MECHANISM DESIGN

Subject Code	:	06ME751
IA Marks	:	25
No. of Lecture Hrs./ Week	:	

04	
Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	
100	

PART - A

Unit - 1

Geometry of Motion: Introduction, analysis and synthesis, mechanism terminology, planar, spherical and spatial mechanisms, mobility, kinematic inversion, Grashoffs law, mechanical advantage, equivalent mechanisms, unique mechanisms.

6 Hours

Unit - 2

Generalized principles of dynamics: Fundamental laws of motion, generalized coordinates, configuration space, constraints, virtual work, principle of virtual work, energy and momentum, work and kinetic energy, equilibrium and stability, kinetic energy of a system, angular momentum.

8 Hours

Unit - 3

Lagrange's Equation: Larange's equation from D.Alembert's principles, examples, Hamiltons equations, Hamiltons principle, Lagrange's equation from Hamiltons principle, derivation of Hamiltons equations, examples.

8 Hours

Unit - 4

Synthesis of Linkages: Type, number, and dimensional synthesis, function generation, path generation and body guidance, Precision positions, structural error, Chebychev spacing, two position synthesis of slider crank mechanisms, crank-rocker mechanisms with optimum transmission angle.

4 Hours

PART - B

Unit - 5

Motion Generation: Poles and relative poles, relative poles of 4-bar mechanism, relative poles of slider crank mechanism.

4 Hours

Unit - 6

Graphical Methods of Dimensional Synthesis: Two position synthesis of crank and rocker mechanisms, three position synthesis, four position synthesis (point precision reduction), overlay method, coupler curve synthesis, cognate linkages.

8 Hours

Unit - 7

Analytical Methods of Dimensional Synthesis: Freudenstein's equation for four bar mechanism and slider crank mechanism, examples, Bloch's method of synthesis.

6 Hours

Unit - 8

Cams: Introduction, pressure angle, parameters affecting pressure angle, effect of offset follower motion, radius of curvature and undercutting, cams with specified contours.

8 Hours

Text Books:

“Theory of Machines and Mechanism”, E. Shigley, J. J. Uicker, McGraw Hill Company.

“Classical Dynamics”, Greenwood, Prentice Hall of India, 2004

Reference Books:

‘Mechanism & machine Theory’, A.G. Ambekar, PHI, 2007

‘Kinematics, Dynamics & Design of Machinery’, K. J. Waldron, G. L. Kinzel, Wiley India, 2007.

'Design of Machinery', R. C. Nortan , Tata McGraw Hill

Advanced Mechanism Design, Erdman sandoor, Vol-1 PHI, 2006.

THEORY OF PLASTICITY

Subject Code	:	06ME752
IA Marks	:	

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Fundamental of Elasticity: Concept of stress, stress transformation laws, spherical and deviator stress tensors, equilibrium equations, octahedral stresses, concept of strain, deviator and spherical strain tensors, strain transformation laws, octahedral strains, generalized Hooke's law, elastic strain energy, compatibility equations, theories of strength. problems.

7 Hours

Unit - 2

Plastic Deformation of Metals: Crystalline structure in metals, mechanism of plastic deformation, factors affecting plastic deformation, strain hardening, recovery, recrystallization and grain growth, flow figures or luder's cubes.

6 Hours

Unit - 3

Cubical dilation, true stress and strain: Strain tensor, principal strain, plane strain, spherical and deviator strain, octahedral strain and representative strain, problems.

7 Hours

Unit - 4

Stress Strain Relations: Introduction, types of materials, empirical equations, theories of plastic flow, experimental verification of St.Venant's theory of plastic flow, the concept of plastic potential, the maximum work hypothesis, mechanical work for deforming a plastic substance.

