



राष्ट्रीय प्रौद्योगिकी संस्थान, मिजोरम
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DEPARTMENT OF MECHANICAL ENGINEERING

5th Semester

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1518	Heat Transfer	3-1-0	8
2.	MEL1519	Manufacturing Process- I	3-0-0	6
3.	MEL1520	Machine Design- I	3-1-0	8
4.	MEL1521	Dynamic of Machinery- II	3-0-0	6
5.	MEL1522	Industrial Management & Operation Research	3-0-0	6
6.	MEP1523	Thermal Laboratory- I	0-0-3	3
7.	MEP1524	Manufacturing Laboratory- I	0-0-2	2
8.	MEP1525	Dynamics of Machinery Laboratory - II	0-0-3	3
Total				42

Course code	Course Title	Semester	L-T-P	Credits
MEL1518	Heat Transfer	5 th	3-1-0	8

Conduction Heat Transfer: One- dimensional heat conduction equation for slab, cylinder, sphere and composite medium (with and without heat generation), Concept of critical thickness of insulation. Numerical methods for solution of heat conduction problems.

Heat Transfer For Extended Surfaces: Analysis of steady- state heat transfer for fins of uniform cross-section, Fin performance.

Radiation Heat Transfer: Nature of thermal radiation, Radiative properties, Kirchhoff's law, Black body radiation intensity and total emissive power, Displacement law, Radiation heat transfer between black/grey surfaces, network method of solving radiation problems, Concept of view factor.

Convection: Application of dimensional analysis to free and forced convection, Concept of velocity and thermal boundary layer, Equations of motion and energy, Empirical equations of convective heat transfer, Reynolds analogy, Heat transfer in boiling and condensation

Heat Exchangers: Basic types of heat exchanger, LMTD and ϵ - NTU method of heat exchanger analysis. Computational studies in heat transfer processes in Conduction, Convection and Radiation. Experimental techniques related to heat transfer analysis. Heat transfer analysis from commercial software.

Books:-

SL.No	Name of the book	Author	Publication
1	Principles of Heat Transfer	F. Kreith et .al.	International Publication.
2	Heat Transfer	M.N. Ozisik	McGraw hill international.
3	Heat Transfer	J.P. Holman	Tata McGraw Hill.

Course code	Course Title	Semester	L-T-P	Credits
MEL1520	Machine Design-I	5 th	3-1-0	8

Introduction: General considerations and procedure of Machine Design, Mechanical properties, Design stress, Factor of safety, Stress-strain diagram for ductile and brittle materials, Theories of failure, Stress concentration factor, Design for variable loads: endurance limit, Goodman and Soderberg criteria.

Riveted Joints: Types, Modes of failure, Strength and efficiency of riveted joints, Pitch of rivets, Design stresses, Structural joints of butt and lap type, Boiler joints, Rivets subjected to eccentric loading.

Welded Joints: Types of welds, Strength of welds, Eccentric load in plane of weld, Welded pressure vessel and some practical applications.

Keys and Pins: Types of keys, Stresses in keys, Design of square, rectangular and taper keys.

Shafts: Shafts subjected to twisting moment, bending moment, combined twisting and bending moment, fluctuating loads, axial load in addition to combined torsion and bending loads.

Coupling: Rigid and flange coupling, Design of flange coupling

Cotter and Knuckle Joints: Design of Socket and spigot cotter joints, Sleeve and cotter joints, Gib and cotter joint for strap end of a connecting rod, Gib and cotter joint for square rods, Knuckle joint.

Lever: Application of lever in engineering practice, Design of a lever, Foot lever, Cranked lever, Lever for lever safety valve, Bell crank lever.

Books:-

SL.No	Name of the book	Author	Publication
1	Design Of Machine Members	Spotts et.al.	Prentice Hall Publishers.
2	Mechanical Engineering Design	Shigley et.al.	Tata McGraw Hill.
3	Introduction to Machine Design	Bhandari V.B et.al.	Tata McGraw Hill.

Course code	Course Title	Semester	L-T-P	Credits
MEL1521	Dynamic of Machinery-II	5 th	3-0-0	6

Force analysis: Static and dynamic force analysis of mechanism.

Cam dynamics: Analysis of cam and follower, jump phenomenon.

