRAFT and CORLEP
3. Conducting of Method study
4. Conducting of Time study
5. Conducting of Work Sampling
6. Study of assembly process
7. Micro motion studies
8. Ergonomics studies – Measurement of oxygen level and measurement of stress distribution in body
9. Design of Visual system
10. Design of Audio system
11. Office Seat and car seat design
12. Bear game for driving supply chain concepts
13. Computation of wage incentive schemes
14. SAP/ABAP fundamentals – Manufacturing system and Inventory system
15. ERP
16. Computation of sales forecasting techniques and validation
17. Computation of lot sizing methods used in MRP
18. Development of Bill of Materials for MRP (product structure – development of mother, children and brother relationship development) Using the LINGDO package for solving of L.P. models

**Note:** Any 12 experiments may be performed out of 18 experiments.

**LAB MANUALS:**

1. Industrial Engineering Practices, S. K. Sharma, Kataria and Sons, 2nd Edition, 2021.
2. Industrial Engineering and Management Lab Manual, O. P. Khanna, Dhanpat Rai Publications, Revised Edition, 2020.
3. Industrial Engineering Lab Manual, M. Mahajan, Everest Publishing House, 3rd Edition, 2019.
4. Work Study and Industrial Engineering Lab, I. L. O. Geneva, International Labour Office, 5th Edition, 2018.
5. Time and Motion Study Lab Manual, R. C. Mishra and K. Pathak, University Science Press, 1st Edition, 2022.
6. Methods Engineering and Work Measurement Lab Manual, Benjamin W. Niebel and Andris Freivalds, McGraw Hill Education, 12th Edition, 2021.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****STATISTICAL QUALITY CONTROL SYSTEM LAB**

L	T	P	C
0	0	4	2

**Prerequisites:** Statistics and Probability, Quality control concepts

**Course Objectives:** The course aims to

1. Provide practical knowledge of statistical methods used in quality control.
2. Train students to construct and interpret control charts for variables and attributes.
3. Enable students to perform process capability studies and apply acceptance and sampling methods.
4. Familiarize students with quality control tools for monitoring and improving industrial processes.
5. Introduce software-based approaches to analyze and interpret quality data.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Construct and analyze control charts for mean, range, proportion, and defects.
2. Apply process capability analysis to assess production process performance.
3. Use acceptance-sampling plans to make decisions regarding product lots.
4. Implement statistical techniques for quality improvement in manufacturing environments.
5. Utilize quality analysis tools and software (e.g., Minitab, Excel) for data-driven decision-making.

**List of Experiments:**

1. Construction of X and R charts
2. Construction of P Chart
3. Construction of C Chart
4. Construction of NC Chart
5. Construction of Single Sampling Plan, given  $N = 1000$ ,  $n = 10$  and  $c = 2$ .
6. Construction of Double Sampling plan, given  $N = 1000$ ,  $n_1 = 100$ ,  $c_1 = 0$ ,  $n_2 = 50$ ,  $c_2 = 2$ .
7. Construction of Single sampling plan and Double Sampling plan for specified design and find out customer risk and producer risk.
8. Drawing of Quality Control
9. Drawing of Cause and Effect (Fish Bone) diagram.
10. Drawing Pareto diagram.

**LAB MANUALS:**

1. Statistical Quality Control, Eugene L. Grant and Richard S. Leavenworth, McGraw Hill Education, 7th Edition, 2019.
2. Quality Control Lab Manual, Mahajan M., Dhanpat Rai and Co., Revised Edition, 2021.
3. Statistical Quality Control Lab Manual, R. C. Gupta, Khanna Publishers, 2nd Edition, 2020.
4. Industrial Quality Control Practices, Amitava Mitra, Wiley India, 4th Edition, 2022.
5. Quality Assurance and Statistical Quality Control, K. Shridhar Bhat, Himalaya Publishing House, 3rd Edition, 2018.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****MANUFACTURING SYSTEMS: SIMULATION MODELLING AND ANALYSIS****(Professional Core - III)**

L	T	P	C
3	0	0	3

**Prerequisites:** Operations Research, Optimization Techniques, Probability Statistics

**Course Objectives:**

1. Learn ways of analyzing the systems.
2. Classification of systems-based nature of dynamics and knowledge of elements.
3. To develop simulation model for dynamic discrete – event stochastic system.
4. To run the model and collect the data.
5. To analyze the output data of simulation for specified for performance measures based on type of simulation and method of output data analysis.

**Course Outcomes:** At the end of course, students should be able to

1. Define the state of system W.R.T specified performance measures.
2. Develop simulation model for the said system
3. Generate random variations and learn various simulation languages.
4. Analyze through simulation the model and present the results to specified confidence level.
5. Apply simulation for flow shop systems and job shop systems.

**UNIT - I: System Modeling and Statistical Analysis**

System Analysis, Ways to Analyze the System, Model, Types of Models, Simulation, Definition, Types of Simulation Models, Steps Involved in Simulation, Advantages and Disadvantages. Parameter Estimation, Estimator, Properties Estimate, Point Estimate, Confidence Interval Estimates, Independent, Dependent, Hypothesis, Types of Hypothesis, Steps, Types 1 and 2 Errors, Framing, Strong Law of Large Numbers.

**UNIT - II: Model Validation and Stochastic Inputs**

Building of Simulation Model, Validation, Verification, Credibility their Timing, Principles of Valid Simulation Modeling, Techniques for Verification, Statistical Procedures for Developing Credible Model. Modeling of Stochastic Input Elements, Importance, Various Procedures, Theoretical Distribution, Continuous, Discrete their Suitability in Modeling.

**UNIT - III: Random Variate Generation and Simulation Languages**

Generation Of Random Variates, Factors for Selection, Methods, Inverse Transform, Composition, Convolution, Acceptance, Rejection, Generation of Random Variable, Exponential, Uniform Weibull, Normal Bernoullie, Binomial Uniform Poison. Simulation Languages, Comparison of Simulation Languages with General Purpose Languages, Simulation Languages vs Simulators, Software Features, Statistical Capabilities, GPSS, SIMAN, SIMSCRIPT, Simulation of M-M-1 Queue, Comparison of Simulation Languages.

**UNIT - IV: Output Data Analysis and Steady-State Simulation**

Output Data Analysis, Types of Simulation with Respect to Output Data Analysis, Warm Up Period, Welch Algorithm, Approaches for Steady State Analysis, Replication, Batch Means Methods, Comparisons.



**UNIT –V: Simulation Applications in Manufacturing**

Applications of Simulation, Flow Shop System, Job Shop System M/M/1 Queues with Infinite and Finite Capacities, Simple Fixed Period Inventory System, New Boy Paper Problem.

**TEXT BOOKS:**

1. Simulation Modelling and Analysis by Law, A.M. and Kelton, McGraw Hill, 2<sup>nd</sup> Edition, 1991.
2. Discrete-Event System Simulation, Jerry Banks and John S. Carson II, Prentice-Hall, 1<sup>st</sup> Edition, 1984.

**REFERENCE BOOKS:**

1. Simulation of Manufacturing Systems, Allan Carrie, John Wiley and Sons, Chichester and New York, 1<sup>st</sup> Edition, 1988.
2. A Course in Simulation, Sheldon M. Ross, Macmillan Publishing Company, 1<sup>st</sup> Edition, 1990.
3. Simulation Modeling and SIMNET, H. A. Taha, Prentice Hall, 1<sup>st</sup> Edition, 1988.
4. Modeling and Simulation of Discrete Event Systems, Byoung Kyu Choi and DongHun Kang, Wiley, 2<sup>nd</sup> Edition, 2023.
5. Introduction to Simulation Using Simulink, Michael A. Dwyer, Springer, 1<sup>st</sup> Edition, 2023.
6. Simulation with AnyLogic, Andrei Borshchev, Springer, 2<sup>nd</sup> Edition, 2021.
7. Manufacturing Systems Modeling and Analysis, Guy L. Curry and Richard M. Feldman, Pearson Education, 2<sup>nd</sup> Edition, 2023.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech., I Year, II Semester**  
**SUPPLY CHAIN MANAGEMENT**  
**(Professional Core - IV)**

L	T	P	C
3	0	0	3

**Prerequisites:** Operations and Production Management

**Course Objectives:**

1. To analyze various Logistics and Competitive strategies.
2. To list and explain various Logistics systems designs and their costs and performance.
3. To analyze the Logistics and Supply chain relationship.
4. Analysis of technology used in Supply chain.
5. To develop an understanding of managing global logistics and global supply chains.

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

1. Analyze various kinds of models in logistic Management.
2. Understand the concept of total cost analysis.
3. Execute mapping of supply chain processes.
4. To explain coordination in supply chain and internal supply chain management.
5. Understand global supply chain business processes.

**UNIT - I: Logistics and Supply Chain Strategy**

Logistics and Competitive Strategy, Competitive, Advantage, Gaining Competitive Advantage through Logistic, Mission of Logistics Management, Integrated Supply Chains, Supply Chain and Competitive Performance, Changing Logistics Environment, Models in Logistics Management, Logistics to Supply Chain Management, Focus Areas in Supply Chain Management, Performance Measures for SCM.

Customer Service Dimension, Marketing and Logistics Interface, Customer Service and Customer Retention, Service, Driven Logistics Systems, Basic Service Capability, Increasing Customer Expectations, Value Added Services, Customer Satisfaction and Success and Time Based Logistics, Case Studies.

**UNIT - II: Logistics Design and Performance Measurement**

Logistics Systems Design, Logistics Positioning, Logistics Reengineering, Reengineering Procedure, Logistics Environmental Assessment, Time Based Logistics, Alternative Logistics Strategies, Strategic Integration, Logistics Time Based Control Techniques.

Measuring Logistics Costs And Performance: Concept of Total Cost Analysis, Principles of Logistics Costing, Logistics and the Bottom Line, Impact of Logistics on Shareholder Value, Customer Profitability Analysis, Direct Product Profitability, Cost Driver and Activity, Based Costing.

**UNIT - III: Logistics Benchmarking and Supply Chain Pricing**

Benchmarking the Logistics Process and SCM Operation, Mapping the Supply Chain Processes, Supplier and Distributor Benchmarking, Setting Benchmarking Priorities, Identifying Logistics Performance Indicators, Channel Structures, Economics of Distribution, Channel Relationship, Logistic Service Alliances.

Sourcing Transporting and Pricing Products: Sourcing Decisions in Supply Chain, Transportation in the Supply Chain, Transportation Infrastructure, Supplier of Transport

Services, Basic Transportation Economics and Pricing, Transportation Documentation, Pricing and Revenue Management in the Supply Chain, Coordination in the Supply Chain, Pricing and Revenue Management in Supply Chains.

