Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Syllabus Structure of T.E. (Mechanical Engineering) w.e.f. Academic Year 2013-14

Part-I

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Subject</th>
<th>Contact Hours / Week</th>
<th>Examination Scheme</th>
<th>Duration of Theory Examination</th>
<th>Remark</th>
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<td>MED305</td>
<td>Industrial Management and Engineering Economics</td>
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<td>MED321</td>
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<td>MED322</td>
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## Part-II

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<td>Heat Transfer</td>
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<td>Tool Engineering</td>
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<td>CAD / CAM / CAE</td>
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<td>MED373</td>
<td>Lab-IX Industrial Hydraulics and Pneumatics</td>
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<td>Lab-X Tool Engineering</td>
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<td>MED375</td>
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L: Lecture hours per week      T: Tutorial Hours per week      P: Practical hours per week
TH: University Theory Examination      TW: Term Work      P: Practical / Oral Examination
**Unit 6: Design of Spring (7 Hrs)**

1. **The meaning of design, Influence of design, Presses of designing, Design classification, use of standards in designing, Preliminary.**
2. **Theoretical Stress, Selection of material, BIS designation.**
3. **Aesthetic, Economic & General design consideration, use of standards in designing.**

**Objectives:**
- Developing creativity for designing the various types of fasteners including riveted joints and welded joints under combined stresses.
- Design of C-clamp & C-frame.
- Different types of failure, Necessity of Types of failure, Two dimensional stress condition.
- Stress concentration, Failure Finiture, Endurance limit, notch sensitivity, Goodman, Soderberg.
- Stress concentration, Failure Finiture, Endurance limit, notch sensitivity, Goodman, Soderberg.
- Stress concentration, Failure Finiture, Endurance limit, notch sensitivity, Goodman, Soderberg.

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**Unit 5: Design of welded and Riveted Joints: (6 Hrs)**

1. **Types of welded joints, Eccentrically loaded joints, Welded joints subjected to bending.**
2. **Types of riveted joints, Eccentrically loaded joints, Welded joints subjected to bending.**

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**Unit 4: Design against fluctuating load (7 Hrs)**

1. **Stress concentration, Fatigue failure, Endurance limit, Notch sensitivity, Goodman, Soderberg.**
2. **Fatigue failure, Endurance limit, Notch sensitivity, Goodman, Soderberg.**
3. **Fatigue failure, Endurance limit, Notch sensitivity, Goodman, Soderberg.**
4. **Fatigue failure, Endurance limit, Notch sensitivity, Goodman, Soderberg.**

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**Unit 3: Design of Screw and Fasteners (5 Hrs)**

1. **Design of bolted and threaded joints, Design of power screw, Introduction to recirculating ball.**
2. **Design of screw and fasteners.**
3. **Design of screw and fasteners.**
4. **Design of screw and fasteners.**
5. **Design of screw and fasteners.**
6. **Design of screw and fasteners.**
7. **Design of screw and fasteners.**
8. **Design of screw and fasteners.**

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**Unit 2: Design of Shaft, Keys and Coupling: (8 Hrs)**

1. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
2. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
3. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
4. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
5. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
6. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
7. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**
8. **Shafts subjected to bending and torsion, types of keys and their design, design of rigid and flexible couplings.**

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**Unit 1: Design of structural joints: (7 Hrs)**

1. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
2. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
3. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
4. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
5. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
6. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
7. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**
8. **Design of structural joints, Design of structural joints, Design of structural joints, Design of structural joints.**

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**Class Test: 20 Marks**

**Theory Exam: 80 Marks (3 Hrs)**

**Teaching Scheme:**

**Med301-Design Machine Elements – I**

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**Teaching Scheme:**

1. **Introduction to design and design process.**
2. **Predicting the reasons of failure and correlating it with theoretical knowledge.**
3. **Developing the capability to analyze and select the various criteria of design.**
4. **Developing creativity for designing the various typ es of fasteners including riveted joints and welding joints at various loading conditions.**

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**Objectives:**
- Understanding the meaning of design and design process.
- Predicting the reasons of failure and correlating it with theoretical knowledge.
- Developing the capability to analyze and select the various criteria of design.
- Developing creativity for designing the various types of fasteners including riveted joints and welding joints at various loading conditions.
Reference Books


Pattern of Question Paper

The units in the syllabus are divided into two equal sections. Question paper consists of two
sections A and B. Section A includes first three units (1, 2, and 3) and Section B includes
remaining three units (4, 5 and 6). Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Five questions in each Section
2. Attempt any three questions from each Section.

