Structure & Syllabus of
M.Tech. (Industrial Engineering)

Effective from Academic Year 2013-14

Prepared by: - Board of Studies in Industrial & Production Engineering
Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by,

Chairman – BOS                                  Chairman – Academic Board
Vision & Mission of Institute

VISION

“To be a globally acclaimed Institute in Technical Education and Research for holistic Socio-economical development”

MISSION

- To impart knowledge and skill based Education in Collaboration with Industry, Academia and Research Organizations
- To strengthen global collaboration for Students, Faculty Exchange and joint Research
- To prepare competent Engineers with a spirit of Entrepreneurship
- To Inculcate and Strengthen Research Aptitude amongst the Students and Faculty


Vision Statement

To be an acclaimed department of preferred choice among stakeholders in the field of industrial and production engineering

Mission Statement

- To create knowledgeable and skilled manpower for meeting current and future demands of industry, government, research organizations and entrepreneurial pursuits
- To strengthen collaborative research amongst students and faculty
- To create sensitivity to social and professional development
- To provide opportunities for life-long learning through global exposure through students- and faculty- exchange and career progression through higher studies
- To strengthen industrial collaboration through training and consultancy
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Program Educational Objectives (PEO) for M.E. (Industrial Engineering) Program

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<th>PEO No.</th>
<th>Description of the Objective</th>
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<tr>
<td>I</td>
<td>Careers</td>
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<td>Utilize industrial engineering skills and employ them in productive careers in industry or for pursuing higher studies and research.</td>
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<td>II</td>
<td>Engineering Expertise</td>
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<td>Apply mathematical, scientific, engineering fundamentals, methods and tools to represent, integrate and solve real world problems.</td>
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<td>III</td>
<td>Professionalism</td>
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<td>Become ethical leaders, who are socially responsible, work collaboratively with others, and have an appreciation for other disciplines.</td>
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<td>IV</td>
<td>Lifelong Learning</td>
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<td>Remain at the leading edge of the industrial engineering discipline and respond to challenges of an ever-changing environment with the most current knowledge and technology.</td>
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2. Program and Course Outcomes

Programme Outcomes:
Our industrial engineering graduates will be able to:

1. Apply knowledge of engineering fundamentals in getting solutions to engineering related problems.
2. Identify, define, formulate, and analyze engineering problems in reaching substantiated conclusions using industrial engineering tools and techniques.
3. Demonstrate ability to design and conduct experiments, interpret and analyze data using mathematical, statistical, engineering and software tools and present results.
4. Select, design, analyze, simulate, improve appropriate manufacturing processes, methods, operating systems for products and services to meet desired standards, specifications and requirements.
5. Make effective / productive use of man, machine and material resources in manufacturing and service sector.
6. Design and improve layouts, material handling and material management systems, supply chain networks.
7. Analyze the impact of operational, economical and financial parameters in real life processes and projects.
8. Design solutions for engineering problems, system components or processes that meet specified needs with appropriate consideration for public in terms of quality, safety, energy, ethical, legal, societal and environmental considerations.
9. Communicate effectively the technical details related to design and manufacturing in both written and verbal form using modern tools.
10. Understand aspects of entrepreneurship.
11. Conduct investigations of complex engineering problems using research-based knowledge and research methods.
12. Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological changes.
13. Demonstrate knowledge and understanding of engineering, management and ethical principles and apply these as a member and leader in a team, to manage projects in multidisciplinary environments.
Semester I
### Teaching Scheme

<table>
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<tr>
<th>Sub. Code</th>
<th>Subject Name</th>
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<th>Class Test</th>
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### TOTAL

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6
IP 50151 : MATHEMATICAL AND STATISTICAL METHODS

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Mathematical Methods (7Hrs)
Set Theory, Series, Binomial Theorem, variables and functions, least square approximation of functions, Iterative methods : Bisection method, Newton-Raphson method.

Unit II : Matrices (7Hrs)
Theory of Matrices, Application of matrix algebra to solution of linear equations, Gauss elimination method, Gauss-Seidal iterative method, Interpolation: Lagrange interpolation, Markovian matrix, Applications of matrices to input-output analysis

Unit III : Descriptive Statistics (7Hrs)
Measures of frequency distribution for central tendency, dispersion, skewness, kurtosis, Types of data, Graphical tools of data presentation, Theory of probability

Unit IV : Probability Distributions (7Hrs)
Discrete probability distributions, Continuous probability distributions, Theory of sampling, Methods of sampling, Sampling distributions, Central Limit Theorem, Estimation in Statistics, Determination of sample size

Unit V : Inferential Statistics (7Hrs)
Tests of hypotheses for Mean, Proportion and Variances, Type I and Type II error in test of hypothesis, ANOVA, Introduction to DOE

Unit VI : Research Methodology (7Hrs)
Types and stages of research process, various methods of data collection, questionnaire design and its various aspects, Characteristics of research- World in general and India in particular

Total Contact Hours: 42

Text Books:


Reference Books:
4. Taguchi Methods Explained: Practical steps to robust design- Tapan Bagchi, Prentice Hall of India, 1993

Course Outcomes:
Students will be able to:

a. represent statistical data graphically; analyze and draw inferences by using techniques like hypothesis testing, regression, correlation, ANOVA etc.
b. identify appropriate examples for each type of probability distribution from business environment.
c. design questionnaire and select appropriate survey method for the predefined purpose.
d. design a plan for experimentation
Unit I : Introduction to Industrial Engineering (7Hrs)
Introduction to Industrial Engineering, Historical background, Contribution of Taylor and Gilbreth, Productivity – Definition, Types, Improvement, Work Content Analysis, Definition and Scope of Work Study, Productivity study, productivity ratios, Numerical and Cases on Productivity

Unit II : Method Study I (7Hrs)
Method Study - Definition, Steps in Method Study, Various Considerations to select a job for Method Study, Recording – Significance, Need, Charting Symbols, Recording Techniques - Charts and Diagrams, Examine – Questioning Techniques – Primary & Secondary Questions, Methods improvement - cost benefit analysis, Cases on Recording Techniques

Unit III : Method Study II (7Hrs)

Unit IV : Work Measurement I – Time Study (7Hrs)

Unit V : Work Measurement II (7Hrs)