#### **UNIT- IV: Supply Chain Coordination and IT Integration**

Coordination and Technology in Supply chain, Lack of coordination and Bullwhip Effect, Impact of lack of coordination, Obstacle to Co-ordination, Managerial Levers to Achieve Co-ordination, Building Strategic Partners and Trust within a Supply Chain. Role of IT in the Supply Chain, Customer Relationship Management, Internal Supply Chain Management, Supply Chain IT in Practice, Information Technology and the Supply Chain, E – Business and the Supply Chain, E-Business Framework and Case Studies.

#### **UNIT - V: Global Logistics and Supply Chain Management**

Managing Global Logistics and Global Supply Chains, Logistics in a Global Economy, Views of Global Logistics, Global Operation Levels, Interlink Global Economy, Global Supply Chains, Global Supply Chain Business Processes, Global Strategy, Global Purchasing, Global Logistics, Channel in Global Logistics, Global Alliances, Issues and Challenges in Global Supply Chain Management and Case Studies.

#### **TEXT BOOKS:**

1. Logistical Management: The Integrated Supply Chain Process, Donald J. Bowersox and David J. Closs, McGraw Hill, 1st Edition, 1996.
2. Logistics and Supply Chain Management: Creating Value-Adding Networks, Martin Christopher, Pitman Publishing (London), 1st Edition, 1993.

#### **REFERENCE BOOKS:**

1. Supply Chain Management: Strategy, Planning and Operation, Sunil Chopra and Peter Meindl, Pearson Education, 2nd Edition, 2002.
2. Supply Chain Management for Global Competitiveness, B.S. Sahay, Macmillan India, 1st Edition, 2003.
3. Managing the Global Supply Chain, Philip B. Schary and Tage Skjott-Larsen, Viva Books, Mumbai, 1st Edition, 2000.
4. Purchasing and Supply Chain Management – Analysis, Planning and Practice, Arjan J. Van Weele, Thomson Learning, 2nd Edition, 2000.
5. Business Logistics/Supply Chain Management, Ronald H. Ballou, Pearson/Prentice Hall, 5th Edition, 2004.
6. Business Logistics / Supply Chain Management, Ronald H. Ballou, Pearson Education, 5th Edition, 2004.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., I Year, II Semester**  
**TOTAL QUALITY MANAGEMENT**  
**(Professional Elective - III)**

L	T	P	C
3	0	0	3

**Prerequisites:** Quality Concepts, Operations and Production Management

**Course Objectives:**

1. To introduce the principles and philosophies of Total Quality Management (TQM) and its significance in industrial systems.
2. To understand the quality management tools, techniques, and standards such as ISO, Six Sigma, and quality circles.
3. To develop the ability to implement continuous improvement strategies in products, processes, and systems.
4. To provide knowledge on quality auditing, benchmarking, and quality function deployment.
5. To integrate customer-focused quality planning and strategic quality control in manufacturing and service sectors.

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

1. Explain the core principles and concepts of Total Quality Management.
2. Apply statistical tools and quality control charts for monitoring and improving process performance.
3. Implement quality standards and certification systems such as ISO 9000.
4. Analyse and enhance customer satisfaction through effective quality planning.
5. Drive continuous improvement initiatives using tools like Six Sigma, benchmarking, and QFD.

**UNIT – I: Introduction to TQM and Process Quality**

The Concept of TQM, Quality and Business Performance, Attitude and Involvement of Top Management, Communication, Culture and Management Systems.

Management of Process Quality: Definition of Quality, Quality Control, Brief History, Product Inspection vs Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

**UNIT – II: Customer Focus and Benchmarking in TQM**

Customer Focus and Satisfaction, Process vs Customer, Internal Customer Conflict, Quality Focus, Customer Satisfaction, Role of Marketing and Sales, Buyer and Supplier Relationships. Bench Marketing: Evolution of Bench Marketing, Meaning of Bench Marketing, Benefits of Bench Marketing, Bench Marketing Process, Pitfalls of Bench Marketing.

**UNIT – III: TQM Organization and Productivity Improvement**

Systems Approach, Organizing for Quality Implementation, Making the Transition from a Traditional to a TQM Organizing, Quality Circles. Productivity, Quality and Reengineering: Advantage of Productivity and Quality, Management Systems vs Technology, Measuring Productivity, Improving Productivity Re-Engineering.

**UNIT – IV: Cost of Quality and Its Management**

Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, Use of Quality Cost Information, Accounting Systems and Quality Management.

**UNIT – V: ISO 9000 Standards and Certification**

ISO9000, Universal Standards of Quality, ISO around the World, ISO9000 ANSI/ASQCQ-90. Series Standards, Benefits of ISO9000 Certification, Third Party Audit, Documentation ISO9000 and Services, Cost of Certification Implementing the System.

**TEXT BOOKS:**

1. Total Quality Management: Text, Cases and Readings, Joel E. Ross, Taylor and Francis (St. Lucie Press), 3rd Edition, 1999.
2. Beyond TQM, Robert L. Flood, Wiley, 1st Edition, 1993.

**REFERENCE BOOKS:**

1. Quality Management, Donna C.S. Summers, Pearson Education, 5th Edition, 2010.
2. Total Quality Management, Suganthi L. and Anand Samuel, PHI Learning, 1st Edition, 2006.
3. Statistical Quality Control, Eugene L. Grant and Richard S. Leavenworth, McGraw Hill, 7th Edition, 1996.
4. Total Quality Management, N.V. Naidu, G. Rajendra, K. Ramaiah, New Age International, 1st Edition, 2006.
5. Juran's Quality Handbook, Joseph M. Juran, Joseph A. Defeo, McGraw Hill Education, 6th Edition, 2010.
6. Total Quality Management, Dale H. Besterfield, Pearson Education, 3rd Edition, 2011.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****IoT IN MANUFACTURING****(Professional Elective - III)**

L	T	P	C
3	0	0	3

**Prerequisites:** Manufacturing Systems, Industrial automation**Course Objectives:** The course aims to

1. Introduce the fundamentals of Internet of Things (IoT) and its applications in manufacturing.
2. Explain IoT architecture, protocols, and communication technologies relevant to smart factories.
3. Familiarize students with sensor integration, data acquisition, and real-time monitoring in industrial environments.
4. Explore cloud computing, edge computing, and analytics in IoT-enabled manufacturing.
5. Enable students to design and implement IoT solutions for predictive maintenance, quality control, and process optimization.

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Understand IoT architecture and communication models used in industrial applications.
2. Integrate sensors and embedded systems for real-time monitoring of manufacturing processes.
3. Develop IoT-based systems for data acquisition, control, and remote diagnostics.
4. Apply data analytics and cloud platforms to enhance decision-making in manufacturing.
5. Design and prototype smart manufacturing solutions using IoT tools and technologies.

**UNIT I: IoT Evolution and Architectures**

Evolution of Internet of Things, Enabling Technologies. Iot Architectures: One M2M, Iot World Forum and Alternative Iot Models, Simplified Iot Architecture and Core Iot Functional Stack, Fog, Edge and Cloud in Iot.

**UNIT II: IoT Components and Communication Modules**

Components in Internet of Things, Functional Blocks of an IoT Ecosystem, Sensors, Actuators, and Smart Objects, Control Units, Communication Modules (Bluetooth, ZigBee, Wi-Fi, GPS, GSM Modules)

**UNIT III: Introduction to Industry 4.0**

Introduction of Industries 4.0 Introduction to First, Second and Third Industrial, Revolution, Challenges in Third Revolution, Opportunity and Challenges in Industry 4.0 Characteristic of Industry 4.0, Industry 4.0 Environment, Advantage and Disadvantage of Industry 4.0.

**UNIT IV: Design and Applications of Industry 4.0**

Design Requirements of Industry 4.0, Drivers of Industry 4.0 (Mega Trends, Tipping Point), Smart Business Perspective (Monitor, Control, Optimize, Automate), Characteristics of Smart Business Model, Impacts of Industry 4.0 (Economy Perspective, Business Perspective, Global Perspective), Applications of Industry 4.0 (Smart Factory and Manufacturing System, Smart City, Logistics, Agriculture, Public Transport, Construction, Food Production).

**UNIT V: IIoT in Inventory Management and Quality Control**

L- Inventory Management and Quality Control using IIoT, Introduction to Inventory Management and Quality Control using IIoT, Inventory Management, Types of Inventory (Finished Goods, Work- in-Process, Raw Materials, Maintenance, Repair and Operating Supplies (MRO) Goods), Types of Inventory Management, Just-In-Time (JIT) Management, Materials Requirement Planning (MRP), Economic Order Quantity (EOQ), Days Sales Inventory (DSI)), Inventory Management and IIoT, Benefits of IIoT Applications in Inventory Management, Quality Control.

**TEXT BOOKS:**

1. Internet of Things: A Hands-On Approach, Arshdeep Bahga and Vijay Madisetti, VPT, 1st Edition, 2014.
2. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, 1st Edition, 2013.

**REFERENCE BOOKS:**

1. Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist, Apress, 1st Edition, 2016.
2. Industrial Internet of Things: Cybermanufacturing Systems, Sabina Jeschke, Christian Brecher, Houbing Song, and Danda B. Rawat (Eds.), Springer, 1st Edition, 2017.
3. The Internet of Things in the Industrial Sector: Security and Device Connectivity, Zaigham Mahmood, Springer, 1st Edition, 2019.
4. Internet of Things: Architecture and Applications, Raj Kamal, McGraw Hill Education, 1st Edition, 2017.
5. Smart Manufacturing: The Lean Six Sigma Way, Anthony Tarantino, Wiley, 1st Edition, 2022.
6. Internet of Things: A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 1st Edition, 2015.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****ENERGY MANAGEMENT****(Professional Elective – III)**

L	T	P	C
3	0	0	3

**Prerequisites:** Energy Systems and Utilities, Engineering Economics

**Course Objectives:** The objectives of this course are

1. To impart knowledge of Energy management.
2. To understand various energy audits.
3. Technology and design for conservation of energy.
4. Methods of evaluation of projects.
5. To enable the student to understand various types of alternative sources of energy.

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

1. Explain principles of energy management.
2. To understand and execute various types of Energy audits.
3. Implement various technologies in energy conservation.
4. To use various methods in evaluating projects.
5. Understand the various alternative energy sources.

**UNIT - I: Energy Management Principles and Roles**

Principles of Energy Management, Managerial organization, Functional Areas for Manufacturing Industry, Process Industry, Commerce and Government. Role of Energy Manager in each of these organizations.

**UNIT - II: Energy Audits and Management Programs**

Initiating, Organizing and Managing Energy Management Programs. Energy Audit; Definition and Concepts, Types of Energy Audits, Basic Energy Concepts, Resources for Plant Energy Studies, Data Gathering, Analytical Techniques.