Section A: Units 1, 2 and 3
Section B: Units 4, 5 and 6
Unit 1: Toothed Gears (10 Hrs)

Introduction, Gear terminology, types of gears and applications.

(A) Spur Gears: Terminology, conjugate action, involute and cycloidal profiles, path of contact, arc of contact, contact ratio, interference, undercutting, methods to avoid interference and undercutting, backlash, effect of center distance variation, frictional losses.

(B) Helical and Herringbone Gears: Their relative merits and demerits over spur gears, determination of common shaft angle, center distance and efficiency of helical gears.

(C) Spiral bevels and worm gears: Terminology, geometrical relationships, construction of worm gears, various types of worm and worm gears, efficiency of worm gearing.

Unit 2: Governor and Flywheel (8 Hrs)

(A) Governors: Function, inertia and centrifugal governors (Watt, Porter, Proell and Hartnell only), controlling force and governor power, sensitivity, stability, isochronism and hunting.

(B) Flywheels: Turning moment diagram, fluctuation of energy and speed, determination of size for different types of engines and machines.

Unit 3: Gyroscope (4 Hrs)

Introduction, angular acceleration, gyroscopic couple, effect of gyroscopic couple on vehicle performance, stability of ships and aircrafts.

Unit 4: Friction Clutches (4 Hrs)

Types of friction, friction laws, single plate and multiple plate clutches, centrifugal clutches, torque transmitting mechanisms.

Unit 5: Belt, Rope & Chain Drives (4 Hrs)

Flat and Vee belts, rope drives, limiting tension and power transmitting capability, centrifugal clutches, single plate multiple plate clutches, centrifugal clutches, torque transmitting mechanisms.

Unit 6: Vibration (10 Hrs)

Introduction, cause, effects and terminology.

Damped free vibrations: differential equation of motion. Logarithmic decrement damping methods, Damped natural frequency (analysis of viscous damping only).

Forced Vibrations: vibration due to harmonic force excitation, centric mass excitation, support excitation. Steady state response curves, phase lag angle. Motion and force transmissibility, seismic instruments.

Pattern of Question Paper

For 80 marks Paper:

1. Five questions in each Section
2. Attempt any three questions from each Section

Section A: Units 1, 2, and 3
Section B: Units 4, 5, and 6

Reference Books

1. Theory of Machines – Thomas Bevan
2. Theory of Machines and Mechanisms – Shigley
3. Theory of Machines and Mechanisms – Rao & Dukkipati
5. Theory of Machines – Khurmi & Gupta
6. Theory of Machines – R. K. Bansal
8. Theory of Machines – D. R. Singhal
9. Theory of Machines – V. P. Singh
10. Mechanical Vibrations by Cover C. K., N. G. P. Publishers
12. Theory of Machines – Thomas Bevan
13. Kinematics of Machines – Dr. Sadhu Singh
14. Theory of Machines – Thomas Bevan
15. Theory of Machines – V. P. Singh
17. Theory of Machines – Thomas Bevan
19. Theory of Machines – Thomas Bevan
21. Theory of Machines – Thomas Bevan
23. Theory of Machines – Thomas Bevan
25. Theory of Machines – Thomas Bevan
27. Theory of Machines – Thomas Bevan
MED303 - METALLURGY AND MATERIALS

Teaching Scheme

Lectures: 4 Hrs/ Week.
Examination Scheme

Theory Examination: 80 Marks (3 Hrs)
Class Test: 20 Marks

Examination Scheme

Objectives:
1. To impart a fundamental knowledge about extraction of steel & cast iron and their applications.
2. To impart sound knowledge of different materials with their selection, properties and application.
3. To improve general knowledge about extraction of steel & cast iron from ore.