Unit VI : Job Evaluation and Merit Rating (7Hrs)
Introduction to Job Evaluation system, necessity, Job Analysis, Job Description, Job Evaluation, job classification, Different Job Evaluation Systems like Factor Comparison, Point System etc, merit rating, methods of merit rating, Wages and Incentives, factors influencing wage system, types of wages, wage structure, Incentive schemes

**Total Contact Hours: 42**

**Text Books:**

**Reference Books:**

**Course Outcomes**

Our students will be able to:

1. Systematically record and critically examine existing and proposed ways of doing work to effect improvements
2. Do work content analysis and methods improvement
3. Design and develop the workplace layout using principles of motion economy and fundamental hand motions.
4. Establish standard time to carry out a specified job at defined level of performance
IP50155: QUALITY AND RELIABILITY ENGINEERING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

**Unit I : Concepts Of Quality** (7Hrs)

**Unit II : Acceptance Sampling** (7Hrs)

**Unit III : Statistical Process Control** (7Hrs)

**Unit IV** (7 Hrs)
**Quality Improvement Tools**

**Unit V** (7 Hrs)
**Six Sigma & Quality Management Systems**

Unit VI : Reliability
Concept of probability, reliability-definition, performance ,cost and reliability, stochastic processes, bathtub curve, MTBF, MTTR, hazard rate, failure rate, cumulative probability distribution function, exponential and weibull distributions. Acceptance sampling based on reliability test-OC curves Active and Passive Redundancy, redundancy allocation and limitations, Evaluation of overall system reliability. Preventive maintenance, Testing and repair, reliability centered maintenance, system availability and maintainability. Life testing-objective-classification

Total Contact Hours: 42

Text Books
1. Amitav Mitra, Fundamentals of Quality Control & Improvement, Pearson Education
2. Phadke, Quality Engineering using Robust Design, Pearson Education

Reference Books
1. J.M. Juran & F.M.Gryna , Quality Planning and Analysis.

Course Outcomes:
Students will be able to:
1. Understand and apply principles of quality management
2. Select and use appropriate tools and techniques for measuring, improving and controlling quality in context of business and operational problems
3. Understand Six Sigma Methodology
IP52151:: FACILITIES PLANNING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I  
Introduction to Facilities Planning  
(7 Hrs)

Scope of Facilities Planning – Importance & Objectives, Nature Of Location Decision, Affecting Facility Location, Single & Multiple Facility Location Models, Qualitative Considerations in Facility Location, Factors Urban v/s Rural Location, Site Selection. Plant Layout – Introduction, Types of Plant Layout: Product, Process, Fixed Postion, Hybrid – Cellular, FMS, etc. Phases of Layout Planning. Urban Location versus Rural Location. Case Study in Location Decisions, Location Pattern In India

Unit II  
Systematic Layout Planning 1  
(7 Hrs)


Unit III  
Systematic Layout Planning 2  
(7 Hrs)


Unit IV  
Material Handling  
(7 Hrs)

Unit V
Systematic Handling Analysis
(7 Hrs)

Unit VI
SHA, Maintenance & Safety
(7 Hrs)

Text Books
1. Practical Plant layout .. Richard Muther
2. Systematic Layout Planning .. Richard Muther
3. Systematic Handling Analysis .. Richard Muther
4. Clark, Facility Planning, Pearson Education
5. Plant layout and design By James More

Reference Books
1. Plant Layout and Material Handling ..By James M Apple
2. Plant Layout By Immer
3. Plant Layout By Shubin
4. Material handling By Allexander
5. Material Handling Equipment By N Rudenko
6. Maintenance Engineering Handbook By Lindley Higgins
Course Outcomes
Our students will be able to:
1. Analyze and select location of facilities for manufacturing and service organizations
2. Analyze, design and improve existing and new layouts for manufacturing and service organizations
3. Analyze and select appropriate material handling systems for manufacturing organizations
IP 52153 : PRODUCTIVITY MANAGEMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Productivity Basics  
Productivity basics in relation with Production, Profitability, Financial statements, Quality, Technology, Factors affecting productivity, and their importance – inflation employment, standard of living, Economic power, Political power, Method of Statistical indices,

Unit II : Productivity Measurement : Conceptual Framework And Models  
Use of KPA in MBO, MBO and PO-P, Production function models, Product oriented models, Surrogate models, Economic utility models, Models based on systems approach, Financial ratios as measures of productivity.

Unit III : Standard Man Hour  
SMH as a unit of measurement, Inputs and SMH accounting in jobbing, mass-production, Batch type factory work and process factories and service work, Uses of SMH, SMH Balance sheet, Productivity monitoring schemes.

Unit IV : Productivity Management : The Role Of External Environment  
External Environment sub-systems such as socio-cultural, Technological, economic, political sub system, approaches to measure impact of external environment

Unit V : Productivity Improvement Implementation Strategies  
Productivity planning, Productivity improvement strategies- The organization factor, Human factor-Behavioral Techniques, Technology Factor, Productivity Audit and Control

Unit VI : PM at various levels  
District level, Regional level, State level, National level and International levels, International Labor Organization (ILO)- Role, importance, duties, research studies and publications, Productivity Improvement strategies around the world- Australia, Asia, Europe, Africa, North America, South and Central America

Total Contact Hours: 42
Text Books:

Reference Books:

Course Outcomes
Our students will be able to:
1. Analyze performance of an organization on the basis of various productivity measures
2. Understand and apply productivity improvement techniques in manufacturing and service sector
3. Understand the significance of productivity improvement techniques and productivity management
IP52155: INDUSTRIAL AND COMMERCIAL LAWS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I
The Industrial Disputes Act, 1947

The Industrial Disputes Act, 1947. Works Committee, Conciliation Officers, Board of Conciliation, Court of Inquiry, Labour Courts, Tribunals, National Tribunal. Procedure, power and duties of the authorities. Strikes and lockouts, layoffs and retrenchment, closure. Unfair labour practices, Penalties, Case Laws

Unit II
The Trade Union Act 1926


Unit III
The Factories Act, 1948 and The Employees Provident Fund and Miscellaneous Provisions Act, 1952


Unit IV
The Industrial Employment [Standing Orders] Act, 1946

Draft Standing Orders, conditions for certification of Standing Orders, Appeals, Register of Standing Orders. Temporary application of model standing orders.

Unit V
The Competition Act, 2000
Objective, Competition Commission, Dominant Position, Anti-Competitive Agreements, Relevant Markets, Cartel, Abuse of Dominant Position, Regulation of Combinations. Case studies and penalties.

