

MRSPTU M. TECH. MECHANICAL ENGINEERING (INDUSTRIAL & PRODUCTION) SYLLABUS 2016 BATCH ONWARDS

M. TECH. MECHANICAL ENGINEERING (INDUSTRIAL & PRODUCTION)

Total Contact Hours = 24

Total Marks = 600

Total Credits = 22

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MREM0-101	Research Methodology	4	0	0	40	60	100	4
MMEE5-102	Advanced Manufacturing Processes	4	0	0	40	60	100	4
MMEE5-103	Advanced Engineering Materials	4	0	0	40	60	100	4
MMEE5-104	Method Engineering & Ergonomics	4	0	0	40	60	100	4
MMEE5-105	Lab -I	0	0	4	60	40	100	2
Department Elective – I (Select any one)		4	0	0	40	60	100	4
MMEE5-156	Value Engineering							
MMEE5-157	Project Management							
MMEE5-158	Total Quality Management							
MMEE5-159	Jig Fixture & Die Design							
Total	Theory = 5 Lab = 1	20	0	4	260	340	600	22

Total Contact Hours = 24

Total Marks = 600

Total Credits = 22

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMEE5-206	Metrology & Industrial Inspection	4	0	0	40	60	100	4
MMEE5-207	Supply Chain Management	4	0	0	40	60	100	4
MMEE5-208	Tool & Cutter Design	4	0	0	40	60	100	4
MMEE5-209	Facility Planning	4	0	0	40	60	100	4
MMEE5-210	Lab-II	-	-	4	60	40	100	2
Departmental Elective – II (Select any one)		4	0	0	40	60	100	4
MMEE5-260	Operation Management							
MMEE5-261	Product Design & Development							
MMEE5-262	Enterprise Resource Planning (ERP)							
Total	Theory = 5 Lab = 1	20	0	4	260	340	600	22

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Total Contact Hours = 20

Total Marks = 500

Total Credits = 26

SEMESTER 3 rd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMEE5-311	3D- Printing	4	0	0	40	60	100	4
MMEE5-312	Production Planning & Control	4	0	0	40	60	100	4
MMEE5-313	Project & Seminar	0	0	4	40	60	100	4
MMEE5-314	Thesis Synopsis	0	0	4	-	100	100	10
Open Elective (Select any one)		4	0	0	40	60	100	4
Total	Theory = 3 Lab = 2	12	0	8	160	340	500	26

Total Credits = 20

SEMESTER 4 th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	Subject Name	L	T	P	Satisfactory/ Unsatisfactory	
MMEE5- 415	Final Thesis	0	0	0		20

Overall

Semester	Marks	Credits
1 st	600	22
2 nd	600	22
3 rd	500	26
4 th	--	20
Total	1700	90

RESEARCH METHODOLOGY

Subject Code – MREM0-101

L T P C
4 0 0 4

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Introduction to Research: Meaning, Definition, Objective and Process

Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental

Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature

Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.

Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT-II (10 Hrs.)

Sources of Data: Primary and Secondary, Validation of Data

Data Collection Methods: Questionnaire Designing, Construction

Sampling Design & Techniques – Probability Sampling and Non Probability Sampling

Scaling Techniques: Meaning & Types

Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability

Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT-III (13 Hrs.)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation

Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number

Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs.)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling

Report Writing: Essentials of Report Writing, Report Format

Statistical Software: Application of Statistical Softwares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis

**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITS*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education, New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education, New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education, New Delhi.

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6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

ADVANCE MANUFACTURING PROCESSES

Subject Code: MMEE5-102

**L T P C
4 0 0 4**

Duration: 46 Hrs.

UNIT-I (11 Hrs.)

Introduction: Overview of general trends in Manufacturing, concept and significance of important properties related to manufacturing processes; Machinability index, Formability, weldability, Fluidity, dimensional accuracy, surface integrity, residual stresses, limitations of conventional manufacturing processes need and evolution of advanced manufacturing, selection and economics of manufacturing processes.

UNIT-II (15 Hrs.)