Unit 1: Structure of Materials and Strengthening Mechanism

Objectives:
- Introduction to the structure of materials
- Strengthening mechanisms

1. Structure of Materials
   - Crystallography
   - Crystal defects
   - Phases in the Fe-C system

2. Strengthening Mechanism
   - Grain boundaries and deformation
   - Solid solution strengthening
   - Martensite strengthening
   - Strain hardening
   - Bauschinger effect

Unit 2: Phase Diagram

Objectives:
- Equilibrium diagrams
- Iron-carbon phase diagram
- Phase transformations
- Critical temperatures

1. Iron Carbon Equilibrium Diagram
   - Phases in the Fe-C system
   - Transformation reactions
   - Critical temperatures

2. Phase Diagrams
   - Isothermal transformation diagrams
   - Continuous cooling transformation diagrams

Unit 3: Heat Treatment of Steels

Objectives:
- Heat treatment processes
- Types of heat treatment
- Annealing
- Normalizing
- Hardening
- Tempering
- Surface and case hardening treatments

1. Annealing
   - Stress relieving
   - Full annealing
   - Isothermal annealing
   - Diffusion annealing
   - Partial annealing

2. Normalizing
   - Hardening methods
   - Jominy end quench test
   - Retained austenite

3. Hardening
   - Hardening defects and quench stresses
   - Retained austenite
   - Sub-zero treatment

4. Tempering
   - Objective of tempering
   - Types of tempering
   - Temper brittleness
   - Austempering
   - Martempering

5. Surface and case hardening treatments
   - Carburizing
   - Nitriding
   - Surface hardening methods

Unit 4: Steel & Cast Irons

Objectives:
- Classification of steel and cast iron
- Properties and applications

1. Steel
   - Classification
   - Specifications
   - Types of steel

2. Cast Irons
   - Types of cast iron
   - Properties
2. Attempt any three questions from each Section.

1. Five questions in each Section.

For 80 marks Paper:

Pattern of Question Paper

6. ASM Handbook - Vol. 01 & 02. Properties and Selection (Ferrous & Nonferrous metals)
2. James S. Reed, "Introduction to the Principles of Ceramic Processing."
1. Chitra P. Poojary and Frank J. Owens, "Introduction to Nanotechnology."

Wiley, India.

Reference Books

4. S.A.C. Furukawa and Motokawa, "Macroweld HPL Publication"
2. James S. Reed, "Introduction to the Principles of Ceramic Processing."
1. Chitra P. Poojary and Frank J. Owens, "Introduction to Nanotechnology."

Wiley, India.

Section B: Units 4, 5 and 6

Section A: Units 1, 2 and 3

Nano Materials: Classifications of Nano Materials, Nanocomposites, and Nanocomposites and Nanocomposites

Composites Materials: Classification of Composites, Structures, and Properties

Carbon Materials: Ceramics and Glasses, Ceramics and Glasses, and Ceramics and Glasses

Advanced Materials

Nanostructured Materials and Applications, Nanotubes and Nanocomposites

Aluminium Alloys: Composition, Properties, and Uses, Copper Alloys, and Aluminium Alloys

Ceramic Alloys: Ceramics and Glasses, and Ceramics and Glasses

Other Materials: Advanced Materials, and Advanced Materials


Metallography, Microstructures, and Microstructures of Cast Iron.


Metallography, Microstructures, and Microstructures of Cast Iron.


Metallography, Microstructures, and Microstructures of Cast Iron.

This course deals with the basic concepts of fluid mechanics. The objectives of the course are

- Understand the concept of different types of fluid, and their properties.
- Understand Pascal's law and its application, physical significance and application
- Understand concept of fluid kinematics, dynamics, application of dimensional analysis and CFD.
- Understand the concept of boundary layer and its application.
- Understand the concept of fluid kinematics, dynamics, application of dimensional analysis.
- Understand the concept of different types of fluid, and their properties.

**Objectives:**

- Class Test: 20 Marks
- Theory: 80 Marks (4 HRS)
1. Fluid mechanics and Hydraulic machines by Domkundwar & Domkundwar, Dhanpat Rai & Co.

2. Fluid mechanics and Hydraulic machines by S K Som, G Biswas, Tara Mcgraw Hill


5. Fluid mechanics and Hydraulic machines by R K Rajput, S Chand co. Publication.

6. Computational Fluid Dynamics by Anderson.


Boundary Layer Theory:

- Introduction to boundary layer, definition and characteristics, boundary layer separation and its control.
- Von-Karman momentum equation, laminar boundary layer, turbulent boundary layer.
- Displacement thickness, energy thickness, momentum thickness.
- Introduction to boundary layer, definition and characteristics, boundary layer thickness.