Unit VI (7 Hrs)
The Sale of Goods Act, 1930 (3 of 1930)


Text Books

Reference Books
1. Taxman, Commercial Laws.
3. Bare Acts and Bare Acts with Cases for each of these acts

Course Outcomes:

Students will be able to:

1. Apply and utilize legal provisions for resolving industrial disputes in an organization
2. Apply and utilize legal provisions related to health, safety, welfare, working conditions, wages and salaries in an organization
3. Apply and utilize legal provisions for ethical and fair competition, contract of sale in course of trade
IP52157: MATERIALS & OPERATIONS MANAGEMENT

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Unit I
Scope of Operations Management & Materials Management


Unit II
Inventory Management & Replenishment Systems

Classification and Costs of Inventories: Types, Objective of holding inventories, Different types of Inventories, Costs Associated with Inventory - Carrying cost, Procurement cost. EOQ - Concept, Assumptions of EOQ Model, Practical Constraints – Numerical Analysis, Quantity Discounts. EMQ Model - Carrying cost, Set up cost. EOQ Special Considerations – Spares, Bought-outs, etc. Replenishment Systems: Introduction, Concept of lead time and its effects on Inventory, Components of Lead Time - Internal and External. Variability in demand and lead time. Safety Stock Evaluation and ways to minimize lead time, Different types of replenishment systems like Fixed order quantity system, Fixed order interval system, Combination of fixed order interval and quantity system, Two Bin System. Selective Inventory Control: Concept of Selective Inventory Control, ABC analysis, VED analysis, HML analysis, SDE analysis, SOS analysis, FSN analysis, GOLF analysis.

Unit III
OPC and Demand Forecasting

Unit IV  
(7 Hrs)
Aggregate Planning (S & OP) & Quantitative Techniques in Scheduling

Pure Strategies – Chase, Level, Mixed Strategies, Master Production Schedule, Detailed Capacity Requirement Planning, Johnsons Algorithm - Sequencing n jobs on m machines, Assignment Models.
Numerical & Cases in Aggregate Planning

Unit V  
(7 Hrs)
MRP II (Manufacturing Resource Planning)

Documentation - Production Work Order. Techniques of scheduling, dispatching and expediting. Nature of production control in different types of production systems.

Unit VI  
(7 Hrs)
Material Requirement Planning (MRP I) & Production Activity Control


Text Books

Reference Books
Course Outcomes:
Our students will be able to:

1. Design and develop replenishment systems for manufacturing and services organizations
2. Analyze, manage and optimize the inventory levels for manufacturing and services organizations
3. Analyze, assess and develop vendor selection and rating systems for manufacturing organizations for effective procurement of materials
4. Determine the appropriate production system based on the product attributes such as variety, volumes, etc.
5. Understand need of various functions in production planning and control for better management of manufacturing and/or service systems
6. Develop analytical mind for identifying and solving demand forecasting problems using appropriate tools and techniques
7. Develop aggregate plans, master production schedule, capacity requirement plan, and material requirements plans, as part of resource requirements planning systems
IP 52159: TRAINING NEEDS ANALYSIS AND HUMAN RESOURCE PLANNING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I: Learning Curve (7Hrs)

Unit II: HR Planning (7Hrs)
Organizational Business planning, Strategic planning vs. divisional/departmental planning, Manpower planning: process, procedure, methods, pre-requisites, job/role defining and profiling and recruitment decisions, Selection devices and decisions: individual and group processes, tools and techniques, Customization of tests, Validation and reliability, Important Environmental Influences

Unit III: PMS (7Hrs)
Performance Management System - Goal setting, Performance review, discussion and counseling; various methods of designing performance appraisal with its merits and demerits. Empowering / Dis-empowering Systems

Unit IV: Reward Management (7Hrs)
Pay for position, performance and person; Designing rewards for motivation and retention, Career Planning and Development: individual growth vis-à-vis organization; role of individual and organizations, Employee morale, Attitudes and Job Satisfaction

Unit V: Job Analysis (7Hrs)
Job Design, Job Analysis, Job evaluation, Quality of work life: Balancing personal and professional life for organizational and personal success, Employee welfare, Participative management, Employee communication, HR in Information Technology organizations

Unit VI: Conflict Management (7Hrs)
Employee Grievance Handling and discipline management: both legal and strategic approaches, HR Intervention: its importance and types, Employee Separation Schemes: VRS, and retaining the best talent, Displining the problem employees, HR in mergers and acquisitions
Total Contact Hours: 42

Text Books:
2. Human Resource Management by Biswajeet Pattanayak, Prentice Hall of India

Reference Books:
1. Managing Human Resources by Bohlander, Snell, Sherman, Thomsan Learning

Course Outcomes:
Students will be able to:
1. Conceptualize the components of individual and group behavior, learning and training
2. Understand the practicability of performance management systems and reward management
3. Apply job analysis and conflict management techniques in organizations
IP52161: ENVIRONMENTAL ENGINEERING AND ENERGY MANAGEMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I: Introduction  

Unit II: Energy Sources  

Unit III: Legal Provisions  

Unit IV: Demand Side Management  

Unit V: Energy Audit and Energy Saving  
Provisions under the Electricity Act, functions of Bureau of Energy Efficiency

**Unit VI : Environment Protection Act, 1986** (7Hrs)


**Total Contact Hours: 42**

**Text Books:**

**Reference Books:**

**Course Outcomes:**

Students will be able to:

1. Understand present & future energy scenario, importance of energy conservation & energy efficiency.
2. Study various energy conversion processes & their use to generate energy.
3. Understand and participate to conduct energy audit in an organization.
4. Understand efficient energy management approaches.
Part A: Work Study: List of Practical

1. Study of research paper from journal on productivity improvement
2. Assignment on – Flow process chart
3. Assignment on – Two handed process chart
4. Assignment on – Multiple activity
5. Assignment on – Flow diagram and string diagram
6. Case – Bagging Exercise – Method Study 1 (Record, Examine)
7. Case – Bagging Exercise – Method Study 2 (Develop, Evaluate, Define)
8. Training in Rating - Dealing Cards
9. Training in Rating – Walking
10. Setting Time Standards using Time Study – Video Analysis
11. Setting Time Standards using Time Study – Stop watch time study
12. Setting Time Standards using MTM – Video Analysis
13. Setting Time Standards using stop watch time study data – Video Analysis
14. Work Sampling Exercise – preparing and executing work sampling plan