Advanced Machining Processes: Classification, Review of conventional machining processes, Principles, process parameters, capabilities and mechanism of material removal of Electro discharge machining, Electrochemical Machining, Laser Beam Machining, and Abrasive Flow machining, concept and need of Hybrid Machining Processes. **Advanced Welding Processes:** Classification, Review of conventional welding processes, Principles, process parameters, capabilities and theoretical considerations for Ultrasonic Welding, friction Welding, Explosion Welding, Underwater Welding, Adhesive Bonding.

UNIT-III (10 Hrs.)

Advanced Forming Processes: Classification, Review of conventional Forming processes, concept of High Energy Rate Forming, Principles, process parameters, capabilities and theoretical considerations for Explosive Forming, Electro hydraulic Forming, Electromagnetic Forming, Super plastic forming.

UNIT-IV (10 Hrs.)

Advanced Casting processes: Classification, Review of conventional casting processes, brief review regarding Casting of Ferrous and Nonferrous metals, Principles, process parameters, capabilities and theoretical considerations for Shell Mould Casting, Vacuum Casting, Lost Foam Casting, Investment Casting, Centrifugal Casting, concept of rapid solidification.

Recommended Books

1. Shan and Pandey, 'Modern Machining Processes', Tata Mc Hill N. Delhi.
2. 'ASTME High Velocity Forming of Metals', PHI, N. Delhi.
3. Kalpakjian Serope and R. Schmid Steven, 'Manufacturing Processes for Engg. Materials', Pearson Education.
4. G.F Benedict, 'Non Traditional Manufacturing', Marcel Dekker.
5. P.K. Mishra, 'Non-Conventional Machining', Narosa Publishing House, N. Delhi.

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ADVANCE ENGINEERING MATERIALS

Subject Code: MMEE5-103

**L T P C
4 0 0 4**

Duration: 38 Hrs.

UNIT-I (8 Hrs.)

The Structures of Materials: Metals, Ceramics, Polymers and Composites; Properties: Chemical, Physical, Mechanical and Dimensional Properties;

UNIT-II (10 Hrs.)

Ferrous Alloys: Heat Treatments, Selective and Surface-Hardening, Specifications, Low Alloy and High Alloy Steels, Tool Steels, Stainless Steels, Cast irons;

UNIT-III (10 Hrs.)

Non-ferrous Alloys: Copper and its alloys, Aluminum and its alloys, Nickel, Zinc, Titanium, Magnesium and Refractory Metals;

UNIT-IV (10 Hrs.)

Shape Memory Phenomenon and Alloys; Ceramics, Cermets, Glass and Carbon Products; Engineering Plastics, Polymeric Coatings and Adhesives; Failure Prevention; and The Selection Process

Recommended Books

1. G.E. Dieter, 'Engineering Design: A Materials and Processing Approach', McGraw Hill, 1991.
2. M.F. Ashby, 'Materials Selection in Mechanical Design', Pergamon Press, 1992.
3. W.J., Patton, 'Plastics Technology, Theory, Design and Manufacture', Lenton Publishing Co.
4. 'Introduction to Engineering Materials & Manufacturing Processes', NIIT, Prentice Hall of India.
5. Kenneth G. Budinski, 'Engineering Materials Properties and Selection', Prentice Hall of India.
6. R.A. Higgins, 'Engineering Metallurgy', Part-1, Edward Arnold.
7. Gladius Lewis, 'Selection of Engineering Materials', Prentice-Hall, New Jersey, US.

METHODS ENGINEERING AND ERGONOMICS

Subject Code: MMEE5-104

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (8 Hrs.)

Introduction to Industrial Engineering and productivity measurement of productivity, Introduction to work study, methods-study principles and motion economy, filming techniques and micro-motion analysis, Introduction to work measurement. Time study, performance allowances, work sampling, predetermined motion system, standard data system, job evaluation of merit rating. Wage incentive plans, MTM (Methods Time Measurement)

UNIT-II (12 Hrs.)

Design Approach: A new design, modification, of existing design, assessment of design. Limitation of man and machine with respect to each other, posture-standing at work, seated at work, work station heights and seat geometry. Human anthropometry and its use in work place layout, Analysis. Controls: Hand controls and foot controls, location of controls and work place

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envelope. Recommendation about hand and foot push buttons, rotary selector switches, hand wheels, crank levers etc. Instruments and displays.