6 Hours

PART - B

Unit - 5

Yield Criteria: Introduction, yield or plasticity conditions, Von Mises and Tresca criteria, Geometrical representation, yield surface, yield locus (two dimensional stress space), experimental evidence for yield criteria, energy required to change the shape with basic principle problems

7 Hours

Unit - 6

Slip Line Field Theory: Introduction, basic equations for incompressible two dimensional flow, continuity equations, stresses in conditions of plain strain, convention for slip lines, solutions of plastic deformation problem, Geometry of slip line field, Properties of the slip lines, construction of slip line nets

7 Hours

Unit - 7

Bending of Beams: Analysis for stresses, Non linear stress strain curve, shear stress distribution, residual stresses in plastic bending, problems.

6 Hours

Unit - 8

Torsion of Bars: Introduction, plastic torsion of a circular bar, elastic perfectly plastic material, elastic work hardening of material, residual stresses and problems

6 Hours

TEXT BOOKS:

'Theory of Plasticity', Chakraborty 3rd Edition Elsevier.

'Engineering Plasticity', W. Johnson and P. B. Mellor D Van N.O Strand Co. Ltd 2000

REFERENCE BOOKS:

Basic Engineering Plasticity, DWA Rees 1st Edition Elsevier.

Theory of Plasticity, L. S. Srinath TMH,

Theory of Plasticity, Sadhu Singh, Kanna publisher

PRODUCT DESIGN AND MANUFACTURING

Subject Code

:

06ME753	
IA Marks	
:	
25	
No. of Lecture Hrs./ Week	
:	
04	
Exam Hours	
:	
03	
Total No. of Lecture Hrs.	

:

52

Exam Marks

:

100

PART - A

Unit - 1

Introduction to Product Design: Asimow's model: Definition of product design, Design by Evolution, Design by Innovation, Essential Factors of Product design, Production-Consumption Cycle, Flow and Value Addition in the Production-Consumption Cycle, The Morphology of Design (The seven phases), Primary Design Phases and Flowcharting, Role of Allowance, Process Capability and Tolerance in Detailed

Design & Assembly.

6 Hours

Unit - 2

Product Design Practice And Industry: Introduction, Product Strategies, Time to Market, Analysis of the Product, The S's Standardization, Renard Series, Simplification, Role of Aesthetics in Product Design, Functional Design Practice.

6 Hours

Unit - 3

Review of Strength, Stiffness and Rigidity Considerations in Product Design: Principal Stress Trajectories (Force-Flow Lines), Balanced Design, Criteria and Objectives of Design, Material Toughness: Resilience Designing for Uniform Strength, Tension vis-a-vis Compression. Review of Production Process: Introduction, Primary Processes, Machining Process, Non-traditional Machining Processes.

7 Hours

Unit - 4

Design for Production – Metal Parts: Producibility requirements in the Design of machine Components, Forging Design, Pressed components Design, Casting Design, and Design for Machining Ease, The Role of Process Engineer, Ease of Location Casting and Special Casting. Designing with Plastic, rubber, ceramics and wood: Approach to design with plastics, plastic bush bearings, gears in plastics, rubber parts, design recommendations for rubber parts, ceramic and glass parts.

7 Hours

PART - B

Unit - 5

Optimization in Design: Introduction, Siddal's Classification of Design Approaches, Optimization by Differential Calculus, Lagrange Multipliers, Linear Programming (Simplex Method), Geometric Programming, Johnson's Method of Optimum Design.

6 Hours

Unit - 6

Economic Factor Influencing Design: Product Value, Design for Safety, Reliability and Environmental Considerations, Manufacturing Operations in relation to Design, Economic Analysis, Profit and Competitiveness, Break – even Analysis, Economic of a New Product Design.

6 Hours

Unit - 7

Human Engineering Considerations In Product Design: Introduction, Human being as Applicator of Forces, Anthropometry; Man as occupant of Space, The Design of Controls, of controls, the Design of Displays, Man/Machine Information Exchange.