Text Books:


Reference Books:


Course Outcomes

Our students will be able to:

1. Systematically record and critically examine existing and proposed ways of doing work to effect improvements
2. Do work content analysis and methods improvement
fundamental hand motions.
4. Establish standard time to carry out a specified job at defined level of performance

**Part B: Quality & Reliability Engineering**

**Assignments:**
1. Design of Sampling Plan
2. Design of Control Charts – Variables
3. Design of Control Charts – Attributes
4. Assignment on Process Capability
5. Case Study on 7 QC Tools
6. Case Study on 7 QM Tools
7. Case on Constructing House of Quality (QFD) for any Product
8. Assignment 1 on Reliability
9. Assignment 2 on Reliability
10. Assignment on Six Sigma

**Text Books**
2. K.J.Hume, Engineering Metrology, Kalyani publication

**Reference Books**
2. J.M. Juran & F.M.Gryna, Quality Planning and Analysis.

**Course Outcomes:**

Students will be able to:

1. Understand and apply principles of quality management
2. Select and use appropriate tools and techniques for measuring, improving and controlling quality in context of business and operational problems
3. Understand Six Sigma Methodology
IP57751 : SEMESTER PROJECT I

Credits: 02  Teaching Scheme: - Laboratory 2 Hrs/Week

Assessment of Semester Project

Semester Project will be based on all subjects of that Semester except GP.

1. The Semester Project will be for a group of 2 students. Head of Department to appoint Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.

2. Group formation, discussion with faculty advisor, formation of the Semester Project statement, resource requirement, if any should be carried out at the start of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

The Assessment Scheme will be: End Semester Examination: 100 marks

Course Outcomes:
A student will be able to
1. analyze/evaluate a concept / system / machine operation / process etc
2. make physical working model/charts of concepts or carry out a survey
3. analyze and improve methods and determine work content considering human factors
4. make effective / productive use of man, machine and material resources
5. investigate complex problems using various statistical, quantitative and simulation tools
6. work as an individual and lead the teams effectively to achieve the set objectives.
7. prepare project report and present at the end of semester
Semester II
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<td>IP52160</td>
<td>Product Design &amp; New Product</td>
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IP50152:: OPTIMIZATION TECHNIQUES & SIMULATION MODELING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I (7 Hrs)
Linear Programming

Solution of LPP using TORA & Solver in Excel

Unit II (7 Hrs)
Queuing Theory & Simulation

Queuing Theory: Introduction, terminology, Poisson single and multi channel queuing system models: M/M/1 Model, M/M/C Model, M/Ek/1 Model. Simulation: Definition, Introduction, Application, Monte Carlo Simulation. Applications of Simulation, Generation of Random Numbers.
Simulation software, Building Model on Simulation Software, Running the simulation, Understanding the results

Unit III (7 Hrs)
Replacement Model & Theory of Games

Replacement Model: Replacement of capital equipments that deteriorates with time, time value of money (a) remains same (b) changes with constant rates during period. Equipment renewal policy, group and individual replacement. Individual Replacement, Group Replacement Policies, Problems. Game Theory: Game theory Introduction, Terminology, Two -person zero sum game, minimax and maximin principle, Saddle Point, Games with pure and mixed strategies, Dominance property, Solutions with Graphical methods.
Case studies on Replacement Models & Game Theory: L.P. method, approximation method.

Unit IV (7 Hrs)
Goal Programming, Integer Programming & Dynamic Programming

Case studies based on Integer Programming & Dynamic Programming

Unit V
Network Theory 1
(7 Hrs)
Introduction to Networks, deriving networks on the basis of graph theory, Maximal flow minimal cut theorem, applications of networks in operations research. Various models in OR which can be solved using networks techniques.

Unit VI
Network Theory 2
(7 Hrs)

Text Books
1. Taha H A Operation Research and Introduction, McMillian, 8/e, Pearson Education
3. Paneerselvam Operations Research, Prentice Hall of India
4. Philips, Ravindran; Network theory,

Reference Books
2. S.D. Sharma – Operations Research, Kedarnath, Ramnath &Co

Course Outcomes:
Our students will be able to:
1. Formulate a certain class of decision problems and solution
2. Formulate real life queuing problems and generate optimal solutions
3. Simulate various real life problems and generate optimal solutions
IP50154:: PROJECT MANAGEMENT

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Unit I  (7 Hrs)
Introduction:

Project Life Cycle Phases – Concept/Initiation Phase: Parameters Involved in Project Identification. Sources of New Project Ideas,
B. Governmental Framework for Identification of Opportunities, Incentives from state &

Unit II  (8Hrs)
Project Conceptualization & Feasibility Analysis

B Socio-Economic: Socio-Cost Benefit Analysis. Effective Rate of Protection, Domestic Resource Cost

Unit III  (7 Hrs)
Project Planning & Scheduling


Unit IV  (7 Hrs)

Project Cost Management

Capital Budgeting Techniques: Payback Period, Discounted PBP, IRR, NPV, PI, Annual Worth.

Unit V (7 Hrs)
Project Organization, Monitoring, Implementation & Control


Unit VI (7 Hrs)
Critical Chain & Computer Applications in Project Planning & Control

Critical Chain Management – Concept of critical chain, buffers, Planning project with critical chain Introduction to MS Projects – Understanding the MS Project screen & different views, Defining the project, Working with calendar, Outline the project, Create dependencies between tasks, Creating WBS, Format task list and Gantt chart, Resource planning, leveling and preparing resource graph, Working with baseline, tracking the project.