UNIT-III (12 Hrs.)

Work Load: Static and dynamic muscular work. Human motor activity, metabolism, physical work load, measurement of physical work load, mental work load, measurement of mental work load, repetitive and inspection work, work duration and rest pauses, principles of motion economy, Analysis. **Climates:** Heat Humidity: Body heat balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance.

UNIT-III (13 Hrs.)

Vibration: Terminology, Response of body to low frequency (LF) vibration, vibrations and discomfort, effect on health of worker, high frequency vibration, effect of H.F. vibrations, methods of reducing vibrations, analysis. **Noise:** Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent threshold shift, effect of noise on performance, reduction of noise, personal noise protection. Analysis.

Recommended Books:

1. E.V. Krick, 'Methods Engineering Study'.
2. H.S. Shah, 'Work Study and Ergonomics', Dhanpat Rai & Sons, 1992.
3. Bridger, Introduction of Ergonomics, Tata McGraw Hill, 1995.
4. O.P. Khanna, 'Work Study', Dhanpat Rai & Sons, 1995.

. LAB-I

Subject Code: MMEE5-105

**L T P C
0 0 4 2**

One lab /field/industrial oriented project /problem will be allocated to each student related to the subjects taught in 1st semester.

VALUE ENGINEERING

Subject Code: MMEE5-156

**L T P C
4 0 0 4**

Duration: 34 Hrs.

UNIT-I (8 Hrs.)

Introduction: Life cycle of a Product, Definition, objectives and methodology of value Engineering, Comparison with other cost reduction techniques, unnecessary cost.

UNIT-II (12 Hrs.)

Functions: definition, types and relationship between different functions in design of a Product, functional cost, functional worth, test for poor value, aim of value engineering. Systematic approach, Phases of value engineering Job plan: General phase, information phase, function phase creation/speculation phase, evaluation phase, investigation phase, recommendation and implementation phase.

UNIT-III (6 Hrs.)

Decision /evaluation Matrix: Quantitative comparison of alternatives, estimation of weight factors and efficiency.

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UNIT-IV (8 Hrs.)

FAST diagramming: Critical path of function, How, why and when logic, supporting and all time functions, Ground rule for FAST diagram.

Recommended Books

1. A.E. Mudge, 'Value Engineering – A Systematic Approach'.
2. L.D. Miles, 'Techniques of Value Analysis and Value Engineering'.
3. H.S. Mittal, 'Value Engineering for Cost Reduction and Product Improvement'.

PROJECT MANAGEMENT

Subject Code: MMEE5-157

**L T P C
4 0 0 4**

Duration: 37 Hrs.

UNIT-I (8 Hrs.)

Introduction & Overview: Definitions, Types of projects, Project life cycle (Project phases) and decisions.

UNIT-II (12 Hrs.)

Go/ No go decisions based on: a) Project Identification and Screening, b) Project Appraisal: Market, Technical, social, Ecological & Financial, c) Project Selection: Pragmatic, pair wise, MADM approach. Development of Project Network: Project description, Work break down structure, Nomenclature, Rules for drawing and representation, consistency and Redundancy in Project Networks, Matrix representation.

UNIT-III (10 Hrs.)

CPM & PERT: Activity times, Completion, Floats, Probability (ND usage), Examples, and Problems. Project Monitoring & Control: Project adjustments, Crashing: Direct & Indirect cost, Normal & Crash: duration & cost, Resource leveling: Types, usage, leveling, Problems, Managing Risk.

UNIT-III (7 Hrs.)

Role of Human Factors: Dealing with people Team Building and Leadership in Projects, commitment, work culture, motivation, coordination, attitude, innovation.

Recommended Books

1. Clifford Gray and Erik Larson, 'Project Management', Tata McGraw Hill Edition.
2. J.D. Wiest and F.K. Levy, 'Management Guide to PERT/ CPM', PHI.
3. Ravi Shankar, 'Industrial Engg. & Mgmt.', Galgotia Publications.