6 Hours

Unit - 8

Value Engineering and Product Design: Introduction, Historical Perspective, What is Value? Nature and Measurement of Value, Normal Degree of Value, Importance of

Value, The Value analysis Job Plan, Creativity, Steps to Problems-solving and Value Analysis, Value Analysis Test, Value Engineering Idea Generation Check-list Cost Reduction through value engineering case study on Tap Switch Control Assembly, Material and Process Selection in Value

Engineering

Modern Approaches to Product Design: Concurrent Design and Quality Function Deployment (QFD).

8 Hours

Text Books:

Product Design and Manufacturing, A.C. Chitale and R.C. Gupta, PHI 4th edition 2007.

Product Design & Development, Karl T. Ulrich & Steven D, Epinger, Tata Mc. Graw Hill, 3rd Edition, 2003

Reference Books:

New Product Development, Tim Jones, Butterworh Heinmann, Oxford, mc 1997.

New Product Development: Design & Analysis by Roland Engene Kinetovicz, John Wiley and Sosn Inc., N.Y. 1990.

SOLAR ENERGY

Subject Code

:

06ME754

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Introduction: Energy source: renewable energy sources, renewable energy potential and achievements in India, General characteristics of solar energy; the Sun, solar spectrum, spectral solar impedance.

6 Hours

Unit - 2

Solar radiation at the earth surface: Solar constant beam, diffuse and global radiation. Solar radiation data of India.Measurement of solar radiation. Pyronometer, pyrheliometer, sunshine recorder (schematic diagram and working principles of the devices.)

6 Hours

Unit - 3

Solar radiation geometry: Sun earth angles- latitude, declination, hour angle, zenith, solar altitude angle, surface azimuth angle, solar azimuth angle, Local apparent time, solar time, apparent motion of sun, day length, numerical examples. Flux on a plane surface, Solar radiation on a inclined surface- Beam, defuse, reflected radiation on a tilted surface, expression for flux on a tilted surface, monthly average hourly and daily radiation on inclined surface. Numerical examples.

6 Hours

Unit - 4

Solar thermal radiation devices: Liquid flat plate collectors, solar air heaters, concentrating collectors like cylindrical, parabolic, evacuated tubular collectors.

Storage devices: Sensible heat storage, latent heat storage. Application of solar energy: water heating, space heating, space cooling, active and passive cooling systems. Various power generation methods; Solar furnace, Refrigeration, Distillation, Solar ponds; theory, working principle, operational problems (Sketches, principle of working).

8 Hours

PART - B

Unit - 5

Solar photovoltaic system: Introduction, Description, Principles of working of solar cell:- Doping, Fermi level, p-n junction, photovoltaic effect. Photovoltaic Material:- Single crystal solar cell, Poly crystal solar cell, thin film solar cell, I-V characteristic, limits to cell efficiency, Cell temperature factors affecting PV cell performance Current status and Future potential

of P.V. cells.

6 Hours

Unit - 6

Performance analysis of liquid flat plate collectors: General description, collector geometry, selective surface (qualitative discussion), basic energy balance equation, stagnation temperature, transmissivity of the cover system, transmissivity- absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss- coefficient, problems (all correlations to be provided)

6 Hours

Unit - 7

Temperature distribution: Temperature distribution between the collectors tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expression to be provided). Effect of various parameters on the collector performance: Collector orientation, selective surface, fluid inlet temperature, number of covers, dust.

Solar Concentrators: Introduction, characteristic parameters: Aperture area, Acceptance angle, absorber area, geometric concentration ratio. Local concentration ratio or brightness concentration ratio, intercept factor, optical efficiency, thermal efficiency.. Concentration ratio.

6 Hours

Unit - 8

Concentrators, types, classification, Tracking: Concentration, Non tracking concentrator. Geometrical optics in concentrators:- Ray tracing in a reflecting surface, ray tracing in a refracting surface. Theoretical solar image. Thermal analysis:- Cylindrical parabolic concentrator, Hemispherical Bowl Mirror, V- trough. Tracking Methods:- Three Dimensional Concentrators, Two dimensional concentrators. Materials for concentrators: - Reflecting and Refracting surfaces, receiver cover and surface coating, working fluids, insulation, Numerical problems.