Text Books
1. Harold Kerzner, Project Management
2. Narendra Singh; Project Management & Control; Himalaya Publishing House, Mumbai.
4. Prasanna Chandra; Project: Preparation, Appraisal, Budgeting & Implementation
5. Pinto, Project Management – Achieving Competitive Advantage & MS Projects, Pearson Education

Reference Books
1. Maylor, Project Management, Pearson Education,
2. Gopal & Ramamurthy; Project Management Handbook; Macmilan.
3. Project Management Body of Knowledge, PMI
4. Practical Project Management by Ghatak & Sandra, Pearson Education (Singapore)


**Course Outcomes:**

Students will be able to:

1. Ascertain the feasibility of small and medium projects with respect to managerial, marketing, operational, financial and socio-economic perspectives
2. Plan and schedule small and medium projects to achieve the triple constraint of time, cost and quality using software package
3. Monitor the progress of projects to determine variances and recommend corrective actions software package
IP50156:: HUMAN FACTORS ENGINEERING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Introduction (7Hrs)
Human criteria’s, human physical activities, features of the human body, Measures of physiological functions such as: energy expenditure, gross body activity, local muscualr activity, work load, work efficiency, work and rest. Type of movements of body members. manual material handling (MMH)
Performance criteria for physical activity such as: Strength & endurance, speed of movements, accuracy of movements

Unit II (8 Hrs)
Applied Anthropometry and Work Space
Introduction to anthropometry, use & principles of anthropometry data, work spaces, work space envelopes for seated persons, design of work spaces such as: work surface height, seated & standing, principles of seat design, workplace design.
Design and Displays: Information input & processing, visual displays of static & dynamic information. Auditory, textual & olfactory displays, general location of controls & displays within workspace, concept of visibility
Physical space & arrangement, principles of arrangement of component, Functions of controls, types of controls, factors in control design, design of specific hand operated controls, foot controls and special control devices.

Unit III (8 Hrs)
Working Conditions & WMSDs
Illumination: Color systems, energy consideration,
Atmospheric conditions: Measurement of thermal variables, wet-bulb globe temperature, Botsball, heat stress index, heat index, wind chill index,
Noise: Physiological effect of noise on performance, noise exposure limits,

Unit IV (8 Hrs)
Energy Expenditure
A. Muscle mechanism, BMR, Heart Rate variations, Oxygen consumption, Rest
allowances, Rate of energy expenditure, Manual Material Handling Capacity determination
B. Effect of environmental conditions and work design on Energy Expenditure

Unit V
Ergonomics and Work Organization

Human factors applications in system design, characteristics of system design, human factors data for interface design, ergonomic safety & health management
Case studies of ergonomically designed product.

Unit VI : Legal and Safety Aspects

Provisions in the Factories Act, NIOSH, OSHA guidelines, ISO 18000, Product liabilities

Total Contact Hours: 42

Text Books :

i. ILO, Introduction to Work study
ii. Curie R. M. & Faraday, Work study

Reference Books :

ii. E. Grad jean, Fitting Task to the Man.

Course Outcomes:

Students will be able to:

1. Use principles of anthropometry and ergonomically design work spaces, work places and work stations
2. Identify injuries and occupational diseases that occur due to improper workplace design
3. Perform ergonomic assessments and provide solutions for better and safer workplace design
4. Assess and provide better physiological working conditions to enhance operator comfort
IP52152:: SUPPLY CHAIN ANALYSIS & MODELING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I

Logistics & Warehousing

A. Definition, Logistics Function: Transportation – Significance, Modes of Transportation, Warehousing – Objectives, Warehousing Functions, Types of Warehouses, Inventory Management, Order Processing – Role of IT, Material Handling

Transportation: Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages, Concept of TL, LTL, FTL. Selections of Appropriate Modes of Transportation. Warehouse Management: Concept of SKUs, Warehousing Principles & Best Practices in Receiving, Shipping, Order Picking, Storage & Put away, Warehouse Activity Profiling, Warehouse Layout Planning

Unit II

Concept of SCM


Importance of Supply Chain, Examples of Supply Chain

Unit III

Network Design in Supply Chain


Logistics Modeling: Location – Allocation Models Multiple Facility Location Models: Baumol Wolf Method, Add & Construction Heuristic,


Factors Influencing Network Design Decisions – Strategic, Technological, Macroeconomic, Political, Infrastructure, Competitive

Unit IV

Planning Demand & Supply in a Supply Chain
Managing Supply: Managing Capacity – time flexibility of workforce, seasonal workforce, subcontracting, use of dual facilities, design product flexibility into production processes. Managing Inventory – use common components across multiple products, build inventory of high demand of predictable demand products
Managing Demand: Variable pricing, Forward buying.
Collaborative Planning Forecasting & Replenishment, Demand Forecasting & Aggregate Planning in Supply Chain.

Unit V (7 Hrs)
Planning & Managing Inventories in a Supply Chain
Managing Economies of Scale: Cycle Inventory- Role in SC - Lot sizing for single product, multiple products or customers, Aggregating multiple products in single order
Managing Uncertainty: Safety Inventory – Role in SC – Determine appropriate level of safety inventory
Transportation & Inventory Cost Trade-off: Choice of Transportation Mode, Inventory Aggregation. Transportation cost and customer-responsiveness trade-off
Pricing & Revenue Management in Supply Chain: Role, Revenue Management for Multiple Customer Segments, Seasonal Demand, Bulk & Spot Customers
Economies of scale to exploit quantity discounts. Procurement Process. Sourcing Planning & Analysis

Unit VI (7 Hrs)
Co-ordination & Technology in the Supply Chains
Information Technology and Supply Chain: Role of IT in SC Supply Chain IT Framework. E-business & Supply Chain
Building Strategic Partnerships and Trust within a Supply Chain. Future of IT in Supply Chain. Cases on E-business and supply chains

Text Books
1. Sunil Chopra & Peter Meindl, Supply Chain Management - Strategy, Planning & Operation –Pearson Education

Reference Books
1. Bowersox , Logistical Management - The Integrated Supply Chain Process
2. Christopher, Logistics & Supply Chain Management, Pearson Education
3. Logistics & Supply Chain Management – Raghuram

Course Outcomes:
Students will be able to:
1. Identify the key elements and processes in a supply chain and their interaction
2. Identify the techniques used in management of critical components of supply chain
3. Analyze and select the appropriate modes of transportation
4. Analyze, design and improve stores and warehousing processes
5. Analyze, design and optimize supply chain networks for manufacturing organizations
IP52154:: ENTREPRENEURSHIP DEVELOPMENT

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Unit I
Entrepreneurship
Introduction: Entrepreneur, Entrepreneurship, Intrapreneur. Theories of Entrepreneurship
Concept of Vision, Mission & Its Relevance to Entrepreneurship. Entrepreneurship
Development in India – Role of EDC, EDI, DST, NSETB, Networks Organizations –
MCED, etc. in promoting entrepreneurship