**UNIT - III: Energy Conservation and Economic Analysis**

Technologies for Energy Conservation, Design for Conservation of Energy Materials, Energy Flow Networks, Critical Assessment of Energy Usage, Formulation of Objectives and Constraints, Synthesis of Alternative Options and Technical Analysis of Options, Process Integration. Economic Analysis: Scope, Characterization of an Investment Project, Types of Depreciation, Time Value of Money, Budget Considerations, Risk Analysis.

**UNIT - IV: Project Evaluation Methods and Energy Consulting**

Methods Of Evaluation Of Projects, Payback, Annualized Costs, Investor's Rate of Return, Present Worth, Internal Rate of Return, Pros and Cons of the Common Methods of Analysis, Replacement Analysis. Energy Consultant; Need of Energy Consultant, Consultant Selection Criteria.

**UNIT - V: Solar and Wind Energy Systems**

Alternative Energy Sources, Solar Energy, Types of Devices for Solar Energy Collection, Thermal Storage System, Control Systems, Wind Energy, Availability, Wind Devices, Wind Characteristics, Performance of Turbines and Systems.



**TEXT BOOKS:**

1. Energy Management Handbook, W.C. Turner (Ed.), Fairmont Press, 4th Edition, 2001.
2. Management: A Systems and Contingency Analysis of Managerial Functions, Harold Koontz and Cyril O'Donnell, McGraw Hill, 4th Edition, 1976.

**REFERENCE BOOKS:**

1. Financial Management: An Analytical and Conceptual Approach, S.C. Kuchhal, Chaitanya Publishing House, 4th Edition, 1976.
2. Energy Management, W.R. Murthy and G. McKay, BS Publications, 1st Edition.
3. Energy Management Principles: Applications, Benefits, Savings, Craig B. Smith, Pergamon Press, 1st Edition, 1981.
4. Guide to Energy Management, Barney L. Capehart, Wayne C. Turner, CRC Press, 7th Edition, 2012.
5. Industrial Energy Management: Principles and Applications, Giovanni Petrecca, Springer, 1st Edition, 1999.
6. Energy Conservation: Success Stories, G.D. Rai, Khanna Publishers, 1st Edition, 2004.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****DATA ANALYTICS****(Professional Elective – IV)**

L	T	P	C
3	0	0	3

**Prerequisites:** Statistics and Probability, Mathematics for Data Analytics**Course Objectives:** The course aims to

1. Introduce foundational concepts and tools used in data analytics.
2. Teach data pre-processing, exploratory data analysis, and visualization techniques.
3. Explain statistical modelling, regression, and classification methods.
4. Familiarize students with data-driven decision-making using analytical methods.
5. Provide hands-on experience with tools and platforms used for analysing structured and unstructured data.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Understand the key concepts of data analytics and the data analysis process.
2. Perform data cleaning, transformation, and visualization using analytics tools.
3. Apply statistical and machine learning techniques for data interpretation and prediction.
4. Analyze large datasets to extract meaningful insights and patterns.
5. Create effective visualizations to communicate findings to stakeholders.

**UNIT- I: Data Analytics and Business Intelligence**

Data Analytics, Types, Phases, Quality and Quantity of Data, Measurement, Exploratory Data Analysis, Business Intelligence.

**UNIT- II: Big Data**

Big Data and Cloud Technologies, Introduction to HADOOP, Big Data and Apache Hadoop, Map Reduce Data Serialization, Data Extraction, Stacking Data, Dealing with Data.

**UNIT- III: Data Visualization**

Introduction to Data Visualization, Data Visualization Options, Filters, Dashboard Development Tools.

**UNIT- IV: Analytics and Machine Learning**

Machine Learning, Modeling Process, Training Model, Validating Model, Predicting New Observations, Supervised Learning Algorithms, Unsupervised Learning Algorithms.

**UNIT- V: Data Science Ethics**

Doing Good Data Science, Owners of the Data, Valuing Different Aspects of Privacy, Getting Informed Consent, The Five Cs, Diversity, Inclusion, Future Aspects of Privacy, Getting Informed Consent.

**TEXT BOOKS:**

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali, Manning Publications, 1<sup>st</sup> Edition, 2016.
2. Data Analytics: The Ultimate Guide, Anil Maheshwari, McGraw Hill Education, 1<sup>st</sup> Edition, 2017

**REFERENCE BOOKS:**

1. Python for Data Analysis, Wes McKinney, O'Reilly Media, 2nd Edition, 2017.
2. Data Analytics Made Accessible, Anil Maheshwari, Create Space Independent Publishing, 2nd Edition, 2017.
3. Data Analytics Made Accessible, Anil Maheshwari, Amazon Digital Services, 3rd Edition, 2017.
4. Practical Statistics for Data Scientists, Peter Bruce, Andrew Bruce, O'Reilly Media, 2nd Edition, 2020.
5. Applied Analytics through Case Studies Using SAS and R, Deepti Gupta, CRC Press, 1st Edition, 2018.
6. Data Science and Big Data Analytics, EMC Education Services, Wiley, 1st Edition, 2015.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester  
STRATEGIC MANAGEMENT  
(Professional Elective – IV)**

L	T	P	C
3	0	0	3

**Prerequisites:** Basic Economics and Competitive Advantage, Management principles

**Course Objectives:** The course aims to:

1. Introduce the concepts, processes, and frameworks of strategic management.
2. Explain how organizations develop and implement strategies to achieve competitive advantage.
3. Analyse internal and external environments using strategic tools and models.
4. Provide knowledge of corporate, business, and functional level strategies.
5. Encourage strategic thinking for decision-making in complex and dynamic environments.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Understand the principles and scope of strategic management in organizations.
2. Conduct strategic analysis using tools such as SWOT, PESTLE, Porter's Five Forces, and value chain analysis.
3. Formulate appropriate business strategies based on internal competencies and market dynamics.
4. Evaluate strategic options and implement effective strategy execution plans.
5. Apply strategic thinking to real-world case studies and develop long-term organizational strategies.

**UNIT-I: Strategic Planning**

Strategy Developing, Distinction between Long Range Planning and Strategic Planning, History and Development, Growth and Portfolio Theory, The Marketing Revolution, Core Competence, Competitive Advantage.

Vision and Mission, Core Components of Mission Statement, Characteristics of Mission Statement, Strategic Management, Evaluation of Strategic Options, Strategy Hierarchy, Strategic Change, Limitations of Strategic Management, Reasons for Failures of Strategic Plans.

Goal Setting, Setting Preliminary Objectives at the Top, Setting Subordinate's Objectives, Recycling Objectives, Career Planning.

**UNIT -II: Corporate Planning and MBO**

Steps in Corporate Planning, Approaches to Corporate Policies, Decision Making and Execution, Top- Down Approach and Bottom –Up Approach.

Management by Objectives (MBO), Features Of (MBO), Steps in MBO Planning, Systems Approach to MBO, Merits of MBO, Demerits of MBO, Essential Conditions for Successful MBO (How to make MBO Effective).

**UNIT- III: Strategy Formulation and Implementation**

Procedure of Strategy Formulation and Implementation, Identify Mission and Vision and Set Objectives and Goals, Strategy Alternatives, Cost Leadership, Differentiation, Niche, Combination of Generic Strategies, The Danger of "Stuck In The Middle", Porter's Generic Strategies vs 5 Forces.

Strategies Based on Lifecycle, Expansion Strategies, Stability Strategies, Retrenchment Strategy, Combination Strategy, Strategic Alliance, Product Alliance, Price Collaboration, Promotional Alliance, Physical Distribution Alliance, Growth Strategies, Ansoff's Growth Matrix (Product and Market Mix), Franchising and Licensing, Merger and Acquisition.

**UNIT-IV: Environmental Scanning: SWOT/SWOC**

Environmental Scanning, Generic Strategy Alternatives, Strategy Variations, Strategic Choice, Allocation of Resources and Development of Organizational Structure, Formulation of Policies Plans, Programs And Administration, Strategy Implementation, Strategy Evaluation and Control.

Types of Environment, Environmental Scanning, Modes of Scanning, PEST Analysis, The SWOT (TOWS) Analysis, History and Origins of SWOT Analysis, Method of SWOT/SWOC Analysis, SWOT to Understand Situation, Assessment, Decision Making and Strategy Formulation, SWOT/SWOC for Business Firm, Matching and Converting, Internal and External Factors, Criticism of SWOT/SWOC, Distinction and Relationship between PEST and SWOT/SWOC.

**UNIT-V: Performance Management**

Business Process Management (BPM), Business Process Outsourcing (BPO), Indian Perspective, Merits, Hurdles in BPO, Threats, Business Process Reengineering (BPR), BPR Topics-Criticism.

Management Information System (MIS), Components of Information, Decision Support System, Management Information System and Information Management System.

Performance Management (PM), Concept and Prerequisites, The Performance Management Process, Plan-Monitor, Develop-Rate-Reward-Balanced Scorecard (BSC) Concept, Prerequisites for Balanced Scorecard, Perspectives of Implementation, Design of BSC-Criticism.

Capability Maturity Model (CMM), Maturity Model, Structure, Software Process Framework, People Capability Maturity Model, (PCMM) Structure of People CMM, Capability Maturity Model Integration (CMMI).

**TEXT BOOKS:**

1. Essentials of Strategic Management: The Quest for Competitive Advantage, John E. Gamble, Arthur A. Thompson and Margaret A. Peteraf, McGraw-Hill Education, 7th Edition, 2016.
2. Strategic Management, N. V. S. Raju, BSP Publications, 1st Edition, 2019.

**REFERENCE BOOKS:**

1. Strategic Management Concepts (Competitive Advantage, Concepts and Cases), Fred R. David et al. Pearson, 14th Edition, 2013.
2. Strategic Management, John A. Pearce II and Richard B. Robinson, McGraw-Hill Education, 12th Edition, 2010.
3. Industrial Engineering and Management, N. V. S. Raju, Cengage Learning India, 1st Edition, 2013.
4. Exploring Strategy: Text and Cases, Gerry Johnson, Richard Whittington, Kevan Scholes, Pearson Education, 11th Edition, 2017.
5. Strategic Management: Concepts and Cases – Competitiveness and Globalization, Michael A. Hitt, R. Duane Ireland, Robert E. Hoskisson, Cengage Learning, 12th Edition, 2016.
6. Competitive Strategy: Techniques for Analyzing Industries and Competitors, Michael E. Porter, Free Press, 1st Edition, 1980.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****LEAN MANUFACTURING****(Professional Elective – IV)**

L	T	P	C
3	0	0	3

**Prerequisites:** Industrial Engineering Fundamentals, Manufacturing Systems**Course objectives:** The course aims to

1. Introduce the principles and philosophy of lean manufacturing and its impact on productivity.
2. Explain various lean tools and techniques such as 5S, value stream mapping, and Kaizen.
3. Develop the ability to identify and eliminate waste in manufacturing and service processes.
4. Discuss the implementation of lean systems in different industries and supply chains.
5. Promote a culture of continuous improvement and employee involvement in lean practices.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Understand the core principles of lean thinking and its evolution in manufacturing.
2. Apply lean tools to streamline processes and reduce non-value-adding activities.
3. Analyse production systems using value stream mapping and other diagnostic techniques.
4. Implement lean strategies to improve quality, reduce lead-time, and enhance customer satisfaction.
5. Develop action plans for lean transformation in real-world manufacturing environments.