8 Hours

TEXT BOOKS:

Solar Energy- Principles of thermal collection and storage, S.P Sukhatme, Tata McGraw- Hill publishing company limited, NewDelhi,ISBN 0-07-462453-9.

Solar Power Engineering, P. K. Nag THH 2003.

REFERENCE BOOKS:

Solar Engineering of thermal processes, Duffie, J.A. and Beckman, W.A., John Wiley and Sons, Netwark (1991)

Solar Energy Utilization – G.D.Rai

Non Conventional Energy Resources, B.H. Khan- TMH

Renewable Energy, Sorensen; Elsvier publications.

GAS DYNAMICS

Subject Code	:	06ME755
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04
Exam Hours	:	03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Fundamental Equations of Steady Flow: Continuity and momentum equations, The thrust function, The dynamic equation and Euler's Equation.
Bernoulli's Equation.

Steady flow energy equation.

8 Hours

Unit - 2

Isentropic Flow: Acoustic velocity, Mach number, Mach cone and Mach angle. Flow parameters, stagnation temperature, pressure, and density.

6 Hours

Unit - 3

Adiabatic Flow: Stagnation temperature change. Rayleigh line, Pressure ratio and temperature ratio, Entropy considerations, maximum heat transfer.

6 Hours

Unit - 4

Flow With Friction: The fanning equation, Friction factor and friction parameter, Fanno line, Fanno equations.

6 Hours

PART - B

Unit - 5

Wave Phenomena: Classification of wave phenomena, analysis of shock phenomena, Hugoniot equation. Weak waves, compression waves, Normal shock waves, oblique shock waves, Entropy considerations, Rayleigh Pilot equations, detonation and deflageration.

6 Hours

Unit - 6

Variable Area Flow: Velocity variation with Isentropic flow, Criteria for acceleration and deceleration. Effect of pressure ratio on Nozzle operation. Convergent nozzle and convergent divergent nozzle. Effect of back pressure on nozzle flow. Isothermal flow functions. Comparison of flow in nozzle. Generalized one dimensional flow.

7 Hours

Unit - 7

Applications of dimensional analysis and similitude to gas dynamic problems.

6 Hours

Unit - 8

Introduction to Flames and combustion: Flame propagation, diffusion flames, premixed flames, flame velocity, theories of flame propagation, ignition for combustible mixture, flame stabilization.

7 Hours

Text Books:

Fundamentals of Compressible flow: Yahya, 2nd Edn. 1991; Wieley Eastern.

Gas Dynamics, E Radhakrishnan PHI-2006

Reference Books:

Introduction to Gas Dynamics: Rolty, wiley 1998.

Elements of Gas Dynamics: Liepmann and roshko, Wiley 1994.

The dynamiacs and thermodynamics of compressible fluid flow: Shapiro Ronold press. 1994.

Compressible Fluid Flow, J. F. Anderson

MANAGEMENT INFORMATION SYSTEMS

Subject Code	:	06ME756
IA Marks	:	25
No. of Lecture Hrs./ Week		

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Foundation Concepts: Foundations of Information Systems in Business Information System and Technologies, Business applications, developments and management, competing with Information Technology using Information Technology for strategic advantage.

7 Hours

Unit - 2

Review of Information Technologies: Computer Hardware – computer systems, end user and enterprise computing, computer peripherals, input, output, and storage technologies, Computer Software- application software, end user application, system software, computer system management.

6 Hours

Unit - 3

Data Resource Management: Managing Data Resources, Technical foundations of Database Management, Telecommunication and Networks – overview of telecommunications and networks, technical telecommunications alternatives.

6 Hours

Unit - 4

Business Applications: The Internet worked E. business Enterprise The Internet, Intranets and Extranets in Business, Enterprises Communication and Collaboration, Electronic Business Systems, Cross Functional E-Business systems, Functional E-Business systems, Electronic Commerce systems, Electronics commerce fundamentals, commerce applications and Issues.

