

**COURSE STRUCTURE & SYLLABUS OF
BACHELOR OF TECHNOLOGY (B.TECH)**

***In*
MECHANICAL**

Course Structure

Third Year

Sixth Semester

Paper Code	Subject
BTM6	Strength of Materials
BTM7	Industrial Engg. & Production Management
BTM8	Design of Machine Elements
BTM9	Hydraulic Machines
BTM10	Industrial Economics & Management

BTM6 : STRENGTH OF MATERIALS

CHAPTER 1 : INTRODUCTION

- Interdisciplinary
- Brief Historical Review
- Organization of the book

CHAPTER 2: SIMPLE STRESSES AND STRAINS

- General Meaning of stress
- Unit of stress
- Simple Stresses
 - Normal stress
 - Shear stress
- Strain
- Stress Strain Relation
 - Behaviour in Tensions
 - Behaviour of Materials under compression
- Nominal stress and true stress
- Behaviour of Materials under Repeated Loadings
- Factor of Safety
- Hooke's Law
- Extension / Shortening of a bar
- Bars with cross-sections varying in steps
- Bars with continuously varying cross-sections
- Bars subjected to varying loads
- Indeterminate structural problems
- Compound Bars
- Temperature stresses

- Simple Shear
- Poisson's Ratio
- Volumetric Strain
- Elastic Constants
- Relationship between Modulus of Elasticity and Modulus of Rigidity
- Relationship between Modulus of Elasticity and Bulk Modulus
- Strain Energy due to Direct Stresses and Impact Loads
- Strain Energy due to shear Stresses

CHAPTER 3 : SHEAR FORCE AND BENDING MOMENT DIAGRAMS IN STATICALLY DETERMINATE BEAMS

- Shear Force and Bending Moment
- Sign Convention
- Relationship between load Intensity, Shear Force and Bending Moment
- Shear Force and Bending Moment Diagrams
- SFD and BMD for Standard Cases
- SFD and BMD for beams subjected to various loads
- Short Cut procedure

CHAPTER 4 : STRESSES IN BEAMS

- Theory of Simple Bending
- Moment carrying capacity of a section
- Composite beams/flitched beams
- Beams of Uniform strength
- Leaf Springs
- Shearing Stresses in Beams
- Shear Stresses across a few Standard Sections
- Shear Stresses in Built Up Sections
- Limitation of Theory Developed

CHAPTER 5: DEFLECTIONS OF BEAMS BY DOUBLE INTEGRATION METHOD

- Differential Equation for Deflection
- Other Useful Equations
- Double Integration Method
- A few General Cases
- Macaulay's Method

CHAPTER 6: TORSION

- Introduction
- Pure Torsion
- Assumptions in the Theory of pure Torsion
- Derivation of Torsional Equations
- Polar Modulus
- Power Transmitted
- Torsional rigidity/ Stiffness of Shafts
- Stepped shafts and Composite Shafts
- Shear Keys
- Coupling
- Torsion of a Tapering Shaft
- Strain Energy in Torsion
- Closed Coiled Helical Springs
- Torsion of shafts of Non-circular sections

CHAPTER 7: COMPOUND STRESSES

- Stresses on an Inclined Plane
- Mohr's Circle of Stress
- Compound Stresses in Beams
- Shafts Subjected to combined Bending and Torsion
- Shafts subjected to Combined Action of Bending, Torsion and Axial Thrust

CHAPTER 8: THIN AND THICK CYLINDERS AND SPHERES

- Stresses in Thin Cylinders
- Changes in Dimensions of Cylinder
- Riveted Cylinders
- Wire Wound Cylinders
- Thin Spherical shells
- Thick cylinders
- Compound Cylinders
- Shrinkage Allowance
- Thick spherical shells

CHAPTER 9: COLUMNS AND STRUTS

- Short columns subjected to Axial Loads
- Eccentrically loaded masonry columns
- Euler's Theory for Axially Loaded Elastic long columns
- Effective Length
- Limitations of Euler's theory
- Rankine's Formula
- Formula used by Indian Standard Code

CHAPTER 10: THEORIES OF FAILURES

- Maximum Principal Stress Theory
- Maximum Shear Stress Theory
- Maximum Strain Theory
- Maximum Strain Energy Theory
- Maximum Distortion Energy Theory

BTM7 : INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT

Chapter 1:Introduction to Industrial Engineering:

Definition, History and Development of Industrial Engineering, Contributions of Industrial Engineering, Activities of Industrial Engineering, Industrial Engineering Approach, Objectives of Industrial Engineering, Function of an Industrial Engineer, Techniques of Industrial Engineering, Place of Industrial Engineer in an Organisation, Industrial engineering in Service Sector.