TOTAL QUALITY MANAGEMENT

Subject Code: MMEE5-158

**L T P C
4 0 0 4**

Duration: 44 Hrs.

UNIT-I (8 Hrs.)

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type. Control on Purchase of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

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UNIT-II (12 Hrs.)

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims. Quality Management, Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

UNIT-III (12 Hrs.)

Human Factor in Quality

Attitude of top management, co-operation, of groups, operator's attitude, responsibility, causes of operator's error and corrective methods. Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

UNIT-IV (12 Hrs.)

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

ISO-9000 and its concept of Quality Management:

ISO 9000 series, Taguchi method, JIT in some details

Recommended Books

1. H. LaI, 'Total Quality management', Wiley Eastern Limited, 1990.
2. Greg Bounds, 'Beyond Total Quality Management'. McGraw Hill, 1994.
3. H.G., 'TQM in New Product manufacturing', McGraw Hill.

JIG, FIXTURE & DIE DESIGN

Subject Code: MMEE5-159

L T P C

Duration: 38 Hrs.

4 0 0 4

UNIT-I (12 Hrs.)

Jigs and Fixtures: Elements of jigs and fixtures, costs calculations. Locating element, clamping elements, procedure in designing. Jig and fixtures: Fits and tolerances analysis.

Non-Standard clamping devices, centralizers, equalizers, actuators (Pneumatic, hydraulic electric and electronic.) Automatic loading and unloading devices.

UNIT-I (11 Hrs.)

Types of Frunions: Single, double and multi-axis and indexers. Transfer line jigs & fixtures for the operation of Multi-drilling, boring, milling and grinding. Assembly line fixtures.

UNIT-III (7 Hrs.)

Universal Jigs and Fixtures, Transfer-devices, transfer machine, modulation-design concept, in process gauging.

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UNIT-IV (8 Hrs.)

Design of Dies: Elements of Dies and Punch. Types and design procedure, progressive dies, drawing die, bending die etc. Analysis.

Recommended Books

1. Franklin-D-Jones, Jigs and Fixtures Design.
2. F.H. Colovin and Massachusettes, 'Jigs and Fixtures', Institute of Technology.
3. H.W. Hardy, 'Jigs and Fixtures Design'.
4. P.S. Houghton, 'Jigs and Fixtures Design'.
5. Parson, 'Jigs and Fixtures'.

METEROLOGY & INDUSTRIAL INSPECTION

Subject Code: MMEE5-206

**L T P C
4 0 0 4**

Duration: 46 Hrs.

UNIT-I (10 Hrs.)

Standards of Measurement: Line, End and Wavelength standards. Primary secondary and working standards. Limits, Fits & tolerances, Interchangeability, design & manufacture of gauges, use of slip gauges, dial indicators, sine bars, auto-collimators, taper gauges, optical projectors and microscopes, straightness, flatness and square ness testing.

UNIT-II (11 Hrs.)

Instruments for Measuring Surface finish & Roughness: Classes of instruments, the Taylor-Hobson telesurf, plastic replica techniques, numerical assessment of roundness. Calibration of Working Standards by Interferometry: Application of interferometry, calibration of gauges by interference.

UNIT-III (12 Hrs.)

The Calibration of working standards by direct comparison in series: Different types of comparators such as the pneumatic, optical, electrical and electronic comparators principle of amplification- magnification, sensitivity and response, the calibrations of end gauges in sets, ruling and calibration of standard scales.

UNIT-IV (13 Hrs.)

Measurement of Gear and Screw Threads: Measuring methods for run out, pitch, profile, lead, backlash, tooth thickness, composite elements, inspection equipment quality control screw thread terminology, measurement over wires, one wire measurement, three wire measurement, standard specifications and formulas, tolerances. Management of Inspection and quality control: Communication of specifications, the nature of dimensions, selection of gauging equipment, kind of inspection, quality control Management

Recommended Books

1. Taher, 'Metrology and Measuring'.
2. Miller, 'Dimensional Metrology'.
3. Khare & Vajpayee, 'Dimensional Metrology'.
4. I.C. Gupta, 'Engineering Metrology'.