7 Hours

PART - B

Unit - 5

Business Decision: E –Business Decision Supports Systems for decision support, executive support systems, group decision support system, Artificial Intelligence Technologies in Business

6 Hours

Unit - 6

Development Processes: Developing E-Business strategies, E-Business planning fundamentals, implementing E-Business strategies, Developing E-Business solutions – Developing E-Business systems, Implementing E-Business systems.

7 Hours

Unit - 7

Management Challenges: Security and Ethical challenges of E-Business – Security, Ethical and Societal challenges of E-Business, security management of E –Business, Enterprise and Global management of E-Business Technology – Managing E-Business Technologies, Global E-Business, Technology Management.

7 Hours

Unit - 8

Managing Global Systems: Growth of International Information Systems, Organizing International Information Systems, Managing Global systems, Off/Outsourcing, Global Value chain, Case Studies

6 Hours

Text Books:

Management Information Systems, Managing information Technology in the Internet Worked Enterprise, Jams, A O'Braien - McGraw Hillpublishing company Ltd., 2002. 5th edition ISBN 0-07048637-9

Managing information systems, W.S.Jawadekar,Tata McGraw Hillpulbishing Co. Ltd., New Delhi 1998. ISBN 0-07-463197-9

Reference Books:

Mangement Information Systems, Laudon & Laudon, PHI 1998 Ed. ISBN 81-203-1282-1

Managaement Information systems, S.Sadagopan, Prentice Hall of India, 1998 Ed. ISBN 81-203-1180-9

Information sytems for Modern managaement G.R.Murdick PHI 2002.

AUTOMATION IN MANUFACTURING

Subject Code	:	06ME757
IA Marks	:	25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

Introduction: Production System Facilities, Manufacturing Support systems, Automation in Production systems, Automation principles & Strategies

5 Hours

UNIT - 2

Manufacturing Operations: Manufacturing Operations, Product/Production Relationship, Production concepts and Mathematical Models & Costs of Manufacturing Operations

7 Hours

UNIT - 3

Industrial Control System: Basic Elements of an Automated System, Advanced Automation Functions & Levels of Automation, Continuous versus Discrete control, Computer Process control, Forms of Computer Process Control.

7 Hours

UNIT - 4

Automated Manufacturing Systems: Components of a Manufacturing systems, Classification of Manufacturing Systems, overview of Classification Scheme, Single Station Manned Workstations and Single Station Automated Cells.

7 Hours

PART - B

UNIT - 5

Group Technology & Flexible Manufacturing Systems: Part Families, Parts Classification and coding, Production Flow Analysis, Cellular Manufacturing, Flexible Manufacturing Systems: What is an FMS, FMS Components, FMS Applications & Benefits, and FMS Planning & Implementation Issues.

8 Hours

UNIT - 6

Quality Control Systems: Traditional and Modern Quality Control Methods, Taguchi Methods in Quality Engineering. Introduction to SQC Tools.

4 Hours

UNIT - 7

Inspection Technologies: Automated Inspection, Coordinate Measuring Machines Construction, operation & Programming, Software, Application & Benefits, Flexible Inspection

System, Inspection Probes on Machine Tools, Machine Vision, Optical Inspection Techniques & Noncontact Nonoptical Inspection Technologies

6 Hours

UNIT - 8

Manufacturing support system: Process Planning, Computer Aided Process Planning, Concurrent Engineering & Design for Manufacturing, Advanced Manufacturing Planning, Just-in Time Production System, Basic concepts of lean and Agile manufacturing. Basic Concepts of Lean and Agile manufacturing, Comparisons of Lean & Agile Manufacturing.

8 Hours

Text Books:

Automation, Production Systems and Computer Integrated Manufacturing, M. P. Groover, Pearson education. Third Edition, 2008

Principles of CIM, Vajpayee, PHI.