**UNIT I: Lean Manufacturing**

Introduction, Definitions of Lean manufacturing, Explaining Basic Concepts. Overview of Historical Development. Management Theory.

Primary Tools of Lean Manufacturing: 5-S, Workplace Organization, Total Productive Maintenance, Process Mapping / Value Stream Mapping.

**UNIT II: Secondary Tools of Lean manufacturing**

Objective and Benefits of Secondary Lean Tool, Cause and Effect Diagram, Pareto Chart, Spider Chart, Poka Yoke, Kanban, Automation, Single Minute Exchange of Die (SMED), Design for Manufacturing and Assembly, Just In Time (JIT).

**UNIT III: TQM Tools and Techniques**

The Seven Traditional Tools of Quality, New Management Tools. Bench Marking, Reason to Benchmark, Bench Marking Process, FMEA, Stages and Types. Quality Circles, Quality Function Deployment (QFD), Taguchi Quality Loss Function, TPM, Concepts, Improvement Needs, Cost of Quality, Performance Measures

**UNIT IV: Total Productive Maintenance**

Objectives and Functions, Reliability Centred Maintenance (RCM), Maintainability Prediction, Availability and System Effectiveness, Maintenance Costs, Maintenance Organization. Minimal Repair, Maintenance Types, Balancing PM and Breakdown Maintenance, Primary and Secondary Tool For TPM, Case Studies Related to TPM.

**UNIT V: DOE and Six Sigma Practices**

Design of Experiments: Introduction, Methods, Taguchi Approach, Achieving Robust Design, Steps in Experimental Design.

Six Sigma: Meaning of six sigma, Why Six Sigma, Six Sigma Improvement Model, DMAIC and DMADV principle, Building Six Sigma Organization and Culture, Six Sigma Application and Case Studies.

**TEXT BOOKS:**

1. Fundamentals of Quality Control and Improvement, Amitava Mitra, Prentice Hall, 2<sup>nd</sup> Edition, 1998.
2. Total Quality Management, Dale H. Besterfield et al. Pearson Education, 3<sup>rd</sup> Edition, 2008.

**REFERENCE BOOKS:**

1. Design and Analysis of Experiments, Douglas C. Montgomery, John Wiley and Sons, 6<sup>th</sup> Edition, 2004.
2. Lean Manufacturing, K. B. Akhilesh, PHI Learning, 1st Edition, 2007.
3. Creating a Lean Culture: Tools to Sustain Lean Conversions, David Mann, CRC Press, 2nd Edition, 2010.
4. Lean Six Sigma: Combining Six Sigma Quality with Lean Production Speed, Michael L. George, McGraw Hill Education, 1st Edition, 2002.
5. Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy, Masaaki Imai, McGraw Hill Education, 2nd Edition, 2012.
6. Kaizen: The Key to Japan's Competitive Success, Masaaki Imai, McGraw Hill Education, 1st Edition, 1986.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., I Year, II Semester**  
**SIMULATION OF MANUFACTURING SYSTEMS LAB**

L	T	P	C
0	0	4	2

**Prerequisites:** Simulation modeling and Probability, Fundamentals of Manufacturing systems

**Course Objectives:** The course aims to

1. Provide hands-on experience in modeling and simulating manufacturing systems.
2. Teach the use of simulation software tools for analyzing manufacturing operations.
3. Enable students to evaluate the performance of manufacturing layouts, scheduling, and resource allocation.
4. Develop skills to identify bottlenecks, reduce cycle time, and optimize system throughput.
5. Promote data-driven decision-making using simulation outcomes.

**Course Outcomes:** After the successful completion of this course, the student will be able to:

1. Develop discrete-event simulation models for various manufacturing scenarios.
2. Use simulation tools such as Arena, FlexSim, or Simul8 for performance analysis.
3. Collect and analyze output data to assess system behavior under different configurations.
4. Identify and resolve inefficiencies in production systems using simulation-based insights.
5. Interpret and communicate simulation results to support industrial decision-making.

**List of Experiments:**

1. Through C++, Creation of class for product with the following elements
  - a) product ID b) processing order c) processing times
2. Through C++, Creation of 5 products as objects from using class called product
3. Creation of classes matching with the following attributes:
  - a) M/c ID b) with accession of varying elements of M/c class
4. Simulation of flow shop manually for calculating total make-span time 2 and 3 machined with n Job
5. Write algorithm for simulation of flow shop system
6. Simulation of job shop system manually for n jobs and 3 machines and compare it with manual system
7. Write a programme for simulation of 2 jobs / n machines of job shop system and compare it with the manual calculation
8. Simulation for M/M/1 for 4 customers arrival considering arrival of customers of Poisson process and service process is exponential distribution
9. Simulation of news boy problem and tied average profit
10. Simulation of EO model with demand of random process and estimate average inventory

**LAB MANUALS:**

1. Discrete Event System Simulation, Jerry Banks and John S. Carson II, Prentice Hall, Englewood Cliffs, NJ, 1st Edition, 1984.
2. Simulation of Manufacturing Systems, Anthony Carrie, Wiley, New York, 1st Edition, 1988.
3. Simulation of Manufacturing Systems Lab, P. Radhakrishnan, New Age International Publishers, 2nd Edition, 2015.



4. Manufacturing Systems Simulation Lab Manual, S. Jayaraman, Lakshmi Publications, 1st Edition, 2017.
5. Computer Simulation of Manufacturing Systems, N. Viswanadham and Y. Narahari, PHI Learning, 2nd Edition, 2013.
6. Simulation Modeling and Analysis Lab Manual, Averill M. Law, McGraw Hill Education, 5th Edition, 2014.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester  
SUPPLY CHAIN MANAGEMENT LAB**

L	T	P	C
0	0	4	2

**Prerequisites:** Supply Chain Fundamentals, Logistics and Operations Management

**Course Objectives:**

1. Provide hands-on experience with supply chain modeling, analysis, and decision-making tools.
2. Teach students to simulate and evaluate supply chain performance using relevant software tools.
3. Develop practical skills in inventory control, demand forecasting, and transportation planning.
4. Enable the design and optimization of end-to-end supply chain networks.
5. Promote data-driven analysis for improving responsiveness, efficiency, and sustainability in supply chains.

**Course Outcomes:** After the successful completion of this course, the student will be able to:

1. Model and simulate various components of a supply chain system using software tools.
2. Analyze inventory levels, lead times, and demand variability to improve service levels.
3. Apply optimization techniques for supply chain network design and logistics planning.
4. Evaluate performance metrics such as cost, responsiveness, and throughput.
5. Use decision support tools to enhance supply chain efficiency and resilience.

**List of Experiments:**

1. Network design and operations
2. Designing and planning transportation networks
3. Designing and planning distribution networks
4. Value Stream Mapping – Development of Current State Map and Future State Map
5. Decision Making in Supply Chains
6. Lean, agile and leagile supply chains
7. Supply chain restructuring
8. Supply chain performance measures
9. Inventory optimization in supply chain
10. Forecasting models in supply chain
11. Bear game

**LAB MANUALS:**

1. Supply Chain Management Lab Manual, Sunil Chopra, Pearson Education, 2nd Edition, 2016.
2. Logistics and Supply Chain Simulation Lab, S. Rajesh, Lakshmi Publications, 1st Edition, 2018.
3. Practical Supply Chain Management Lab, J. Janat Shah, Pearson India, 2nd Edition, 2015
4. Hands-on Supply Chain Lab Manual, Rahul V. Altekhar, PHI Learning, 1st Edition, 2012.
5. Supply Chain Modeling and Simulation Lab, Nada R. Sanders, Wiley India, 2nd Edition, 2014.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester  
PRODUCT DATA MANAGEMENT  
(Professional Elective – V)**

L	T	P	C
3	0	0	3

**Prerequisites:** Management Science**Course Objectives:**

1. To build competence with tools and methods for product design and development.
2. To instill confidence in creating and managing new product development projects.
3. To promote awareness of cross-functional roles in product development (marketing, finance, design, production).
4. To enhance the ability to coordinate multidisciplinary tasks towards a common goal.
5. To reinforce knowledge through practice and reflection in real-world, action-oriented settings.
6. To strengthen team collaboration skills.

**Course Outcomes:** After doing this course, the student will be able to

1. Understand industrial product development, customer needs, and design aspects of new products.
2. Involve customers in product development and effectively manage their requirements.
3. Apply design of experiments and technical analysis in product development.
4. Understand and apply concepts of product architecture.
5. Investigate customer needs and conduct problem surveys.
6. Apply design for manufacturability concepts and develop prototypes.

**UNIT- I: Introduction**

Need For IPPD, Strategic Importance of Product Development, Integration of Customer, Designer, Material Supplier and Process Planner, Competitor and Costumer, Behavior Analysis. Understanding Customer, Promoting Customer Understanding, Involve Customer in Development, Managing Requirements, Organization, Process Management and Improvement, Plan and Establish Product Specification.

**UNIT – II: Concept Generation and Selection**

Task, Structured Approaches, Clarification Search, Externally and Internally Explore Systematically, Reflect on the Solutions and Process, Concept Selection, Methodology, Benefits. Product Architecture: Implications, Product Change, Variety, Component Standardization, Product Performance, Manufacturability.

**UNIT - III: Product Development Management**

Establishing the Architecture, Creation, Clustering, Geometric Layout Development, Fundamental and Incidental Interactions, Related System Level Design Issues, Secondary Systems, Architecture of the Chunks, Creating Detailed Interface Specifications.

Industrial Design: Integrate Process Design, Managing Costs. Robust Design Integrating: CAE, CAD, CAM Tools, Simulating Product Performance and Manufacturing Processing Electronically, Need for Industrial Design, Impact Design Process.

#### **UNIT – IV: Industrial Design Process and Evaluation**

Investigation Of Customer Needs, Conceptualization, Refinement, Management of the Industrial Design Process, Technology Driven Products, User Driven Products Assessing the Quality of Industrial Design.

#### **UNIT – V: Design for Manufacturing and Product Development**

Definition, Estimation of Manufacturing Cost, Reducing the Component Costs and Assembly Costs, Minimize System Complexity. Prototype Basics, Principles of Prototyping, Planning for Prototypes, Economics Analysis, Understanding and Representing Tasks, Baseline Project Planning, Accelerating the Project Execution.