Unit I
Introduction Motivation Inputs To Entrepreneurship
Motivational input: Charms of being an entrepreneur. Reasons for being an entrepreneur.
Study of the wealth creators of an economy. Myths of entrepreneurship. Case studies of
successful entrepreneurs. qualities necessary to be a successful entrepreneur, developing
entrepreneurship qualities, Entrepreneurship tendency test. Achievement oriented work
environment. Psychological tendencies in budding entrepreneurs. Entry barriers to
entrepreneurship and how to overcome them. Overcoming family and social barriers,
overcoming and understanding barriers to business development.
Administration inputs to entrepreneurship – planning scheduling, time management

Unit II
Legal Inputs To Entrepreneurship
The Government policies promoting entrepreneurship and business. Business
environments Legal inputs on staring a business. Review of forms necessary to start
businesses. Review of registration procedures, Business classifications. Sales Excise
Duties and Tax formalities. (Assignment) Overview on rules and regulations for different
types of business units. Overcoming legal obstacles, Long term partnering with law and
tax firms Monopoly creation of Logos, branding , Copyrights and Patents.
Shop ACT Business cards, venue Ambience,

Unit III
Business Opportunity Identification Inputs To Entrepreneurship

**Unit IV**  
**Marketing Inputs To Entrepreneurship**  
(7 Hrs)

What to sell and how to sell?: Market research and survey, overview on methods of forecasting, launching and marketing the products and services, sales and distribution, project feasibility study – market feasibility, technical feasibility, sources of finance, financial feasibility – project costing and budgeting, product costing. Where to find finance and how to get project finance for a business; Legal input to a business Marketing inputs to entrepreneurship: How to prepare a business plan and strategise. How to identify the right strategy for market development. Exploiting an attractive market. Creating competitive advantages for the market. Creating the right strategy. Inputs for strategy development.

**Unit VI**  
**Problem Solving Inputs To Entrepreneurship**  
(7 Hrs)

How to solve problems as and when they arrive? Business crisis and how to solve them when they arise. Review of Cash crisis Starting Crisis, Delegation crisis, Management crisis and Succession crisis. Review of methods to solve each crisis. Methods to solve new crisis which may arrive in the future. Review of luck and the business cycle. Tax and relativity of moral ethics in adverse business (corrupt) environments.

**Text Books**

2. Class notes on entrepreneurship

**Reference Books**

1. Dr J. S. Juneja, Small and Medium Enterprise: Challenges and opportunities
2. Kondalah, chukka; Enterprise in the new millennium, McGraw-Hill publication
4. Gopal & Ramamurthy; Project management Handbook, Macmilan.
5. Prassanna Chandra; Preparation, Appraisal, Budgeting and Implementation.

**Course Outcomes:**
Students will be able to:
1. Evaluate his or her own entrepreneurial tendency and ability
2. Analyze the techno-commercial feasibility of new business ventures
3. Brainstorm ideas for new and innovative products or services.
IP52156 MANAGEMENT INFORMATION SYSTEM

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Introduction (7Hrs)
Definitions, objective, structure, operating elements, MIS structure based on management activity, organizational function

Unit II: System concepts (7Hrs)
Definition, Types of systems, system decomposition, system entropy, system stress, methods of simplification, design concepts

Unit III : SDLC Approach (7Hrs)
System development life cycle approach, system requirement specifications, entity relationship diagram, data dictionary, report generation, database administration

Unit IV : Object Oriented Analysis and Design (7Hrs)
Introduction, concepts of objects, class, encapsulation, various steps of OOA, methods like Booch, Rambaugh etc. Domain Analysis, Human computer Interface, Introduction to System Testing

Unit V : Decision Support System (7Hrs)
Introduction to decision support system, experts systems, hardware and software acquisition, legal Issues

Unit VI : Information Management and society (7Hrs)
Computer security, privacy, manual versus electronic information, back up protection, user interfaces, encryption, responsibility and ethics

Total Contact Hours: 42

Text Books :

Reference Books:

iii. Lorna M. Daniells Business Information Sources, University of California Press, 1993

Course Outcomes:

Students will be able to:

1. Understand System development life cycle approach.
2. Perform Object Oriented Analysis and Design
3. Designing Human computer Interface & decision support system
IP52158: WORLD CLASS MANUFACTURING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Unit I  
WCM & Lean Manufacturing  
(7 Hrs)


Hall’s, Schonberger,s framework of World Class Manufacturing, Various models of world class manufacturing

Unit II  
Lean Manufacturing Tools & Techniques 1  
(7 Hrs)

Kaizen – Concept, Types of Kaizen, Kaizen Worksheets, Developing Kaizen Design of JIT-Pull System, Kanban – Types, Calculations of Kanban  
Set-up Time Reduction: SMED Methodology for Set-up reduction, Set-up Reduction Projects, Quick attachment devices

Unit III  
Lean Manufacturing Tools & Techniques 2  
(7 Hrs)


Concept of Standard Work – Work Standardization, Standard Operating Procedures, Charting techniques in work standardization

Unit IV  
Total Productive Maintenance  
(7 Hrs)
Unit V (7 Hrs)

Business Process Reengineering


Unit VI (7 Hrs)

Theory of Constraints

Introduction to TOC, Concept, Constraints – Types, Concept of Throughput, Inventory & Operating Expenses, Throughput Accounting, TOC Methodology, Numerical & Cases in TOC. Application of TOC in industry

Drum-Buffer-Rope Approach, Numerical & Case in TOC Applications

Text Books

1. Cause and Effect Lean – The essentials of Lean Manufacturing by John Bicheno
2. Learning to See, James Womack & Daniel Jones

Reference Books

1. World Class Manufacturing -A strategic perspective by B.S. Sahay, Saxena, Macmillan, India
2. World Class Manufacturing – Richard Schonberger
3. Introduction to TPM: Total Productive Maintenance by Nakajima Seiichi
4. Total Productive Maintenance by Terry Wireman (Industrial Press)
5. TPM material/ books published by JIPM (Japanese Institute of Plant Maintenance)
6. Lean Thinking by James Womack & Daniel Jones

Course Outcomes:

Students will be able to:
1. Identify, eliminate and reduce the non-value added activities (wastes) in manufacturing organization
2. Apply the tools and techniques of lean manufacturing and constraint management to improve productivity in manufacturing and service organizations
3. Analyze, map and improve business processes for achieving improvements
IP52160: PRODUCT DESIGN & NEW PRODUCT DEVELOPMENT

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Product methodology & the structure of Design Process (7Hrs)
Introduction of Product methodology, methodological problems, characteristics of methods, The phases of product design process, foundations of phase models, three phase models etc

Unit II : Design materials & human factors in product design (7Hrs)
Material properties, metals, plastics, rubber, woods & factors considered while designing for metals, plastics, rubber, woods etc, Anthropometry factors, physiological factors, psychology factors, anatomy factors.