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SUPPLY CHAIN MANAGEMENT

Subject Code: MMEE5-207

**L T P C
4 0 0 4**

Duration: 42 Hrs.

UNIT-I (10 Hrs.)

Introduction: Objectives of supply chain Management, key components of supply chain i.e. sourcing, distribution strategy, customer service strategy; supply chain Management as Integrated logistics, generic activities, architecture of supply chain, future potential of supply chain Management.

UNIT-II (11 Hrs.)

Quality Management: Inherent link to SCM: Suppliers development, distribution channel, re-engineering of supply chain, IT – enabled supply chain: Electronic data interchange, enterprise resource planning, implementation of IT, Scope of emerging distributed cooperative tele manufacturing over internet.

UNIT-III (11 Hrs.)

Organizational Issues: Application of knowledge Management for effectiveness SCM, social interactions and linking of functional units in a supply chain, Combined core competency of SC: Global sourcing, technology and tools – essential enablers, framework for managing a knowledge intensive supply chain.

UNIT-IV (10 Hrs.)

Recent Trends in SCM: Tierisation of supplies, Reverse logistics, JIT II, Milk Round System (MRS), bar coding, Hub and Spoke Concept and other latest concepts.

Recommended Books

1. Chopra, 'Supply Chain Management', Pearson Education Asia, New Delhi.
2. Christopher, 'Logistics and Supply Chain Management', 2nd Edn., Pearson Education Asia, New Delhi.
3. Taylor & Brunt, 'Manufacturing Operations and Supply Chain Management (The Lean Approach)', Business Press Thomson Learning New York
4. J. Arjan, Van Weele, 'Purchasing and Supply Chain Management (Analysis Planning and Practice)', 2nd Edn., Business Press, Thomson Learning, New York.
5. Donald Bowersox, 'Logistic Management - The Integrated Supply Chain Process', McGraw Hill, New York.

TOOL & CUTTER DESIGN

Subject Code: MMEE5-208

**L T P C
4 0 0 4**

Duration: 40 Hrs.

UNIT-I (11 Hrs.)

Fundamentals of Cutting tools design, cutting tools and their principal elements, Tool geometry, system of nomenclatures and their interrelations, setting for the grinding of various basic cutting tool (turning, drilling, milling), Tool materials, developments of various tool materials, their relative characteristics, modern trend in tool development, concept of tool life.

UNIT-II (12 Hrs.)

Single point tools; purpose and principle types and their characteristics, design procedure of single point tools, design of various high production tools, design of carbide tools. Drills;

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purpose and principal types and their construction and geometry, development in the shape of twist drills analysis.

UNIT-III (09 Hrs.)

Milling Cutters; Purpose and types and their construction procedure of profile sharpened and form relieved cutters, design of hobs, analysis.

UNIT-IV (08 Hrs.)

Broaches: Purpose and types, design features of various broaches. Introduction of numerically controlled tools and their applications

Recommended Books

1. Sen & Bhattacharya, 'Principles of Machine Tools', New Central Book Agency.
2. Arshinov & Alekreev, 'Metal Cutting Theory and Cutting Tool Design', Mir Publishers.
3. Shah, 'Principles of Metal Cutting', Oxford, IBH.

FACILITY PLANNING

Subject Code: MMEE5-209

**L T P C
4 0 0 4**

Duration: 40 Hrs.

UNIT-I (09 Hrs.)

Importance of plant lay out in plant design, types of layout, factors affecting design of plant layout, principles of plant layout design, importance of facilities planning.

UNIT-II (10 Hrs.)

location factors & analysis, Systematic planning of industrial facilities, phases involved in SPIF, layout evaluation heuristics, heuristics for line balancing.

UNIT-III (10 Hrs.)

Qualitative & quantitative techniques for plant layout decision, Computerization layout planning, classification of computerized layout planning algorithms, description of various algorithms for layout planning,

UNIT-IV (11 Hrs.)

integrating plant layout and material handling systems, systems approach to material handling, selection of MH equipment, characteristic features of various MH systems, automated guided vehicle systems and automated storage & retrieval systems.