#### **TEXT BOOKS:**

1. Product Design and Development, Kari T. Ulrich and Steven D. Eppinger, McGrawill Education, 6<sup>th</sup> Edition, 2016.
2. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, 1<sup>st</sup> Edition, 1992.

#### **REFERENCE BOOKS:**

1. Tool Design–Integrated Methods for Successful Product Engineering, Stuart Pugh, Addison-Wesley Publishing Company, 1<sup>st</sup> Edition, 1991.
2. Production and Operations Management, William J. Stevenson, McGraw Hill, 13<sup>th</sup> Edition, 2022.
3. Tool Design: Integrated Methods for Successful Product Engineering, Stuart Pugh, Addison-Wesley Publishing Company, 2nd Edition, 2022.
4. Production and Operations Management, William J. Stevenson, McGraw-Hill Education, 14th Edition, 2024.
5. Product Lifecycle Management: Driving the Next Generation of Lean Thinking, Michael Grieves, McGraw-Hill Education, 2nd Edition, 2021.
6. Engineering Design Process, Yousef Haik and Tamer M. Shahin, Cengage Learning, 4th Edition, 2023.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester  
FINANCIAL MANAGEMENT  
(Professional Elective – V)**

L	T	P	C
3	0	0	3

**Prerequisites:** Basic Accounting Principles, Fundamentals of Economics

**Course Objectives:**

1. To understand the basic concepts of financial management.
2. To know various techniques of financial analysis and performance evaluation.
3. Able to take financing decisions.
4. Implementation of ABC analysis and EOQ analysis.
5. To understand various limitations of budgetary control

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

1. Understand and explain various methods of financial management.
2. Analyze risk management and evaluation.
3. Implement planning and estimation of working capital.
4. Utilize various tools like ABC and EOQ
5. Acquire knowledge in profit planning and control.

**UNIT - I: Concepts of Financial Management**

Nature and Scope of Financial Management, Introduction of Finance as a Function, Scope, Tradition and Modern Methods, Objectives of Financial Management, Basic Concepts of Time Value of Money, Cash Flow, Risk, Return Preparations of Income Statement and Balance Sheet.

**UNIT – II: Financial Analysis and Investment Decisions**

Techniques of Financial Analysis and Performance Evaluation, Statement of Changes in Financial Position, Presentation of Cash Flow Statement, Financial Performance Analysis Through Ratio Analysis, Long Term Investment Decision, Capital Budgeting Purpose and Evaluation Techniques, Analysis of Risk and Uncertainty, Measurement and Evaluation of Risk.

**UNIT – III: Financing and Working Capital Management**

Financing Decisions, Operating and Financial Leverages, Combined Leverage, Capital Structure Decision, Net Income and Net Operating Income Approaches, Designing Capital Structure, Profitability and Liquidity Aspects and Control. Working Capital Management, Planning of Working Capital, Determinants of Working Capital, Estimation of Current Assets and Current Liabilities.

**UNIT – IV: Working Capital and Cash Flow Management**

Sources of Working Capital, Trade Credit and Bank Credit, RBI Frame Work for Regulation of Bank Credit, Information and Reporting System, Objectives of Cash Management, Determination of Cash Needs, Cash Management. Receivables Management: Objectives, Credit Policies and Terms, Collection Policies, Inventory Management and its Objectives, Quantitative Techniques like ABC Analysis and EOQ Analysis.

**UNIT – V: Profit Planning and Budgetary Control**

Profit Planning and Control, Breakeven Analysis and its Application, Budgets and Budgetary Control as a Management Tool, Installation of Budgetary System, Limitations of Budgetary Control, Classification of Budgets, Preparation of Master Budget.

**TEXT BOOKS:**

1. Financial Analysis, Jim McMenamin, Oxford University Press / Taylor and Francis, 1st Edition, 1999.
2. Financial Management, I. M. Pandey, Vikas Publishing House, 11th Edition, 2015

**REFERENCE BOOKS:**

1. Management Accounting and Financial Control, S.N. Maheshwari, Sultan Chand and Sons, Standard Edition, circa 2015.
2. Financial Management: Text, Problems and Cases, M. Y. Khan and P. K. Jain, McGraw Hill Education, 8th Edition, 2018.
3. Financial Management and Policy, James C. Van Horne, Pearson Education, 12th Edition, 2002.
4. Essentials of Financial Management, Eugene F. Brigham, Joel F. Houston, Cengage Learning, 3rd Edition, 2012.
5. Financial Management: Text, Problems and Cases, M.Y. Khan, P.K. Jain, McGraw Hill Education, 8th Edition, 2018.
6. Financial Management: Core Concepts, Raymond Brooks, Pearson Education, 3rd Edition, 2016.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester****LEADERSHIP AND CHANGE MANAGEMENT****(Professional Elective – V)**

L	T	P	C
3	0	0	3

**Prerequisites:** Principles of Management, Communication Skills**Course Objectives:** The course aims to

1. Provide an understanding of leadership theories, styles, and practices in organizational settings.
2. Explore the role of leaders in driving change and managing resistance.
3. Examine frameworks for effective change management in dynamic business environments.
4. Develop skills to lead teams, build vision, and foster innovation.
5. Analyze case studies to understand practical challenges in leadership and organizational transformation.

**Course Outcomes:** After the successful completion of this course, the student will be able to

1. Understand different leadership theories and evaluate their relevance in organizational contexts.
2. Apply leadership skills to motivate, influence, and manage teams effectively.
3. Analyze the need for change and apply appropriate models for change implementation.
4. Manage resistance to change and foster a culture of continuous improvement.
5. Evaluate real-life leadership and change scenarios using analytical and strategic thinking.

**UNIT I: Leadership**

Concept, Characteristics, Roles, Motives, Skills and Functions. Leadership vs Management. Effective Leadership Behavior and Attitudes. Impact of Leadership on Organizational Performance.

**UNIT II: Leadership Styles and Theories**

Popular Leadership Styles, Entrepreneurial and Super leadership. Transactional and Transformational leadership approaches. Charismatic, Authentic, Servant, Adaptive, Team Leadership, Trait and Path, Goal Theories of leadership.

**UNIT III: Organizational Change**

Role of a Leader in Changing Business Environment, Qualities and Competencies of a Change Leader, Types and Forces of Change, Framework for Change Management, Proactive Change and Reactive Change, Elements of Planned Change, Action Research Model, Individual and Organizational Barriers to Change Management and Overcoming the Barriers to Change Management.

**UNIT IV: Managing and Leading Organizational Change**

Influence of Change: Six Belief Changers That Influence Change, Organizational Change through Influencing Individual Change.

Approaches: Kotter's Eight-Step Plan, Greiner's Change Process Model, Four Key Drivers of Organizational Change, Factors Contributing to Resistance to Change, Best Practices to Overcome Resistance to Change.

**UNIT V: Organizational Culture and Change Management**

Organizational Culture and Leadership, Types of Cultures, Primary and Secondary ways to Influence Culture, Elements of Organizational Culture, Diagnosing, Creating and Managing Organization Culture.

**TEXT BOOKS:**

1. Managing Organizational Change: Altering Mindsets in a Global Context, V. Nilakant and S. Ram Narayan, Sage Response Books, 1<sup>st</sup> Edition, 2006
2. Managing Change: A Human Resource Strategy Approach, Adrian Thornhill, Phil Lewis, Mike Millmore and Mark Saunders, Pearson Education, 1<sup>st</sup> Edition, 1999

**REFERENCE BOOKS:**

1. Leadership: Personal Effectiveness and Team Building, Ranjana Mittal, Vikas Publishing House, 2nd Edition, 2016.
2. Leadership and Change Management, Radha R. Sharma, Tata McGraw-Hill, 1st Edition, 2007.
3. Leading Change, John P. Kotter, Harvard Business Review Press, 1st Edition, 1996.
4. Change Management: The People Side of Change, Jeffrey M. Hiatt, Timothy J. Creasey, Prosci Learning Center Publications, 1st Edition, 2003.
5. Organizational Behavior, Stephen P. Robbins, Timothy A. Judge, Pearson Education, 18th Edition, 2019.
6. Leadership in Organizations, Gary Yukl, Pearson Education, 8th Edition, 2012.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****ENGLISH FOR RESEARCH PAPER WRITING****(Audit Course - I)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic English Grammar and Composition, Fundamentals of Technical Writing

**Course objectives:** Students will be able to:

1. To improve the quality and clarity of academic writing specifically for research papers.
2. To provide students with the structure, style, and conventions of scholarly communication.
3. To help students understand how to write titles, abstracts, introductions, literature reviews, methods, results, and conclusions effectively.
4. To guide students in avoiding common grammatical, structural, and ethical mistakes in writing.
5. To build competence in reviewing and editing research manuscripts for publication.

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

1. Write grammatically correct, well-structured, and coherent research papers.
2. Use appropriate academic language and tone for different parts of a research article.
3. Construct effective titles, abstracts, and concise conclusions.
4. Apply standard referencing styles and avoid plagiarism.
5. Critically revise and refine research drafts for clarity and publication readiness.

**UNIT-I: Effective Writing and Sentence Structuring**

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

**UNIT-II: Academic Writing and Research Ethics**

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

**UNIT-III: Research Paper Structure and Finalization**

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

**UNIT-IV: Essential Academic Writing Skills for Research Papers**

Key Skills are needed when Writing a Title, Key Skills are needed when Writing an Abstract, Key Skills are needed when Writing an Introduction, Skills needed when writing a Review of the Literature.

**UNIT-V: Advanced Research Writing Skills**

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

### **UNIT-VI: Perfecting Your Research Paper**

Useful Phrases, How to ensure Paper is as Good as it could possibly be the First Time Submission.

#### **TEXT BOOKS:**

1. Writing for Science, Robert Goldbort, Yale University Press, 1st Edition, 2006.
2. How to Write and Publish a Scientific Paper, Robert A. Day & Barbara Gastel, 6th Edition (Cambridge University Press), 2006.