Unit III : Economic factors influencing design (7Hrs)
Product value, safety, reliability & environmental considerations, economic analysis, break even analysis, profit & competitiveness, economic of a new product design.

Unit IV : Value engineering in product design, (7Hrs)
Introduction, historical perspective, nature & measurement of value, importance of value, value analysis job plan, creativity, steps for solving & value analysis, value analysis tests

Unit V : Strength considerations in product design, (7Hrs)
Principal stress trajectories (force flow lines), balanced design, criteria & objective of design, material toughness, resilience, designing for uniform strength.

Unit VI : Modern Approaches To Product Design (7Hrs)
Concurrent Design, Quality Function Development (QFD), Rapid Prototyping

Total Contact Hours: 42

TEXT BOOKS:

1. Product design & Manufacturing- A.K.Chitale, R.C Gupta
REFERENCE BOOKS:

1. Product design & Manufacture- Jhon R Lindbeck

Course Outcomes:

Students will be able to:

1. Apply expert knowledge of the product development process; from market analysis, product design and manufacturing to market introduction and sales.
2. Apply new theories on innovation and change, including emerging paradigms such as user-driven innovation, open innovation and market forecasting in practice.
3. Understand the new product development process.
4. Acquire competence with a set of tools and methods for product design and development.
5. Understand awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
IP52162: AUTOMATION STRATEGIES

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Unit I : Hard And Soft Automation
Low Cost Automation. Socio Economic Consideration

Unit II : NUMERICAL CONTROL:

Unit III : Process Planning
GROUP TECHNOLOGY: Introduction, Part Families, Part Classification And Coding, Coding System And Machining Cells.

Unit IV : Quality Control
COMPUTER AIDED QUALITY CONTROL: Traditional Quality Control, Computer In Quality Control, Contact Inspection Methods, Non Contact Inspection Methods, Optical And Non Optical Computer Aided Testing.
COMPUTER AIDED MATERIAL HANDLING: Traditional Material Handling, Computer Control On Material Handling, Conveying, Picking. Warehouse Control,
Computerized Material Handling For Automated Inspection And Assembly.


**Automated Storage Systems:** Storage System Performance, Automated Storage/Retrieval Systems, Carousel Storage Systems, Work-In-Process Storage, Interfacing Handling And Storage With Manufacturing, Problems,

**Unit V : Robotics**

**Unit VI : Future Automated Factory**

**Total Contact Hours: 42**

**Text Books**
1. CAD/ CAM- Groover & Zimmer, Prentice Hall

**Reference Books**
1. CAD/ CAM – Beasanat & Lui, EWP.
4. Robotics and Flexible Automation by SR Deb
IP50352 : PG LAB 2

Credits: 02  
Teaching Scheme: - Laboratory 2 Hrs/Week

Part A: Optimization & Simulation

1. Assignment on Linear Programming Problem
2. Assignment on integer programming.
3. Assignment on dynamic programming.
4. Assignment on goal programming.
5. Assignment on decision making tools.
6. Assignment on replacement models.
7. Assignment on theory of games.
8. Assignment on queuing theory.
9. Assignment on simulation.
10. Assignment 1 on simulation
11. Assignment 2 of simulation
12. Assignment 3 on simulation

Text Books
1. Hira Gupta, Operations Research

Reference Books
2. H. Taha, Operation Research

Course Outcomes:

Our students will be able to:

1. Formulate a certain class of decision problems and solution
2. Formulate real life queuing problems and generate optimal solutions
3. Simulate various real life problems and generate optimal solutions

Part B: Project Management

1. Preparation of Project Feasibility Report
   a. Project Identification, Definition
   b. Project Feasibility – Managerial/Organizational Perspective
   c. Project Feasibility – Marketing, Exit Plan
   d. Project Feasibility – Operational
   e. Project Feasibility – Financial, Financial Projections
2. Assignment on Capital Budgeting – PBP, Discounted PBP, NPV, IRR, Annual Worth
3. Numerical on PERT/CPM – Calculation of Floats, Determination of Critical Path & Project Duration
4. Case let - Project Crashing
5. Case let - Resource Leveling & Resource Smoothening
6. Assignment on Earned Value Analysis
7. Assignment on Critical Chain
8. Project Planning & Scheduling (Using MS Projects) 1 – Preparation of Statement of Works, WBS
9. Project Planning & Scheduling (Using MS Projects) 2 – Network Diagram, Gantt Charts, Project Monitoring

Text Books
1. Narendra Singh; Project Management & Control (1998 ); Himalaya Publishing House, Mumbai.
2. S. Choudary, Project Management

Reference Books
1. Gopal & Ramamurthy; Project Management Handbook; Macmilan.
2. Prasanna Chandra; Preparation, Appraisal, Budgeting & Implementation
3. Project Management Body of Knowledge

Course Outcomes:
Students will be able to:

1. Ascertain the feasibility of small and medium projects with respect to managerial, marketing, operational, financial and socio-economic perspectives
2. Plan and schedule small and medium projects to achieve the triple constraint of time, cost and quality using software package
3. Monitor the progress of projects to determine variances and recommend corrective actions software package
IP57753 : TECHNICAL SEMINAR 1

Credits: 0  
Teaching Scheme: -  
Hrs/Week

Assessment of Technical Seminar

Seminar Topic should be relevant to Industrial Engineering discipline and should not be a part of syllabus. It is mandatory to review at least 5 research papers on the topic chosen

1. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
2. Review – II: The last week before term-end (Optional)
3. For poor performing students identified by the examination panel, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.
4. Seminar is an individual activity with separate topic and presentation.
5. Duration of presentation – 12 minutes
   Question and answer session – 8 minutes

Seminar Evaluation Scheme:

1. Attendance during Semester – 5 marks
2. Attendance during Seminar presentation self & peer – 5 marks
3. Relevance of Seminar topic – 5 marks
4. Timely Abstract submission – 5 marks
5. Literature review – 20 marks
6. Technical contents – 20 marks
7. Presentation – 25 marks
8. Question & answer Session – 15 marks

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100 marks
IP57752 : SEMESTER PROJECT II

Credits: 0
Teaching Scheme: -  Hrs/Week

Assessment of Semester Project

Semester Project will be based on all subjects of that Semester except GP.

