

2012-13

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY
(PROPOSED COURSE STRUCTURE FOR AUTONOMOUS SCHEME)

I Year M. Tech. (Machine Design) M.E.

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MEMD2T6D - PRODUCT ENGINEERING

(Elective IV)

UNIT I

Product Design Process: Design Process Steps, Morphology of Design. Problem Solving and Decision Making: Problem-Solving Process, Creative Problem Solving, Invention, Brainstorming, Morphological Analysis, Behavioral Aspects of Decision Making, Decision Theory, Decision Matrix, Decision Trees. Modeling and Simulation: Role of Models in Engineering Design, Mathematical Modeling, Similitude and Scale Models, Computer Simulation, Geometric Modeling on Computer, Finite- Element Analysis.

UNIT II

Materials Selection: Problem of Materials Selection, Performance Characteristics of Materials, Materials Selection Process, Sources of Information on Materials, Economics of Materials, Evaluation Methods for Materials Selection, Cost versus Performance Relations, Weighted Property Index, Cost Comparison, Value Analysis, Materials Systems, Materials Substitution.

UNIT III

Interaction of Materials, Processing, and Design: Role of Processing in Design, Classification of Manufacturing Processes, Economics of Manufacturing, Design for Castings, Forgings, Sheet- Metal Forming, Machining, Powder Metallurgy, Welding. Residual Stresses in Design, Design for Heat Treatment, Design for Assembly, Design for Brittle Fracture, Fatigue Failure, Corrosion Resistance, Designing with Plastics.

UNIT IV

Risk and Reliability: Risk and Society, Hazard Analysis, Fault Tree Analysis. Failure Analysis and Quality: Causes of Failures, Failure Modes, Failure Mode and Effect Analysis, FMEA Procedure, Classification of Severity, Computation of Criticality Index, Determination of Corrective Action, Sources of Information, Copyright and Copying. Patent Literature.

UNIT V

Overstress Failure and Load - Strength Interference: Failure Mechanisms, Electrical and Mechanical Overstress, Overstress Reliability Models, Safety Margin and Loading Roughness, Normally Distributed Load and Normally Distributed Strength, Safety Factors and Derating, Multiple Load Reliability, Time Dependent Stress-Strength Reliability Models, Design for Quality. Mean stress effects, effect of notches, strain life models, accumulating damage, Stress intensity factor and crack growth models, Fatigue crack propagation, Wear of rolling and sliding elements, Aging interactions and Creep, Fatigue-creep interactions, grain growth effects, fatigue mitigation. Elements of corrosion, corrosion rates, corrosion prevention.

UNIT VI

Test environment and stresses; thermal, vibration, electrical, and combined environments, temperature testing, vibration testing, test effectiveness. Accelerated testing and data analysis, accelerated factors. Weibull probability plotting, testing with censored data.

UNIT VII

Design For Maintainability: Maintenance Concepts and Procedures, Component Reliability, Maintainability and Availability, Fault Isolation in design and Self-Diagnostics. Product Design for Safety, Product Safety and User Safety Concepts, Examples of Safe Designs. Design Standardization and Cost Reduction: Standardization Methodology, Benefits of Product Standardization; International, National, Association and Company Level Standards; Parts Modularization.

UNIT VIII

Product management: The operation of product management: Customer focus of product management, product planning process, Levels of strategic planning, Wedge analysis, Opportunity search, Product life cycle Life cycle theory and practice. Product development: Managing new products, Generating ideas, Sources of product innovation, selecting the best ideas, the political dimension of product design, Managing the product launch and customer feedback. Product managers and manufacturing: The need for effective relationships, the impact of manufacturing processes on product decisions, Prototype planning, Productivity potentials, Management of product quality, Customer service levels.

TEXT BOOKS

1. Engineering Design, George E. Dieter, Mc GRAW-HILL.
2. Product Integrity and Reliability in Design, John W. Evans and Jillian Y. Evans, Springer Verlag.
3. The Product Management Handbook, Richard S. Handscombe, Mc GRAW-HILL.