#### **REFERENCE BOOKS**

1. Handbook of Writing for the Mathematical Sciences, Nicholas J. Higham, SIAM, 2nd Edition, 1998.
2. English for Writing Research Papers, Adrian Wallwork, Springer, 1st Edition, 2011.
3. How to Write and Publish a Scientific Paper, Barbara Gastel, Robert A. Day, Cambridge University Press, 8th Edition, 2016
4. The Elements of Style, William Strunk Jr., E.B. White, Pearson Education, 4th Edition, 2000
5. Scientific Writing and Communication: Papers, Proposals, and Presentations, Angelika H. Hofmann, Oxford University Press, 3rd Edition, 2016
6. Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded, Joshua Schimel, Oxford University Press, 1st Edition, 2012

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****DISASTER MANAGEMENT****(Audit Course - I)**

L	T	P	C
2	0	0	0

**Prerequisite:** Environmental Science, Basic Geography or Earth Science**Course Objectives:** Students will be able to

1. To introduce the concepts, phases, and classifications of disasters and disaster management.
2. To develop an understanding of disaster risk reduction and mitigation strategies.
3. To impart knowledge on institutional frameworks, legal aspects, and community-based approaches.
4. To build the ability to assess risks and prepare emergency management plans.
5. To create awareness about post-disaster recovery, rehabilitation, and resilience planning.

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

1. Identify different types of natural and man-made disasters and their causes.
2. Analyze risk factors and develop suitable mitigation and preparedness strategies.
3. Understand the role of government agencies, NGOs, and international bodies in disaster management.
4. Apply principles of emergency response planning and coordination.
5. Contribute to post-disaster rehabilitation and sustainable development planning.

**UNIT-I: Disaster**

Definition, Factors and Significance, Difference between Hazard and Disaster, Natural and Manmade Disasters, Difference between Nature Types and Magnitude.

**UNIT-II: Repercussions of Disasters and Hazards**

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

**UNIT-III: Disaster Prone Areas in India**

Study of Seismic Zones, Areas Prone to Floods and Droughts, Landslides and Avalanches, Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami, Post Disaster Diseases and Epidemics

**UNIT-IV: Disaster Preparedness and Management**

Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard, Evaluation of Risk, Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

**UNIT-V: Risk Assessment Disaster Risk**

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

**UNIT-VI: Disaster Mitigation**

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

**TEXT BOOKS:**

1. Disaster Management in India: Perspectives, Issues and Strategies, R. Nishith & A. K. Singh, New Royal Book Company, 1st Edition, 2007
2. Disaster Mitigation: Experiences and Reflections, Pardeep Sahni et al. (Eds.), Prentice Hall India, 1st Edition, 2001

**REFERENCE BOOKS:**

1. Disaster Administration and Management: Text and Case Studies, S. L. Goel, Deep & Deep Publications, 1st Edition, 2007.
2. Introduction to International Disaster Management, Damon P. Coppola, Butterworth-Heinemann, 3rd Edition, 2015.
3. Disaster Management and Preparedness, Thomas D. Schneid, Larry Collins, CRC Press, 1st Edition, 2001.
4. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 1st Edition, 2013.
5. Natural Disasters, Patrick L. Abbott, McGraw Hill Education, 9th Edition, 2016.
6. Environmental Hazards: Assessing Risk and Reducing Disaster, Keith Smith, Routledge, 6th Edition, 2013.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****SANSKRIT FOR TECHNICAL KNOWLEDGE****(Audit Course - I)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic understanding of Indian heritage and classical languages**Course Objectives:**

1. To expose students to Sanskrit as a classical language of knowledge and science.
2. To introduce technical terms and concepts embedded in ancient Sanskrit texts.
3. To enable understanding of foundational texts related to mathematics, engineering, and philosophy.
4. To build linguistic skills for reading and interpreting original Sanskrit sources.
5. To appreciate the relevance of Sanskrit in the context of modern scientific discourse.

**Course Outcomes:** Students will be able to

1. Understand the structure and grammar of Sanskrit relevant to technical usage.
2. Recognize and interpret key technical terms and concepts from ancient Sanskrit literature.
3. Translate and explain Sanskrit verses that relate to scientific and engineering disciplines.
4. Develop an interdisciplinary perspective connecting ancient wisdom with contemporary science.
5. Appreciate the contribution of Sanskrit to Indian scientific, philosophical, and cultural heritage.

**UNIT-I:**

Alphabets in Sanskrit,

**UNIT-II:**

Past / Present / Future Tense, Simple Sentences

**UNIT-III:**

Order, Introduction of Roots,

**UNIT-IV:**

Technical Information about Sanskrit Literature

**UNIT-V:**

Technical Concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**TEXT BOOKS:**

1. Abhyaspustakam, Dr. H. R. Vishwasa, Samskrita Bharati Publication, New Delhi, 1st Edition, 2012.
2. Teach Yourself Sanskrit: Prathama Diksha, edited by Vempati Kutumbashastri, Rashtriya Sanskrit Sansthanam, New Delhi, 1st Edition, 2002.

**REFERENCE BOOKS:**

1. Technical Literature in Sanskrit, S. Balachandra Rao, Rashtriya Sanskrit Vidyapeetha, 1st Edition, 2005.
2. Sanskrit and Science, Prabhakar Apte, Central Institute of Indian Languages, 1st Edition, 2003.
3. Scientific Heritage of India in Sanskrit, R. Ganapathi, Bharatiya Vidya Bhavan, 1st Edition, 1990.
4. Sanskrit and Artificial Intelligence, Rick Briggs, AI Magazine (Journal Paper), 1st Edition, 1985.
5. Essentials of Sanskrit Language for Engineering Students, M. Sampath Kumar, Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya, 1st Edition, 2010.
6. Vyavaharika Samskritam (Functional Sanskrit), R.S. Vadhyar, R.S. Vadhyar & Sons, 3rd Edition, 2008.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, I Semester****VALUE EDUCATION****(Audit Course - I)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic Understanding of Ethics and Social Responsibility**Course Objectives:** Students will be able to

1. To help students understand the importance of values in personal and professional life.
2. To promote ethical behavior and decision-making based on human values.
3. To develop a sense of responsibility, empathy, and integrity.
4. To cultivate respect for diversity, equality, and sustainable living.
5. To encourage self-reflection and a commitment to lifelong value-based learning.

**Course Outcomes:** Students will be able to

1. Recognize and apply core human values such as honesty, compassion, and respect.
2. Analyze ethical dilemmas and make morally sound decisions.
3. Demonstrate socially responsible behavior in both personal and professional contexts.
4. Promote harmony in relationships, society, and the environment.
5. Engage in continuous personal development guided by ethical principles.

**UNIT-I: Values and Ethics**

Values and Self-Development, Social Values and Individual Attitudes, Work Ethics, Indian Vision of Humanism, Moral and Non- Moral Valuation, Standards and Principles, Value Judgements.

**UNIT-II: Core Personal Values**

Importance of Cultivation of Values, Sense of Duty, Devotion, Self-Reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of Faith, National Unity, Patriotism, Love for Nature, Discipline.

**UNIT-III: Personality Traits**

Personality and Behavior Development, Soul and Scientific Attitude, Positive Thinking, Integrity and Discipline, Punctuality, Love and Kindness.

**UNIT-IV: Virtuous Living**

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.

**UNIT-V: Character and Wisdom**

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.

**TEXT BOOKS:**

1. Values and Ethics for Organizations: Theory and Practice, S. K. Chakraborty, Oxford University Press, 1st Edition, 1998 (paperback reprint 1999).
2. Value Education and Professional Ethics, R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, 1st Edition, 2010.

**REFERENCE BOOKS:**

1. Education in Values: A Source Book, UNESCO, NCERT Publication, 1st Edition, 2002.
2. Value Education: Principles and Practice, S. Ignacimuthu, Don Bosco Publications, 1st Edition, 2009.
3. Value Education: Theory and Practice, G. Rajagopalan, Bharatiya Vidya Bhavan, 1st Edition, 2011.
4. Education for Values in Schools – A Framework, NCERT, NCERT Publication, 1st Edition, 2012.
5. Education in Human Values, A.C. Bhaktivedanta Swami Prabhupada, Bhaktivedanta Book Trust, 1st Edition, 2001.
6. Teaching of Values: Some Reflections, M. M. Goel, Shipra Publications, 1st Edition, 2005.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester****CONSTITUTION OF INDIA****(Audit Course - II)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic knowledge of Indian history and Governance**Course Objectives:** Students will be able to:

1. To provide a comprehensive understanding of the Indian Constitution, its structure, and significance.
2. To familiarize students with the fundamental rights, duties, and directive principles.
3. To introduce the key organs of government and their roles in a democratic system.
4. To promote awareness of constitutional values, governance mechanisms, and public responsibility.
5. To understand the relationship between the Constitution and the legal-administrative framework of India.

**Course Outcomes:** Students will be able to:

1. Describe the history, evolution, and philosophy behind the Constitution of India.
2. Explain the fundamental rights and duties of citizens and the structure of the Indian government.
3. Analyze the functioning of constitutional bodies and judicial systems.
4. Understand the significance of constitutional amendments and landmark legal cases.
5. Demonstrate responsible citizenship and awareness of constitutional governance

**UNIT-I: Constitution Drafting History**

History of Making of the Indian Constitution, History Drafting Committee, (Composition and Working)

**UNIT-II: Constitutional Philosophy**

Philosophy of the Indian Constitution, Preamble, Salient Features

**UNIT-III: Rights and Duties Framework**

Contours of Constitutional Rights and Duties, Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**UNIT-IV: Organs of Governance**

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions

**UNIT-V: Local Administration**

District's Administration Head, Role and Importance. Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation. Panchayat Raj: Introduction, PRI: Zila Panchayat, Elected Officials and their Roles, CEO Zila Panchayat, Position and Role, Block Level, Organizational Hierarchy (Different Departments), Village Level, Role of Elected and Appointed Officials, Importance of Grass Root Democracy.

**UNIT-VI: Election Commission**

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.

**TEXT BOOKS/ REFERENCES:**

1. The Constitution of India (Bare Act), Government Publication, 1<sup>st</sup> Edition, 1950.
2. Dr. B. R. Ambedkar: Framing of Indian Constitution, Dr. S. N. Busi, Ava Publications, 1<sup>st</sup> Edition, 2016.

**REFERENCE BOOKS:**

1. Introduction to the Constitution of India, M. P. Jain, LexisNexis, 7th Edition, 2014.
2. Introduction to the Constitution of India, D. D. Basu, LexisNexis, 22nd Edition, 2015.
3. Indian Polity, M. Laxmikanth, McGraw Hill Education, 6th Edition, 2021.
4. Our Constitution, Subhash Kashyap, National Book Trust, 1st Edition, 2011.
5. The Constitution of India: A Contextual Analysis, Arun K. Thiruvengadam, Bloomsbury Publishing, 1st Edition, 2017.
6. The Constitution of India, P.M. Bakshi, Universal Law Publishing, 17th Edition, 2020.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., I Year, II Semester**  
**PEDAGOGY STUDIES**  
**(Audit Course - II)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic understanding of Teaching-Learning processes

**Course Objectives:**

1. To understand the concepts, principles, and theories of pedagogy and their application.
2. To evaluate the effectiveness of different teaching approaches in varied educational contexts.
3. To analyze the impact of teacher behavior, classroom environment, and instructional strategies on learning.
4. To assess the challenges in implementing pedagogical innovations in diverse settings.
5. To enable the design of learner-centered, inclusive, and effective educational practices.