Flow through Pipes:

- Introduction, Need of CFD, Governing equation of CFD, CFD applications.

Flow through Pipes (09 HRS)

Tipo of flow: Introduction, Flow of viscous fluid through circular pipe, turbulent flow, flow through parallel pipes, flow through branched pipes, and total entropy into flow through compound pipes in series or flow through compound pipes of different diameters, loss of energy in pipes, loss of energy due to friction in pipes, expression for coefficient of shear stress.

Unit-IV

Unit-IV: Dimensions and Similarity:

- Dimensions of various physical quantities, Buckingham's π theorem, types of similarities, distorted and non distorted models, dimensionless numbers.

Unit-V

Unit-V (06 HRS)

Volume Flow:

- Streamline, types of streamline, distorted and non distorted models, dimensionless numbers π (per).

- Introduction to Computational Fluid Dynamics:
  - Introduction, need of CFD, governing equation of CFD, CFD applications.
  - Their significance.
  - Importance of various physical quantities, Methods of analysis and Buckingham's π theorem.

Unit-VI

Unit-VII (05 HRS)

Introduction to Computational Fluid Dynamics:

- Introduction, Need of CFD, Governing equation of CFD, CFD applications.
- Their significance.
- Importance of various physical quantities, Methods of analysis and Buckingham's π theorem.

Suggested Text Books and References:

1. Fluid mechanics and Hydraulic machines by Domkundwar & Domkundwar, Dhanpat Rai & Co.
5. Fluid mechanics and Fluid power engineering by Cengel, Tara Mcgraw Hill.
6. Computational Fluid Dynamics by Anderson.
7. Fluid mechanics and Hydraulic machines by R K Rajput, S Chand co. Publication.
The units in the syllabus are divided into two equal sections. Question Paper consists of two sections. Section A includes first three units (1, 2, and 3) and Section B includes remaining three units (4, 5, and 6). Question Paper should cover the entire syllabus. Five questions in each section and attempt any three questions from each section.
MED305 - INDUSTRIAL MANAGEMENT & ENGINEERING ECONOMICS

Teaching Scheme

Examination Scheme

Lectures: 4 Hrs/Week
Theory: 80 Marks (3 Hrs)
Examination Scheme

ECONOMICS

MScECS - INDUSTRIAL MANAGEMENT & ENGINEERING

Unit 1: A. Nature & Significance of Economics

Objectives:

1. To understand concept of Management, Administration, Organization, costing and financial management.
2. To engage and enhance critical skills by pursuit of specialist options via management and economics.

Types of economic analysis - Micro and macro, kinds of economic decisions, economic principles for management decisions.

Types of market analysis - Demand and supply analysis

A. Demand and Supply Analysis

B. Inventory Management and Importance of Inventory Management

C. Costing and Financial Management

Unit 2: Human Resource Management

Objectives:

- To understand various aspects of human resource management, project organization, matrix organization, and functions of human resource management, recruitment, selection, training.
- To understand succession planning, job description and specification, job analysis, recruitment and selection, manpower planning, trade union.

Unit 3: Business Organization

Objectives:

- To understand various types of business organizations and their functions.
- To understand steps of organizational development.
- To understand the role of entrepreneurship in organizational development.

Unit 4: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 5: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Management

B. Recent Trends in Management

Unit 6: Inventory Management

Objectives:

- To understand inventory management.
- To understand the importance of inventory management.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 7: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 8: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 9: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 10: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 11: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 12: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 13: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 14: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 15: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 16: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 17: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 18: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 19: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 20: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 21: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 22: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 23: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 24: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 25: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 26: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 27: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 28: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 29: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 30: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 31: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 32: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 33: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 34: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.

Unit 35: Nature & Significance of Economics

Objectives:

- To understand the significance of economics.
- To understand various types of economic decisions.

Unit 36: Demand and Supply Analysis

Objectives:

- To understand the principles of demand and supply analysis.
- To understand the importance of demand and supply analysis.

A. Introduction to Inventory Management

B. Recent Trends in Inventory Management

Unit 37: Costing and Financial Management

Objectives:

- To understand costing techniques.
- To understand the importance of financial management.