Chapter 2:Productivity :

Introduction, Concept, Definitions of Productivity, Production and Productivity, Expectation from Productivity, Benefits from Productivity, Dynamics of Productivity Change, Productivity Measures, Advantages and Limitations of Productivity Measures, Productivity Measurement Models, Factors Influencing Productivity, Productivity Improvement Techniques, Levels of Productivity Measurements.

Chapter 3:Work Study :

Introduction, Importance of Work-Study, Advantages of Work-Study, Work-Study Procedure, Work-Simplification and Work-Study, Human Considerations in Work-Study, Work-Study and the Management, Work-Study and supervisor, Work-Study and the Workers, Work-Study Man, Influence of Methods and Time Study on Production Activities, Concept of Work Content,

Reasons for Excess Work Content, Techniques to Reduce Work Content, Work-Study as Tool to Improve Productivity.

Chapter 4:Method Study :

Introduction, Objectives of method Study, Scope of Method Study, Steps Involved in Method Study, Selection of the Job for Method Study, Recording Techniques, Micro Motion Study, Memo Motion Study, Cycle Graph and Chronocycle Graph, Critical Examination, Development and Selection of New Method, Principles of Motion Economy, Installation of the Proposed Method, maintain the Proposed Method.

Chapter 5:Work Measurement :

Definition, Objectives of Work Measurement, Techniques of Work Measurement, Types of Elements, Time Study Equipments, Performance Rating, Allowances, Computation of Standard time, Comparison of Various Techniques, Work Sampling, Synthetic Data, Predetermined Motion Time Analysis.

Chapter 6:Plant Location:

Introduction, Need for Selecting a Suitable Location, Plant Location Problem, Advantages of Urban, Suburban, Rural Locations, Importance of Location, Systems View of Location, Location Factors, Comparison between Urban and Rural Locations, Factors Influencing Plant Location, Quantitative Method for Evaluation of Plant Location

Chapter 7:Plant Layout

Definition, Plant Layout Problem, Objectives of Plant Layout, Principles of Plant Layout, Factors influencing Plant Layout, Type of Manufacturing System, Types of Layout, Material Flow Patterns, Symptoms of Bad Layout, Plant Layout Procedure, When to Use Process, Products and Fixed Position Layout, Tools and Techniques of Plant Layout, Computer Packages for Layout Analysis, Factory Building,

Chapter 8:Introduction to Production/Operations Management

Production / Operation Functions, Production Systems, Objectives of Production Management, History and Development of Production management, Functions and Scope of Production Department, Production Management Frame Work, Type of Production, Classification of Production System, Production Interface with Sub Functional Areas of Production, Organisation Structure for Production Function

Chapter 9:New Product Design :

Introduction, Product Life-Cycle, Product Policy of an Organisation, Selection of a Profitable Product, Product Design Process, Product Analysis

Chapter 10:Demand Forecasting :

Introduction, Forecasting and Prediction, Need for Demand Forecasting, Long Term and Short term Forecasts, Classification of Forecasting Methods, Judgmental Techniques, Time Series Analysis, Time Series Analysis, Least Square Methods of Forecasting, Moving Average forecasting, Exponential Smoothing Method, Forecast Error, Costs and Accuracy of Forecasts

Chapter 11:Production Planning and Control :

Introduction, Need for PPC, Production Planning and Production Control, Objectives of PPC, Functions of PPC, Comparison between Production Planning and Production Control, Information Requirement of PPC, Production Procedure, Organisation for PPC, Manufacturing Methods and PPC, Problem of Production Planning and Control

Chapter 12:Material requirement Planning (MRP)

Introduction, MRP Objectives, Functions Served by MRP,MRP Terminology, MRP system, MRP Outputs, MRP Logic, Management Information from MRP, Lot Sizing Considerations, Manufacturing resource Planning, Capacity Requirements Planning (CRP)

Chapter 13: Production Control

Introduction, Outline of Production Control, Loading, Sequencing and Scheduling, Loading, Priority Sequencing, Sequencing Problems, Assignment Model, Scheduling, Dispatching, Progressing

Chapter 14: Inventory Control

Introduction, Meaning of Inventory, Types of Inventories, Reasons for Keeping Inventories, Inventory Control, Objectives of Inventory Control, Benefits of Inventory Control, Costs Associated with Inventory, Inventory Control-Terminology, Inventory Cost Relationships, Inventory Cost Relationship, Inventory Models, Safety Stock, Inventory Control System, Selective Control of Inventory.