Recommended Books

1. Richard Muther, 'Practical Plant Layout', McGraw Hill Book Company, New York.
2. Vijay Sheth, 'Facilities Planning and Materials Handling', Marcel Decker, New York.
3. Tompkins, 'While Facilities Planning', John Wiley & Sons, New York.
4. J.M. Apple, 'Plant Layout & Material Handing', John Woley & Sons, New York.
5. Francis White, 'Facility Location & Layout', PHI, New Delhi.

LAB-II

Subject Code: MMEE5-210

**L T P C
0 0 4 2**

One lab /field/industrial oriented project /problem will be allocated to each student related to the subjects related to the subjects taught in 2nd Semester.

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OPERATION MANAGEMENT

Subject Code: MMEE5-260

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Introduction to Operation Management: Today's Global business condition, Operations strategy, forming operations strategy.

Forecasting: Demand forecasting, Qualitative forecasting methods and quantitative methods, Selection of forecasting methods.

UNIT-II (12 Hrs.)

Designing and Developing Products and Services: Process Planning and Design, Major Factors affecting Process Design Decision, Types of Process Designs, Interrelationships among Product Design, Process Design and Inventory Policy, Process Design in Services.

UNIT-III (11 Hrs.)

Facility Capacity and Location: Facility Planning Long-Range Capacity Planning, Facility Location, Facility Layout in Product & Service

Production Planning: Production – Planning Hierarchy, Aggregate Planning, Master Production Scheduling, Types of Production-Planning and control systems, Planning and control of Projects.

UNIT-IV (11 Hrs.)

Quality: Managing Quality and SQC and SPC, Quality assurance, acceptance plans.

Inventory Management: Purchase system and purchase principles, stores Management, Standardization, codification and variety, MRP, Supply Chain Management.

Recommended Books

1. Chunawala & Patel, 'Production and Operation Management', Himalaya Publishers.
2. Bhagde, 'Production and Materials Management', S.D U.S.G Publishers, 1995.
3. Plossl, 'Production and Inventory Control', Prentice Hall, 1967.
4. Heizer and Render, 'Operations Management', Prentice Hall, 2001.
5. Norman Gaither and Greg Fraizer, 'Operations Management'.

PRODUCT DESIGN & DEVELOPMENT

Subject Code: MMEE5-261

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Creative thinking and organizing for product innovation. The product design function. Locating ideas for new products, selecting the right product. Qualifications of the product design engineer. Creative thinking. Curiosity and imagination. Ideas generate ideas. Taking time to think. Using a systematic producer for product innovation. Setting responsibilities for new product development. Structural units for new product development, Functions of the new product development unit. Opportunities for the product design engineer.

UNIT-II (11 Hrs.)

Criteria for Product Success: Areas to be studied preparatory to design. The value of appearance Principles and laws of appearance Incorporating quality and reliability into the design. Man-machine consideration, Designing for ease of maintenance

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UNIT-III (10 Hrs.)

Cost and Product Development: Source of funds for development cost product costs. Estimating the product cost. Kinds of cost procedures, Cost reduction

UNIT-IV (12 Hrs.)

Integrated Approach to Product Development: Diffusion of innovation. Generation, screening and development of new product ideas. Product life cycle and new product development. Economic analysis-evaluation of new product ideas/concepts. Value analysis. Test marketing of new product launch.

Recommended Books

1. Chitale and Gupta, 'Product Design and Manufacturing', Prentice Hall.
2. Bagchi, 'Taguchi Methods Explained', Prentice Hall.
3. Nible & Drper, 'Product Design and Process Engineering', McGraw Hill.

ENTERPRISE RESOURCE PLANNING

Subject Code: MMEE5-262

**L T P C
4 0 0 4**

Duration: 40 Hrs.

UNIT-I (10 Hrs.)

ERP: An Overview - Benefits of ERP - ERP and Related Technologies - Business Process Reengineering (BPR)

UNIT-II (12 Hrs.)