Brake & Dynamometer: Brakes: Types & Analysis. Clutches: Types & Analysis, Dynamometers.

Governors: Types and applications

Gyroscopes: Basic of gyroscope and gyroscopic effects

Balancing: Balancing of reciprocating and rotary machines, single and multi cylinder engine balancing, Flywheel.

Vibration: Introduction to Free and Forced Vibrations, critical speed of shaft, vibration measuring instruments.

Books:-

SL.No	Name of the book	Author	Publication
1	Theory of Machines	Thomas Beven	Pearson Publication.
2	Theory of Machines & Mechanism	R.L. Norton	McGraw hill international.
3	Theory of Machines	S.S. Ratan	Tata McGraw Hill.

Course code	Course Title	Semester	L-T-P	Credits
MEL1519	Manufacturing Process-I	5 th	3-0-0	6

Manufacturing Process and Properties of Materials: Introduction to manufacturing processes, Structure of Matter, Metals and Alloys, Deformation and Mechanical Properties of Materials, Heat Treatment etc.

Casting Processes: Introduction, pattern and mould, mould design, types and various pattern materials, various casting methods such as sand casting investment casting, pressure die casting, centrifugal casting, continuous casting, thin roll casting, casting defects and their remedies etc.

Metal Joining Processes: Brazing, soldering, welding, solid state welding methods; resistance welding; arc welding; submerged arc welding; inert gas welding; welding defects, inspection etc.

Metal forming Processes: Various metal forming operations and their analysis such as forging, rolling, extrusion, wire drawing, sheet metal working, spinning, swaging, thread rolling, metal forming defects etc., powder metallurgy and its applications.

Books:-

SL.No	Name of the book	Author	Publication
1	DeGarmo's materials & Processes in Manufacturing	J.T Black et.al.	Wiley India Pvt Ltd.
2	Manufacturing technology	P.N. Rao	Tata McGraw Hill.
3	Welding Technology	R.A. Little	McGraw hill international.

Course code	Course Title	Semester	L-T-P	Credits
MEL1522	Industrial Management & Operational Research	5 th	3-0-0	6

Introduction: Historical background; Work study definition; Role of work study in improving productivity; Ergonomics and work study. Work study procedure: selection of jobs; Information collection and recording; Recording techniques -charts and diagrams; critical analysis; developing better method; installation and follow up of standard method. Memo motion and Micro motion study; therbligs; cycle graph and chrono cycle graph; SIMO chart; Principles of motion economy; Design of work place layout.

Performance rating: Performance rating; Definition and Procedure; Concept of normal time; allowances. Work sampling technique of work measurement. Introduction to pre-determined motion time system.

Quality: Introduction and definitions of quality, Evolution of Quality: Inspection, Quality Control, Customer-Oriented: Internal & External Customer Concept, Life cycle approach to quality costs- Prevention; Appraisal and Failure costs. Seven QC tools (Histogram, Check sheets, Ishikawa diagrams, Pareto, Scatter diagrams, Control charts). Process capability concepts.

Site Selection: Factors influencing the selection, rural and urban locations of sites, optimum decision on choice of site and analysis. Plant Layout: Types of production, types of layouts, advantages and disadvantages of layout, factor affecting layout, systematic layout planning, Material handling: importance, principles of material handling.

Operation Research: General methodology of OR, application of OR, Formulation of linear programming, deterministic models, graphical solution, simplex algorithm.

Inventory: Inventory related costs, EOO model, EPO model, Inventory models allowing shortages, Inventory models allowing price discounts, Inventory model under risk conditions, Inventory control systems: continuous review, periodic review, optional replenishment etc., Inventory classification systems: ABC, FMS, VED etc, MRP.

CPM and PERT: Project scheduling with CPM, Project scheduling with PERT. Loading and Scheduling , General scheduling problem, Significance of loading and scheduling, Factors affecting scheduling, Scheduling system, Flow shop scheduling, Job shop scheduling, Sequencing, Line balancing.

Books:-

SL.No	Name of the book	Author	Publication
1	Production And Operations Management: An Applied Modern Approach	Joseph S. Martinich	Wiley India Pvt Ltd.
2	Production and Operation Management	S.N. Chary	Tata McGraw Hill.
3	Operations Research	H.A. Taha	Pearson Publication.