BTM8 : DESIGN OF MACHINE ELEMENTS**Chapter 1: Introduction:****Chapter 2: Procedure in Machine Design :**

Design Process, Relation of designer with other disciplines, Classification of design work, Qualities required in a designer, Design procedure, Standardization,

Chapter 3: Materials:

Introduction, Factors determining the choice of materials , Properties and testing of materials, Cast Iron

Chapter 4: Manufacturing Considerations in Machine Design:

Important points to be observed while designing for casting, Important points to be observed while designing for heat for easier machining.

Chapter 5: Important points to be observed while designing for heat treatment, Limits, Fits, and surface finish :

Introduction, Indian Standard (IS 919-1963), Definitions, Types of tolerances, Geometrical tolerances, Interchangeable manufacture and selective assembly , Types of fits, Surface Finish, Surface roughness, Information to be given in the statement of surface roughness,

Chapter 6: Fasteners:

Threaded fasteners, Non-threaded fasteners.

Chapter 7: Shafts :

Introduction, Materials, Design consideration, Determination of shaft sizes on the basis of strength, Shaft sizes based on shaftings, effect of keyways, Critical speeds on shafts,

Chapter 8: Flywheels :

Introduction, Turning Moment diagram, Maximum fluctuation of energy, Design of flywheels,

Chapter 9: Couplings:

Introduction , Rigid couplings, Flexible Couplings, Slip Couplings,

Chapter 10: Clutches:

Introduction, Rigid body clutches , Friction clutches, Centrifugal clutches, Friction clutches, Centrifugal clutches, Electromagnetic Friction clutches, Eddy current clutches, Slip Clutches, Magnetic Particles Clutches,

Chapter 11: Brakes:

Introduction, Friction Materials, Band brakes, Differential band brakes, Band and block Brakes, Block brakes, Self-Energizing and self-locking brakes, Automotive shoe brakes,

Chapter 12: Ball and Roller Bearings:

Introduction, Construction and classification of ball bearings, Types of roller bearings, Bearing life, Bearing Series, Static Load Capacity, Methods of evaluation Static load rating of rolling (ball and roller bearing) , Equations for calculating basic load rating (C_0) (kg), Equations for calculating Static equivalent Load (P_0), Dynamic load capacity, Equivalent dynamic load, Basic Dynamic Load Rating C , Spur, Helical.

Chapter 13: Bevel and Worm Gears :

Introduction, Involute Curve, Terminology of gear Teeth, Interference in Gears, Gear Materials, Sources of errors in manufacturing gears, Design of gears, Design of gears considering hardness, AGMA bending equation, Gear Wheel Design, Internal Gears, Approximate Method of Design of spur gears, Method of calculating the rating of machine cut spur and helical gears, Gear Boxes , Helical Gears, Bevel Gears, Worm Gears

BTM9 : HYDRAULIC MACHINES

Chapter 1: Impact of free jets :

Introduction, Force exerted on a Stationary Flat Plate Held Normal to the Jet, Force Exerted on a Stationary Flat Plate Held Inclined to the Jet, Force Exerted on a Stationary Curved Plate, Force Exerted on a Moving Flat Plate Held Normal to Jet, Force Exerted on a Moving Plate Inclined to the Direction of Jet, Force Exerted on a Curved Vane when the Vane is moving in the Direction of Jet, Jet Striking a Moving Curved Vane Tangentially at One Tip and Leaving at the Other, Jet Propulsion of Ships, Highlights, Objective Type Questions, Theoretical Questions, Unsolved Examples.

Chapter 2: Hydraulic Turbines:

Introduction, Classification of Hydraulic Turbines, Impulse Turbines – Pelton wheel, Construction and working of Pelton wheel/turbine, work done and efficiency of a Pelton wheel, Definitions of heads and efficiencies, Design aspects of Pelton wheel, Reaction Turbine, Francis turbine, work done and efficiencies of a Francis turbine, working proportions of a Francis turbine, Design of a Francis turbine runner, Advantages and disadvantages of Francis turbine over a Pelton wheel, Propeller and Kaplan turbines-Axial flow reaction turbines, Propeller turbine, Kaplan turbine, Kaplan versus Francis turbine, Deriaz turbine, Tabular or bulb turbines, Runaway Speed, Draft Tube, Draft tube theory, Types of draft tubes, Specific Speed, Unit Quantities, Model Relationship, Scale Effect, Performance Characteristics of Hydraulic Turbines, Main or constant head characteristic curves, Operating or constant speed characteristic curves, Constant efficiency or ISO-efficiency or Muschel curves, Governing of Hydraulic Turbines, Governing of reaction turbines, Cavitations, Selection of Turbines, Surge Tanks, Highlights.