Data Warehousing - Data Mining - On-line Analytical Processing (OLAP) - Supply Chain Management

ERP Implementation - ERP Implementation Lifecycle - Implementation Methodology - Vendors, Consultants and Users - Contracts with Vendors, Consultants and Employees - Project Management and Monitoring

UNIT-III (09 Hrs.)

Business Modules in an ERP Package - ERP Market - ERP-Present and Future - Turbo Charge the ERP System.

UNIT-IV (09 Hrs.)

Enterprise Integration Applications (EIA) - ERP and E-Commerce - ERP and Internet - Future Directions in ERP.

Recommended Books

1. Alexis Leon, 'ERP Demystified', Tata McGraw-Hill, 2002.
2. Brady, 'Enterprise Resource Planning', Thomson Learning, 2001.
3. S. Sadagopan, 'ERP: A Managerial Perspective', Tata McGraw-Hill, 1999.

3D PRINTING

Subject Code: MMEE5-311

**L T P C
4 0 0 4**

Duration: 49 Hrs.

UNIT-I (12 Hrs.)

Introduction to 3D Printing: Students will understand how technology shifts throughout history have made 3D printing possible, interface and basic tools available in the CAD software, unique advantages of 3D printing to their designs, distinguish between various 3D printing technologies

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and materials and select appropriately for a given application, compare additive manufacturing to traditional technologies and choose the best technology for a given application.

UNIT-II (13 Hrs.)

Mesh: Define essential geometry terms and how they relate to a 3D mesh, create smooth and detailed 3D structures, repair a 3D mesh and prepare files for print, take advantage of model-sharing websites to accelerate learning and improve product designs, commands for moving from 2D to 3D in CAD, Use the CAM software to prepare files for 3D printing.

UNIT-III (11 Hrs.)

Basic Introduction to various types of engineering, dental and bio-materials, Introduction to fabrication techniques and methodologies for different types of composite materials, Simulation and Finite Element modelling techniques for characterization, advantages and limitations of 3D printing.

UNIT-IV (13 Hrs.)

Gear Systems: Build a gear system in CAD, Convert 2D gear drawings to 3D models, Design systems with 3D printing technology in mind, including minimum tolerance and material thickness, Dynamic Surfaces and Chains: Nest and orient 3D models on the build tray to conserve space and materials, Make more space- and cost-efficient use of 3D printing technology.

PROJECT WORK: Students will apply what they learn in this class to design and 3D print something that moves something. Distribute the final project description that lists the project requirements.

Recommended Books:

1. Norman Dowling, 'Mechanical Behavior of Materials (3E)', Pearson Publishers.
2. 'Mechanical Behavior of Materials', Bowman, John Wiley & Sons.

PRODUCTION PLANNING & CONTROL

Subject Code: MMEE5-312

L T P C

Duration: 42 Hrs.

4 0 0 4

UNIT-I (11 Hrs.)

Function of production, planning and control, its importance in an organization, Manufacturing systems, Product development and design, Product analysis, Product characteristics, break even analysis, Step-wise cost function, Learning cost-profit-volume charts, Economics of new design, Sales forecasting and estimating, Sales trend analysis and activity charts, Production order.

UNIT-II (10 Hrs.)

Quantity in batch production, Stock control, Minimum lot batch size, Production range, Maximum profit batch size, Maximum rate of return batch size.

UNIT-III (10 Hrs.)

Machine capacity, Machine operation, Multi machine supervision by one operator, Machine interface, Ashcroft number, Balancing, Profit maximization.

UNIT-IV (11 Hrs.)

Scheduling, Different forms, Sequencing, Batch production, Scheduling-maximum profit for whole schedule, Maximum return to whole schedule.

Elements of control procedure, Dispatching, Expediting, Computer aided production control.

**MRSPTU M. TECH. MECHANICAL ENGINEERING (INDUSTRIAL &
PRODUCTION) SYLLABUS 2016 BATCH ONWARDS**

Recommended Books:

1. Samuel Eilon, 'Elements of Production, Planning and Control'.
2. S.K. Mukhopadhaya, 'Production, Planning and Control', Prentice Hall of India.
3. Buffa, 'Modern Production Management'.

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