Unit 38: Human Resource Management

Objectives:

- To understand various aspects of human resource management.
- To understand recruitment, selection, training, and development.

Unit 39: Business Organization

Objectives:

- To understand various types of business organizations.
- To understand steps of organizational development.
Unit 6: (6 Hrs) Capital Budgeting and Depreciation

Reasons of Replacement, payback period method, net present value, discounted cash flow method, Profitability index method, internal rate of return (IIR) method, Types of Depreciation: Straight line method, written down method, Liquidation.

Reference Books

Pattern of Question Paper

The units in the syllabus are divided in two equal sections. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Five questions in each Section
2. Attempt any three questions from each Section.

Pattern of Question Paper

Section A: Unit 1, 2, and 3
Section B: Unit 4, 5, and 6

Reference Books

Capital Budgeting and Depreciation

Unit 6 (6 Hrs)
Practical examination is based on the practical work done during the course. Viva Voce.

Practical Exam

Practical: 100 Marks

Assignment Based on

Desi gn of coupl ing / Power Screw
Desi gn of Knuckle Join
Design of Cotter Joint

Term Work

Term Work - 25 Marks
Practical: 100 Marks

Teaching Scheme

15
MED322 LAB-II THEORY OF MACHINES-II

Teaching Scheme

Practical: 2 Hrs/Week

Examination Scheme

Term Work - 50 Marks

Term Work

At least eight out of the following experiments shall be conducted during the course record of Term Work.

1. Assignment on unit 1.
2. Assignment on unit 2.
3. Study of governors
4. Study of interference & undercutting
5. To determine mass moment of inertia of disc by using
   a) Compound pendulum
   b) Bifilar suspension
6. Experiments on longitudinal vibrations of prismatic springs
7. To determine mass moment of inertia of uniform rod by using
   a) Compound pendulum
   b) Bifilar suspension
8. To determine mass moment of inertia of uniform rod by using
   a) Compound pendulum
   b) Trifilar suspension
   c) Single rotor system
9. Determination of Gyroscopic couple
10. Determination of logarithmic decrement (free Damped Vibrations)
11. Determination of equivalent mass of spring mass for spring mass system
12. Determination of equivalent mass of spring mass for spring mass dashpot system

The same shall be submitted by the candidate as Term Work
The teaching scheme for the course "Metallurgy and Materials" includes the following components:

**Practical Scheme (2 Hrs/Week):**
- **Practical Work**
  - 2. Study of mechanisms of quenching
  - 3. Heat treatment of high speed steels
  - 4. Heat treatment and Rockwell Test

**Term Work (25 Marks):**
- 1. Study of Metallurgical Microscope and Image Analyzer
- 2. Preparation of Specimen for metallographic examinations
- 3. Preparation of Mounted samples with the help of mounting press / cold setting resins
- 4. Study of microstructures of steels and Cast Iron
- 5. Study of microstructures of Non Ferrous Metals
- 6. Study of microstructures of Non Ferrous Metals
- 7. Study of microstructures of steels and Cast Iron
- 8. Preparation of mounted samples with the help of mounting press / cold setting resins
- 9. Study of microstructures of steels and Cast Iron
- 10. Study of mechanisms of quenching

The term work shall consist of the experiments based on the above syllabus as mentioned below:
**Term Work**
- Practical Work: 25 Marks

**Examination Scheme (25 Marks):**
- Teaching Scheme
LAB-IV MED324-FLUID MECHANICS

Teaching Scheme

Examination Scheme

Practical: 2 Hrs/week

Term Work: 25 Marks

Practical Exam: 25 Marks

Term Work shall consist of any six experiments from the following (excluding assignments)

1. Determination of viscosity by using Red wood Viscometer.
2. Study and performance on different types of pressure measuring devices.
4. Verification of Bernoulli’s theorem.
5. Measurement of flow by using Venturi meter and orifice meter.
7. To perform Reynolds experiment.
8. To determine the friction factor for pipes of different sizes.
9. Assignments on chapter no. 2, 4 and 6.
BSH331 LAB-V COMMUNICATION SKILLS-II

Teaching Scheme

Examination Scheme

Practical: 2 Hrs/Wk

Online Examination: 50 Marks (1 Hr.)