Chapter 3: Centrifugal Pumps:

Introduction, Classification of Pumps, Advantages of centrifugal Pump over Displacement (Reciprocating) Pump, Component Parts of a Centrifugal Pump, Work done by the Impeller (or Centrifugal Pump) on Liquid, Head of a Pump, Losses and Efficiencies of a Centrifugal Pump, Losses in centrifugal Pump, Effect of outlet vane angle on manometric efficiency, Minimum speed for starting a Centrifugal Pump, Effect of variation of Discharge on the Efficiency, Effect of Number of Vanes of Impeller on Head and efficiency, Working Proportions of Centrifugal Pumps, Multi-stage Centrifugal Pumps, Pumps in series, Pumps in parallel, Specific speed, Model Testing and Geometrically similar Pumps, Characteristics of Centrifugal Pumps, Net Positive Suction Head (NPSH), Cavitations in Centrifugal Pumps, Priming of a Centrifugal Pump, Selection of Pumps, Operational Difficulties in Centrifugal Pumps, Highlights,

Chapter 4: Reciprocating Pumps:

Introduction, Classification of Reciprocating Pumps, Main Components and Working of a Reciprocating Pump, Discharge, work done and power required to drive reciprocating Pump, Single-acting reciprocating pump, Double-acting reciprocating Pump, Co-efficient of Discharge and slip of Reciprocating Pump, Co-

efficient of discharge, slip, Effect of Acceleration of Piston on Velocity and Pressure in the Suction and Delivery Pipes, Indicator Diagrams, Ideal indicator diagram, Effect of acceleration in suction and delivery pipes on indicator diagram, Effect of friction in suction and delivery pipes on indicator diagram, Effect of friction and acceleration in suction and delivery pipes on indicator diagram, Air vessels, Highlights.

Chapter 5: Miscellaneous Hydraulic Machines :

Introduction, Hydraulic Accumulator, Hydraulic Intensifier, Hydraulic Press, Hydraulic Crane, Hydraulic lift, Hydraulic Ram, Hydraulic Coupling, Hydraulic Torque converter, Air Lift Pump, Jet Pump, Highlights.

Chapter 6: Water Power Development:

Hydrology, Definition, Hydrologic cycle, Measurement of run-off, Hydrograph, Flow duration Curve, Mass Curve, Hydro-power Plant, Introduction, Application of hydro-electric power plants, Advantages and disadvantages of hydro-electric power plants, Average life of hydro-plant components, Hydro-plant controls, Safety measures in hydro-electric power plants, Preventive maintenance to hydro-plant, Calculation of available hydro-power, Cost of hydro-power plant, Hydro-power development in India, Combined hydro and steam power plants, Comparison of hydro-power station with thermal power stations, Highlights.

BTM10: INDUSTRIAL ECONOMICS AND MANAGEMENT

Chapter 1 : Nature and Significance of Economics : Science, Engineering and Technology and their relationship with economics development, appropriate technology for development countries

Chapter 2 : Demand and Supply Analysis : Elasticity, Competition, Monopoly, Oligopoly, Monopolistic competition, Price Discrimination, Equilibrium of firm .

Chapter 3 : Function of Money : Supply and Demand for money, Inflation, Black Money.

Chapter 4: Functions of Commercial Bank : Multiple credit creation, Banking systems in India.

Chapter 5 : Central Banking : Functions of Central Banking, monetary policy.

Chapter 6: Sources of Public Revenue : Principles of taxation, Direct and Indirect taxes , reform of tax system.

Chapter 7: Theory of International Trade : Balance of trade and payment, Theory of protection, Exchange control, Devaluation.

Chapter 8: New Economics Policy : Liberalization, Extending , Privatization, Globalization, Market-Friendly state, Export led growth.

Chapter 9: Causes of Underdevelopment : Determinants of economic development, stages of economics growth, Strategy of development, Critical minimum effort strategy .

Chapter 10: Management Functions : Developments of management thought, Contribution of F.W. Taylor, Henri Fayol, Elton-Mayo, System Approach to Management .

Chapter 11: Nature of Planning : Decision making process, MBO.

Chapter 12: Organization : Line and Staff relationships, Decentralization of delegation of authority .

Chapter 13: Communication Process : Media Channels and barriers to effective communication .

Chapter 14: Theory of Motivation : Maslow, Herzberg and McGregor Theory of motivation, McClelland's achievement theory.

Chapter 15 : Production Management : Production Planning and control, inventory control, quality control, total quality management.

Chapter 16 : Project Management : Project Development life cycle, project feasibility, CPM, PERT.

Chapter 17: Cost Accounting and Finance : Techniques of Financial Control, Financial Statements Financial Ratios, Break-even analysis, Budgeting and budgetary control.

Chapter 18 : Marketing Functions : Management of Sales and advertising, Marketing research .

Chapter 19: Human Resource Management : Functions, Selection, Training.

Chapter 20 : Engineering Economics : Investment Decisions, Payback time .