**Course Outcomes:** Students will be able to understand

1. Explain key pedagogical theories and their relevance to classroom teaching.
2. Compare traditional and modern teaching strategies based on evidence from research.
3. Identify factors affecting student engagement, motivation, and learning outcomes.
4. Design instructional plans that incorporate effective pedagogical principles.
5. Critically evaluate and adapt teaching practices to meet diverse learner needs.

**UNIT-I: Pedagogical Foundations**

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.

**UNIT-II: Global Pedagogical Practices**

Thematic Overview, Pedagogical Practices are being used by Teachers in Formal and Informal Classrooms in Developing Countries, Curriculum, Teacher Education.

**UNIT-III: Effective Pedagogy Evidence**

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 School 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.

**UNIT-IV: 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.

**UNIT-V: Future Pedagogical Research**

Research Gaps and Future Directions, Research Design, Contexts, Pedagogy, Teacher Education, Curriculum and Assessment, Dissemination and Research Impact.

**TEXT BOOKS:**

1. Classroom interaction in Kenyan primary schools Ackers, J., and Hardman, F., Compare a Journal of Comparative and International Education, Volume 31, 2001.
2. Curricular reform in schools: The importance of evaluation, Agrawal, M, Journal of Curriculum Studies, Volume 36, 2003.

**REFERENCE BOOKS:**

1. Teacher training in Ghana - does it count? , Akyeampong, K, Multi-site teacher education research project (MUSTER) country report 1. Department for International Development (DFID), London, 1st Edition, 2003.
2. How Learning Works: Seven Research-Based Principles for Smart Teaching, Susan A. Ambrose, Jossey-Bass, 1st Edition, 2010.
3. Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement, John Hattie, Routledge, 1st Edition, 2009.
4. Teaching for Quality Learning at University, John Biggs, Catherine Tang, McGraw-Hill Education, 4th Edition, 2011.
5. The Skillful Teacher: On Technique, Trust, and Responsiveness in the Classroom, Stephen D. Brookfield, Jossey-Bass, 3rd Edition, 2015.
6. Learning Theories: An Educational Perspective, Dale H. Schunk, Pearson Education, 7th Edition, 2015.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., I Year, II Semester  
STRESS MANAGEMENT BY YOGA**

L	T	P	C
2	0	0	0

**(Audit Course - II)**

**Prerequisite:** Basic awareness of mental and physical health

**Course Objectives:**

1. To introduce the concept of stress and its impact on physical and mental well-being.
2. To provide an understanding of yoga as a tool for stress relief and emotional balance.
3. To teach various yogic practices including asanas, pranayama, and meditation for managing stress.
4. To cultivate self-awareness, relaxation, and resilience through regular yogic practice.
5. To promote a healthy lifestyle by integrating yogic discipline in daily life.

**Course Outcomes:** Students will be able to:

1. Understand the causes and physiological effects of stress.
2. Apply basic yogic techniques to reduce stress and enhance focus.
3. Practice breathing techniques and meditation to maintain emotional stability.
4. Demonstrate improved physical flexibility, mental clarity, and stress tolerance.
5. Incorporate yoga as a sustainable approach to managing academic, professional, and personal pressures.

**UNIT-I:**

Definitions of Eight parts of yoga. (Ashtanga)

**UNIT-II:**

Yam and Niyam.

**UNIT-III:** Do's and Don't's in Life

Ahinsa, Satya, Astheya, Bramhacharya and Aparigraha. Shaucha, Santosh, Tapa, Swadhyay, Ishwarpranidhan

**UNIT-IV:**

Aasan and Pranayam

**UNIT-V:**

Various Yoga Poses and their Benefits for Mind and Body. Regularization of Breathing Techniques and its Effects, Types of Pranayam

**TEXT BOOKS:**

1. Yogic Asanas for Group Training – Part I, Janardan Swami Yogabhyasi Mandal, Janardan Swami Yogabhyasi Mandal, Nagpur, Standard Edition, 1990.
2. Rajayoga or conquering the Internal Nature, Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata, 2010.

**REFERENCE BOOKS:**

1. The Heart of Yoga: Developing a Personal Practice, T.K.V. Desikachar, Inner Traditions, 1st Edition, 1999.
2. Yoga for Stress Relief, Swami Shivapremananda, Jaico Publishing House, 1st Edition, 2002.
3. Light on Yoga, B.K.S. Iyengar, HarperCollins, Revised Edition, 2015.
4. The Relaxation Response, Herbert Benson, HarperTorch, Updated Edition, 2000.
5. Yoga for Wellness, Shri Yogendra, The Yoga Institute, 1st Edition, 2001.
6. Yoga as Medicine, Timothy McCall, Bantam Books, 1st Edition, 2007.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., I Year, II Semester**  
**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**  
**(Audit Course - II)**

L	T	P	C
2	0	0	0

**Prerequisite:** Basic Communication and Interpersonal skills

**Course Objectives:**

1. To understand the concept of personality and its development through ethical and moral grounding.
2. To enhance self-awareness, confidence, and emotional intelligence.
3. To inculcate life-enlightening values drawn from Indian wisdom and philosophy.
4. To improve communication, leadership, and decision-making abilities.
5. To promote a positive attitude and holistic approach toward life and career.

**Course Outcomes:** Students will be able to

1. Explain the key elements of personality and factors influencing its growth.
2. Demonstrate improved self-confidence, empathy, and interpersonal relationships.
3. Apply principles from enlightened texts (e.g., Bhagavad Gita, Upanishads) to everyday decision-making.
4. Exhibit qualities of ethical leadership and responsible citizenship.
5. Lead a balanced, purposeful, and value-driven personal and professional life.

**UNIT-I:**

Neetisatakam-Holistic development of personality

1. Verses- 19,20,21,22 (wisdom)
2. Verses- 29,31,32 (pride & heroism)
3. Verses- 26,28,63,65 (virtue)

**UNIT-II:**

Neetisatakam-Holistic development of personality

1. Verses- 52,53,59 (don't's)
2. Verses- 71,73,75,78 (do's)

**UNIT-III:**

Approach to day-to-day work and duties.

1. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
2. Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
3. Chapter 18-Verses 45, 46, 48.

**UNIT-IV:**

Statements of basic knowledge.

1. Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68
2. Chapter 12 -Verses 13, 14, 15, 16,17, 18
3. Personality of Role model. Shrimad Bhagwad Geeta:

**UNIT-V:**

1. Chapter 2-Verses 17, Chapter 3-Verses 36,37,42,
2. Chapter 4-Verses 18, 38,39
3. Chapter 18 – Verses 37,38,63

**TEXT BOOKS:**

1. Srimad Bhagavad Gita, Swami Swarupananda, Advaita Ashram (Publication Department), Kolkata, 2018.
2. Bhartrihari's Three Satakas, (Niti-sringar-vairagya), P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi, 1st Edition, 2002.

**REFERENCE BOOKS:**

1. Awakening the Giant Within, Anthony Robbins, Free Press, 1st Edition, 1992
2. The 7 Habits of Highly Effective People, Stephen R. Covey, Simon and Schuster, 30th Anniversary Edition, 2020
3. Wings of Fire: An Autobiography, A.P.J. Abdul Kalam, Universities Press, 30th Impression, 2014
4. Living with the Himalayan Masters, Swami Rama, Himalayan Institute Press, Revised Edition, 2002
5. The Monk Who Sold His Ferrari, Robin Sharma, Jaico Publishing House, 1st Edition, 1997
6. The Power of Now, Eckhart Tolle, New World Library, 1st Edition, 1999.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester****BUSINESS ANALYTICS****(Open Elective)**

L	T	P	C
3	0	0	3

**Prerequisite:** Statistics and Probability, Mathematics for Analytics**Course objectives:**

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision-making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools and Operations research techniques.

**Course Outcomes:** At the end of the course,

1. Understand and apply key business analytics concepts in various functional areas.
2. Analyze historical data using descriptive analytics for business reporting.
3. Develop predictive models to forecast business trends and customer behavior.
4. Apply prescriptive analytics techniques to support strategic decision-making.
5. Use tools such as Excel, R, Python, or Tableau for data analysis and visualization in a business setting.

**UNIT- I: Business analytics**

Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, Competitive Advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical Methods, Review of Probability Distribution and Data Modelling, Sampling and Estimation Methods Overview.

**UNIT- II: Trendiness and Regression Analysis:**

Modelling Relationships and Trends in Data, Simple Linear Regression, Important Resources, Business Analytics Personnel, Data and Models for Business Analytics, Problem Solving, Visualizing and Exploring Data, Business Analytics Technology.

**UNIT- III: Business Analytics Structure and Techniques**

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

**UNIT- IV: Forecasting Techniques**

Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables,



Selecting, Appropriate Forecasting Models, Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

**UNIT- V: Decision Analysis**

Formulating Decision Problems, Decision Strategies With and Without Outcome Probabilities, Decision Trees and Value of Information, Utility and Decision Making. Recent Trends in Embedded and Collaborative Business Intelligence, Visual Data Recovery, Data Storytelling and Data Journalism.

**TEXT BOOKS:**

1. Business Analytics: Principles, Concepts, and Applications, Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, Pearson FT Press, 1st Edition, 2014.
2. Business Analytics, James R. Evans, Pearson Education, 3rd Edition, 2020.

**REFERENCE BOOKS:**

1. Business Analytics: Data Analysis and Decision Making, S. Christian Albright and Wayne L. Winston, Cengage Learning, 6th Edition, 2016.
2. Data Science for Business, Foster Provost and Tom Fawcett, O'Reilly Media, 1st Edition, 2013.
3. Business Analytics: The Science of Data-Driven Decision Making, U. Dinesh Kumar, Wiley India, 1st Edition, 2017.
4. Data Science for Business, Foster Provost, Tom Fawcett, O'Reilly Media, 1st Edition, 2013.
5. Predictive Analytics: The Future of Big Data, Eric Siegel, Wiley, 1st Edition, 2013.
6. Principles of Business Analytics, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson Education, 1st Edition, 2014.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester****WASTE TO ENERGY****(Open Elective)**

L	T	P	C
3	0	0	3

**Prerequisites:** Renewable Energy Engineering and Technology**Course Objectives:**

1. To understand various types of waste and their energy potential.
2. To study the technologies used for converting waste into energy, including thermal, biological, and chemical processes.
3. To explore waste handling, segregation, and preprocessing techniques.
4. To evaluate the environmental and economic aspects of waste-to-energy (WTE) systems.
5. To examine policies, challenges, and case studies related to WTE implementation.