Examination Scheme

Unit-I
• Fast calculation techniques, Number system, ratio, proportion, variations, averages
• Simple interest, compound interest, profit, loss
• Work and time, speed and distance
• Set theory, and Van diagram, Permutation and combination
• Data interpretation

Unit-II
• The key components of non-verbal communication: eye contact, body language
• Teamwork and team building, The basics of team intelligence, Diversity awareness
• Effective listening, & asking questions, Written and spoken English

Unit-III
• Data interpretation
• Probability, arithmetic, logic, data analysis, coining and decoding and
• Set theory and Van diagram, Permutation and combination

Online Examination: 50 Marks (1 Hr.)

Reference Books

1. Gopal Swamy Ramesh, Mahadevan Ramesh "The Ace of Soft Skills", Pearson
2. Bansal Harison, "Spoken English"
3. Orient Blackswan, "English for Engineers and Technologists"
5. William Shipman, "Perfect Time Management"
Teaching Scheme

Examination Scheme

MED 326 LAB - VI WORKSHOP PRACTICE - V

Teaching Scheme

1. Hazra, Technology of Workshop, Vol 2
2. Hazra, Technology of Workshop, Vol 2

Recommended books:

A workshop diary containing details along with calculations wherever necessary.

Term Work

Preparation of blanks for the various jobs from the different types of available raw materials on the lathe. Study the various single and multiple point tools, tool holding devices and the workpiece holding devices.

1) Study of various measuring instruments, gauges and their applications.
2) Preparation of one gear involving calculation for indexing. The side faces to be milled by the piece holding devices.
3) Preparation of blanks for the various jobs from the different types of available raw materials on the lathe.
4) Study of a file containing the write-up of the study part of the experiments no. 1, 2 and 6.
5) Preparation of blanks for the various jobs from the different types of available raw materials on the lathe. Study the various single and multiple point tools, tool holding devices and the workpiece holding devices.
6) Preparation of blanks for the various jobs from the different types of available raw materials on the lathe. Study the various single and multiple point tools, tool holding devices and the workpiece holding devices.

Term Work

The term work will comprise of the above stated jobs.

Recommended books:

2. Raghuwanshi, Workshop Technology, Vol 2

Practicals: 2 Hrs/Weekly

Exam. Scheme

Teaching Scheme

Term Work: 25 Marks
MED351 - DESIGN MACHINE ELEMENTS – II

Teaching Scheme

Lectures: 4 Hrs/Week
Theory Examination: 80 Marks
Class Test: 20 Marks
Examination Scheme

Objectives:

Class Test: 20 Marks
Theoretical Examination: 80 Marks
Teaching Scheme
Unit -5: Design of brake (5 Hrs)

Introduction and types of brake, design of short shoe (single & double), design of long shoe (single & double), design of simple & differential band brake, design of band & block brake & design of internal expanding brake.

Section A:
Unit 1 and 2

Section B:
Unit 3, 4 and 5

Reference Books

Pattern of Question Paper

The units in the syllabus shall be divided into two equal sections. Quesion paper consists of two sections A and B. Section A includes first two units (1, 2) and Section B includes remaining three units (3, 4, 5). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Five questions in each Section
2. Attempt any three questions from each Section

Reference Books

Section B: Units 3, 4 and 5

Section A: Units 1 and 2

Design of brake (5 Hrs)

1. Introduction and types of brake
2. Design of short shoe (single & double)
3. Design of long shoe (single & double)
4. Design of simple & differential band brake
5. Design of band & block brake
6. Design of internal expanding brake
7. Design of external expanding brake
MED352-HEAT TRANSFER

Teaching Scheme:

Theory: 4 Hrs/Week
Theory Examination: 80 Marks (3 Hrs)
Class Test: 20 Marks

Objectives:
- Recognize and apply appropriate methods for determining radiation heat transfer
- Design and predict heat exchanger performance
- Model basic heat transfer processes and identify modes

Class Test: 20 Marks
Theory Examination: 80 Marks (3 Hrs)

Examination Scheme:

Units: 3

Unit 1: (03 Hrs)
A. Introduction
Hydrodynamic and thermal boundary layer flow around spheres. Classification of flow conditions, laminar and turbulent flow, pipe friction factor, heat transfer through extended surfaces.