Reference Books:

Anatomy of Automation, Amber G.H & P. S. Amber, Prentice Hall.

Performance Modeling of Automated Manufacturing Systems, Viswanandham, PHI

Computer Based Industrial Control, Krishna Kant, EEE-PHI

TOTAL QUALITY MANAGEMENT

Subject Code

:

06ME758

IA Marks	:
25	
No. of Lecture Hrs./ Week	:
04	
Exam Hours	:
03	
Total No. of Lecture Hrs.	:

52

Exam Marks

:

100

PART - A

Unit - 1

Quality, Total Quality, TQM: Introduction-Definition, Basic Approach, TQM framework, Historical Review, Benefits of TQM.

4 Hours

Unit - 2

Evolution of TQM: Contribution of Quality Gurus- Edward Deming, 14 points, PDSA cycle, Joseph Juran, Quality trilogy, Crosby & quality treatment, Ishikawa and company wide quality control, Taguchi & his quality loss function.

8 Hours

Unit - 3

Leadership and quality costs: Characteristics of quality leaders, Quality statement, strategic planning, Introduction to quality costs, prevention costs, Appraisal costs, failure costs, Management of quality costs, economics total of quality costs and its reduction.

6 Hours

Unit - 4

Continuous Improvement:

Improvement as problem solving process

W-V Model of CI, process control

Reactive Improvement

Standard steps & 7 tools of quality, seven steps, management diagnosis of seven steps, reactive improvement.

Proactive Improvement.

Introduction, standard steps, 7 management tools, applying proactive improvement, to develop new product- three stages & nine step.

8 Hours

PART - B

Unit - 5

Tools and Techniques in TQM: Kaizen, Re-engineering, Six Sigma, Benchmarking Definition, Process of benchmarking, 5S, 3M, Poka-Yoke.

8 Hours

Unit - 6

Quality Function Deployment and Failure Modes Effects Analysis: Introduction to QFD and QFD process, Quality by design, Rationale for implementation of quality by design, FMEA, Design FMEA and process FMEA.

6 Hours

Unit - 7

Quality Management Systems: Introduction to different standards Quality management systems, Bureau of Indian standards (BIS), Institute of Standards Engineers (SEI), ISO-9000 series of standards, Overview of ISO-14000, Overview of TS 16959.

6 Hours

Unit - 8

Product Acceptance Control: Product acceptance control through IS 2500 part 1 and part 2.

6 Hours

Text Books:

Total Quality Management: Dale H. Bester field, Publisher - Pearson Education India, ISBN: 8129702606, Edition 03/e Paperback (Special Indian Edition)

Total Quality Management for Engineers: M. Zairi, ISBN: 1855730243, Publisher: Wood head Publishing

Reference Books:

A New American TQM, four revolutions in management, Shoji Shiba, Alan Graham, David Walden, Productivity press, Oregon, 1990

100 Methods for Total Quality Management: Gopal K. Kanji and Mike Asher, ISBN:

0803977476,
Publisher:
Sage Publications, Inc.; Edition – 1

Organisational Excellence through TQM, H. Lal, New age pub, 2008

Mechanism Design. Test the Performance of Mechanisms. A mechanism is a mechanical device that transfers motion and/or force from a source to an output. Mechanism design is much as it sounds: the creation and refinement of mechanisms needed for a specific application or product assembly. Your product wonâ€™t work as intended unless its component mechanisms and assemblies do. And itâ€™s cheaper and easier to investigate a product in 3D CAD rather than one thatâ€™s already reached the prototype stage. Mechanical design is to design parts, components, products, or systems of mechanical nature. For example, designs of various machine elements such as shafts, bearings, clutches, gears, and fasteners fall into the scope of mechanical design. Numerous criteria have been proposed in mechanical design processes, some primary design criteria include functions, safety, reliability, manufacturability, weight, size, wear, maintenance, and liability.