**Course Outcomes:**

1. Classify different types of waste and assess their suitability for energy recovery.
2. Explain and compare WTE technologies such as incineration, gasification, pyrolysis, anaerobic digestion, and landfill gas recovery.
3. Analyze the performance and efficiency of WTE systems.
4. Assess environmental impacts and propose mitigation measures for WTE plants.
5. Design and evaluate small- and large-scale WTE projects considering technical and economic factors.

**UNIT-I: Energy from Waste**

Classification of Waste as Fuel, Agro Based, Forest Residue, Industrial Waste, MSW, Conversion Devices, Incinerators, Gasifiers and Digesters.

**UNIT-II: Biomass Pyrolysis**

Pyrolysis, Types, Slow Fast, Manufacture of Charcoal, Methods, Yields and Application, Manufacture of Pyrolytic Oils and Gases, Yields and Applications. Biomass Gasification: Gasifiers, Fixed Bed System, Downdraft and Updraft Gasifiers, Fluidized Bed Gasifiers, Design, Construction and Operation, Gasifiers Burner Arrangement for Thermal Heating, Gasifier Engine Arrangement and Electrical Power, Equilibrium and Kinetic Consideration in Gasifier Operation.

**UNIT-III: Biomass Combustion**

Biomass stoves, Improved Chullahs, Types, Some Exotic Designs, Fixed Bed Combustors, Types, Inclined Grate Combustors, Fluidized Bed Combustors, Design, Construction and Operation, Operations of all the above Biomass Combustors.

**UNIT-IV: Biogas**

Properties of Biogas (Calorific Value and Composition), Biogas Plant Technology and Status, Bio Energy System, Design and Constructional Features, Biomass Resources and their Classification, Biomass Conversion Process

**UNIT-V: Biomass Conversion and Waste to Energy**

Thermo Chemical Conversion, Direct Combustion, Biomass Gasification, Pyrolysis and Liquefaction, Biochemical Conversion, Anaerobic Digestion, Types of Biogas Plants, Applications Alcohol Production from Biomass, Bio Diesel Production, Urban Waste to Energy Conversion, Biomass Energy Programme in India.

**TEXT BOOKS:**

1. Non-Conventional Energy, Ashok V. Desai, Wiley Eastern Ltd., 1st Edition, 1990.
2. Biogas Technology – A Practical Handbook, Vol. I and II, K.C. Khandelwal and S.S. Mahdi, Tata McGraw-Hill Publishing Co. Ltd., 1st Edition, 1983.

**REFERENCE BOOKS:**

1. Food, Feed and Fuel from Biomass, D.S. Challal, IBH Publishing Co. Pvt. Ltd., 1st Edition, 1991.
2. Biomass Conversion and Technology, C.Y. WereKo-Brobby and E.B. Hagan, John Wiley and Sons, 1st Edition, 1996.
3. Renewable Energy Engineering and Technology: Principles and Practice, V.V.N. Kishore, TERI Press, 1st Edition, 2009.
4. Biomass to Renewable Energy Processes, Jay Cheng, CRC Press, 2nd Edition, 2017.
5. Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Gary C. Young, Wiley, 1st Edition, 2010.
6. Anaerobic Digestion – Making Biogas – Making Energy: The Earthscan Expert Guide, Tim Pullen, Routledge, 1st Edition, 2015.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech., II Year, I Semester**  
**E- COMMERCE MANAGEMENT AND DIGITAL COMMUNICATION**  
**(Open Elective)**

L	T	P	C
3	0	0	3

**Prerequisites:** Business Management, Fundamentals of Computer Applications, Internet and Networking Concepts

**Course Objectives:**

1. To introduce the concepts and components of e-commerce and its business models
2. To understand the role of digital communication in e-commerce
3. To explore strategies for managing online business operations effectively
4. To study tools and technologies enabling e-commerce and digital marketing
5. To analyze security, legal, and ethical issues related to e-commerce

**Course Outcomes:** By the end of this course, students will be able to:

1. Explain the fundamentals and types of e-commerce and its business models
2. Analyze digital communication channels and their role in e-commerce
3. Design and manage effective e-commerce strategies and platforms
4. Evaluate e-commerce payment systems and security protocols
5. Understand legal, ethical, and privacy issues in digital business environments

**UNIT - I: Introduction to E-Commerce**

The Definition, Evolution, and Scope of E-Commerce, Various E-Commerce Business Models Including Business-to-Business (B2B), Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), and Consumer-to-Business (C2B), Advantages and Challenges of E-Commerce, Infrastructure and Architecture Supporting E-Commerce Systems.

**UNIT - II: Digital Communication Fundamentals**

Concepts and Tools of Digital Communication Relevant to E-Commerce, Digital Communication Channels Such as Email, Social Media Platforms, Instant Messaging, and Voice Over IP (VoIP), Role of Digital Communication in Customer Relationship Management (CRM), Overview of Digital Marketing Strategies.

**UNIT - III: E-Commerce Management**

Strategic and Operational Aspects of E-Commerce Management, Formulation of Online Business Strategies, Website Development and Management, Supply Chain and Logistics Management Specific to E-Commerce, Customer Service and Support Systems in Online Businesses.

**UNIT - IV: E-Commerce Payment Systems**

Various Online Payment Methods Including Credit Cards, Digital Wallets, Unified Payments Interface (UPI), and Cryptocurrencies, Payment Gateway Operations and Merchant Accounts, Security Concerns Related to Online Payments Including Encryption, Fraud Detection, and Prevention.

**UNIT- V: Legal, Ethical, and Security Issues**

Cyber Laws and Regulations Governing E-Commerce, Privacy, Data Protection, and Intellectual Property Rights in Digital Environments, Ethical Issues and Corporate Social Responsibility in E-Commerce.

**TEXT BOOKS:**

1. E-Commerce: Business, Technology, Society – Kenneth C. Laudon and Carol Guercio Traver, 16th Edition, Pearson, 2020
2. Digital Marketing: Strategy, Implementation and Practice – Dave Chaffey and Fiona Ellis-Chadwick, 7th Edition, Pearson, 2019
3. E-Commerce 2023: Business, Technology, Society – Kenneth C. Laudon and Carol Traver, Pearson, 2023

**REFERENCE BOOKS:**

1. Electronic Commerce: A Managerial Perspective – Efraim Turban, David King, Jae Lee, Ting-Peng Liang, 8th Edition, Wiley, 2017
2. Digital Business and E-Commerce Management – Dave Chaffey, 7th Edition, Pearson, 2015
3. Internet Marketing: Integrating Online and Offline Strategies – Mary Lou Roberts and Debra Zahay, 3rd Edition, Cengage Learning, 2012.
4. Digital Communications: Fundamentals and Applications, Bernard Sklar and Fredric R. Harris, Pearson, 2nd Edition, 2001.
5. E-Business and E-Commerce Management, Dave Chaffey, Pearson, 6th Edition, 2015.
6. Principles of Digital Communication, Robert G. Gallager, Cambridge University Press, 1st Edition, 2008.
7. Social Media Marketing: A Strategic Approach, Melissa Barker, Donald I. Barker, Nicholas F. Bormann, and Debra Zahay, Cengage Learning, 2nd Edition, 2016.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech., II Year, I Semester****INDUSTRIAL SAFETY****(Open Elective)**

L	T	P	C
3	0	0	3

**Prerequisites:** Industrial Engineering, Occupational Health and Safety Basics**Course Objectives:**

1. To create awareness about hazards and risks in industrial environments.
2. To study safety management systems, accident prevention methods, and risk assessment.
3. To understand safety legislation, standards, and codes of practice.
4. To explore fire safety, electrical safety, and handling of hazardous materials.
5. To promote a safety culture and preventive strategies in industries.

**Course Outcomes:** At the end of the course, student will be able to:

1. Identify hazards and assess risks in various industrial settings.
2. Implement accident prevention and safety management practices.
3. Apply relevant safety standards, codes, and legal requirements.
4. Plan and execute emergency preparedness and disaster management measures.
5. Recommend safety improvements to enhance workplace health and safety.

**UNIT- I: Industrial Safety and Hazard Prevention**

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, Washrooms, Drinking Water Layouts, Light, Cleanliness, Fire, Guarding, Pressure Vessels, etc., Safety Color Codes, Fire Prevention and Firefighting, Equipment and Methods.

**UNIT- II: 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 and its Relation with Replacement Economy, Service Life of Equipment.

**UNIT- III: Wear and Corrosion and their prevention**

Wear Types, Causes, Effects, Wear Reduction Methods, Lubricants, Types and Applications, Lubrication Methods, General Sketch, Working and Applications of Screw Down Grease Cup, Pressure Grease Gun, Splash Lubrication, Gravity Lubrication, Wick Feed Lubrication, Side Feed Lubrication, Ring Lubrication. Definition, Principle and Factors Affecting the Corrosion, Types of Corrosion, Corrosion Prevention Methods.

**UNIT- IV: Fault Tracing and Decision Tree Analysis**

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, Automotive, Thermal and Electrical Equipment's such as Any One Machine Tool, Pump, Air Compressor, Internal Combustion Engine, Boiler, Electrical Motors, Types of Faults in Machine Tools and Their General Causes.

**UNIT- V: Periodic and Preventive Maintenance**

Periodic Inspection-Concept and Need, Degreasing, Cleaning and Repairing Schemes, Overhauling Mechanical Components, Overhauling Electrical Motor, Common Troubles and Remedies Electric Motor, Repair Complexities and Use, Definition, Need, Steps and Advantages Preventive Maintenance, Steps/Procedure for Periodic and Preventive Maintenance Machine Tools, Pumps, Air Compressors, Diesel Generating (DG) Sets. Program and Schedule Preventive Maintenance Mechanical and Electrical Equipment, Advantages Preventive Maintenance, Repair Cycle Concept and Importance.

**TEXT BOOKS:**

1. Maintenance Engineering Handbook, Higgins and Morrow, Da Information Services, 1<sup>st</sup> Edition.
2. Maintenance Engineering, H.P. Garg, S. Chand and Company, 1<sup>st</sup> Edition, 1987.

**REFERENCE BOOKS:**

1. Pump-Hydraulic Compressors, Audels, McGraw Hill Publication, 1<sup>st</sup> Edition.
2. Foundation Engineering Handbook, Hans Winterkorn, Chapman and Hall, London, 1<sup>st</sup> Edition, 1975.
3. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill, 1st Edition, 2010.
4. Safety Engineering, R. K. Jain & Sunil S. Rao, Khanna Publishers, 4th Edition, 2015.
5. Industrial Safety, Health and Environment Management Systems, R. K. Jain & Sunil S. Rao, Khanna Publishers, 2nd Edition, 2016.
6. Industrial Safety and Risk Management, S. K. Basu, Fire and Safety Association of India, 1st Edition, 2017.