1. The Semester Project will be for a group of 2 students. Head of Department to appoint Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.
2. Group formation, discussion with faculty advisor, formation of the Semester Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

The Assessment Scheme will be: End Semester Examination: 100 marks

Course Outcomes:
A student will be able to

1. analyze/evaluate a concept / system / machine operation / process etc
2. make physical working model/charts of concepts or carry out a survey
3. analyze and improve methods and determine work content considering human factors
4. make effective / productive use of man, machine and material resources
5. investigate complex problems using various statistical, quantitative and simulation tools
6. work as an individual and lead the teams effectively to achieve the set objectives.
7. prepare project report and present at the end of semester
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IP 62151 : COSTING AND ECONOMICS

Credits: 02

Teaching Scheme: - Theory 2 Hrs/Week

Unit I
Cost

Unit II
Overheads

Unit III
Activity Based Costing & Transfer Pricing
A. Concept, Concept of Cost Drivers. Calculation of Costs. Mechanism of Activity Based Costing. Transfer Pricing: Objective, Methods – Cost Based, Market Prices Based, Negotiated Prices. Recommended procedure for Transfer Pricing
B. Limitations of Traditional Costing

Unit IV :
Time Value of Money & Life Cycle Costing
Time Value of Money – Basis for comparison of alternatives, Present Worth, Future Worth, Annual Worth, Annuity, Perpetuity,
Life Cycle Costing - Introduction, methodology, applications of LCC in industrial world, differentiation with traditional costing methods

Total Contact Hours: 28
Text Books:
1. Theusen H.G., Engineering Economic Analysis, Prentice Hall of India

Reference Books:
2. S.M. Mahajan, Engineering Economics, Everest Publishing House, Pune
IP67752 :: DISSERTATION STAGE I

Credits: 15

Prerequisite: Nil

Objectives:
- To train the students to apply their engineering knowledge to real life problem solving.

The dissertation work could be of the following nature:
1. Manufacturing / Fabrication of a prototype machine including selection, concept, design, material, manufacturing the components, assembly of components, testing and performance evaluation.
2. Improvement of existing machine / equipment / process.
3. Design and fabrication of Jigs and Fixtures, dies, tools, special purpose equipment, inspection gauges, measuring instruments for machine tools.
4. Computer aided design, analysis of components such as stress analysis.
5. Problems related to Productivity improvements.
6. Problems related to value engineering.
7. Problems relating to material handling system.
10. Product design and development.
11. Analysis, evaluation and experimental verification of any engineering problem encountered.
13. Quality improvements, In-process Inspection, Online gauging.
15. Time and Motion study, Job evaluation.
16. Ergonomics and safety aspects under industrial environment
17. Management Information System.
18. Market Analysis in conjunction with Production Planning and Control.

OR

Fabrication of models, machines, prototypes based on new ideas, robots and machine based on hitech systems and automation, experimental set-up, fabrication of testing equipment, renovation of machines, etc. Computer based design / analysis or modeling / simulation of product(s), mechanism(s) or system(s) and its validation or comparison with available benchmarks / results. Modelling/simulation of product(s), mechanism(s) or system(s) and its validation or comparison with available benchmarks / results. Design/development and
Fabrication of models, machines, and prototypes based on new ideas, robotic and automation systems, Experimental set ups, test rigs/ equipments.

The project work shall be taken up individually or in a group consisting of not more than 4 students.

A report containing maximum 50 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

**Guidelines:**

- Report shall be typed or printed.
- Figures and tables shall be on separate pages and attached at respective positions.
- Project title and approval sheets shall be attached at the beginning of the report followed by index and synopsis of the project.
- References shall be mentioned at the end followed by appendices (if any).
- When a group of students is doing a project, names of all the students shall be included on every certified report copy.

Each group of students shall submit two copies of reports to the institute and one copy shall be prepared for each individual student.

**Course Outcomes:**

Students will be able to:

1. Review literature and identify the problem.
2. Apply basic industrial engineering fundamentals in the domain of practical applications.
3. Correlate the theoretical and experimental/simulations results and draw proper inferences.
4. Apply industrial engineering knowledge in carrying out industrial projects related with setting up production norms, establishing time standards, effecting productivity and quality improvements, resource optimization, etc.
5. Prepare report as per the standard guidelines.
6. Carry out cost estimate and make reasonable trade-offs between functions and costs in planning engineering projects.
7. Plan and manage an engineering project with continuous monitoring and control activities.
8. To practice data collection and analysis using quantitative, statistical and simulations methods and software packages.
9. To practice project planning and control, and costing in industrial engineering related improvement projects.
10. Select and use appropriate technology building blocks and industrial engineering tools and techniques to develop a solution for an industrial problem.
11. Develop personal and professional qualities such as leadership, communication skills, team working skills, co-operative attitude, and co-ordination ability as well as enthusiasm for attempting a problem solution in a right approach
Assessment of Technical Seminar

Seminar Topic should be based on Project Dissertation. Seminar should consist of review of at least 8 research papers

1. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
2. Review – II: The last week before term-end (Optional)
3. For poor performing students identified by the examination panel, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.
4. Seminar is an individual activity with separate topic and presentation.
5. Duration of presentation – 12 minutes
   Question and answer session – 8 minutes

Seminar Evaluation Scheme:

1. Attendance during Semester – 5 marks
2. Attendance during Seminar presentation self & peer – 5 marks
3. Relevance of Seminar topic – 5 marks
4. Timely Abstract submission – 5 marks
5. Literature review – 20 marks
6. Technical contents – 20 marks
7. Presentation – 25 marks
8. Question & answer Session – 15 marks

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100 marks
Semester IV
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<th>Assessment Scheme</th>
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5. Problems related to Productivity improvements.
6. Problems related to value engineering.
7. Problems relating to material handling system.
10. Product design and development.
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13. Quality improvements, In-process Inspection, Online gauging.
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The project work shall be taken up individually or in a group consisting of not more than 4 students.

A report containing maximum 100 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

**Guidelines:**

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