B. One dimensional steady state heat conduction

Unit 2: (04 Hrs)
A. Extended Surfaces
Types and applications of fins. Heat transfer through extended surfaces.

B. Unsteady state heat conduction

Unit 3: Convection (04 Hrs)
A. Convection
Hydrodynamic and thermal boundary layer flow around spheres. Classification of flow conditions, laminar and turbulent flow, pipe friction factor, heat transfer through extended surfaces.

B. Free and Forced Convection
Model basic heat transfer processes and identify modes.

Dimensional analysis in free and forced convection. Physical significance of the dimensionless numbers related to free and forced convection. Empirical correlation for heat transfer in laminar and turbulent flow over a flat plate and in a pipe. Theories of heat transfer: laminar, turbulent, and methods of calculation. Correlations for heat transfer in free and forced convection.
Unit 4: Condensation and Boiling (04 Hrs)

Modes of pool boiling, critical heat flux, burnout point, forced boiling, film and dropwise condensation. (No numerical treatment)

Unit 5: Radiation Heat Transfer (05 Hrs)

Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzmann law, Kirchhoff’s law, Planck’s law and Wein’s displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces, effect of radiation shield, intensity of radiation, radiative heat transfer. (Descriptive and numerical treatment)

Unit 6: Heat Exchangers (05 Hrs)

Heat exchangers classification, Fouling factor, overall heat transfer coefficient, analysis of parallel and counter flow heat exchangers. LMTD correction factor, fouling factor. The effectiveness-NTU method for parallel and counter flow heat exchangers. Introduction to heat pipes. (Descriptive and numerical treatment)

Pattern of Question Paper

The units in the syllabus are divided into two equal sections. Question paper consists of two sections A and B. Section A includes first three units (1, 2, and 3) and Section B includes remaining three units (4, 5, and 6). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Five questions in each Section.
2. Attempt any three questions from each Section.

Section A: Unit 1, 2 and 3

Reference Books

MED353 - INDUSTRIAL HYDRAULICS AND PNEUMATICS

Teaching Scheme

Class Test: 20 Marks
Theory Examination: 80 Marks (4 Hrs)

Examination Scheme

Objectives

- To develop logical understanding of the subject.
- To develop skill so that students are able to apply Principles of Hydraulics and Pneumatics for the industrial applications.
- To enhance the skill of the students in the automation design and application in the present day need of the industrial machines.

Unit 1: Introduction to Hydraulics and pneumatics (6 Hrs)

Introduction of Hydraulic and pneumatic, basic circuits (in block diagram)

Units 2 - 5: Hydraulic and pneumatic circuits

Units 6 - 10: Hydraulic and pneumatic controls, accessories

Study of pneumatic and hydraulic control valves: Pressure control valves, flow control valves, direction control valves.

Study of different piping, couplings, and pipe accessories used in hydraulic and pneumatic systems. Study of all the types, different construction, valve

Study of pneumatic and hydraulic control valves: Pressure control valves, flow control valves, direction control valves.

Study of the different piping, couplings, and pipe accessories used in hydraulic and pneumatic systems.

Introduction of hydraulic and pneumatic, basic circuits (in block diagram)
Design of different circuits basic circuit, speed control circuit, force control circuit, various actuators. Special circuits like sequencing, counter balancing, unloading, variable operation circuit, circuit with air/hydraulic pilot operated valves.

Typical industrial application circuits including synchronizing circuit, fail safe circuit, and two-hand safety circuit, machine applications like clamps, machine feed and other applications, material moving equipments, cranes, jacks, press etc.

Unit 6: Introduction to Electro-Hydraulics and Electro-Pneumatics (6 Hrs)

Review of components in electrical control of hydraulic and pneumatic systems, valve actuators used in these systems. Pressure switches, pressure switches, limit switches, Reed switches, other industrial applications in different control of hydraulic and pneumatic systems.

Unit: Introduction to Electro-Hydraulics and Electro-Pneumatics (6 Hrs)

Reference Books

2. **Hydraulics and Fluid Mechanics**, by Modi Seth. (Standard Book House)
5. **Pneumatic Controls**, by Joji P. (Wiley India Pvt Ltd)

Pattern of Question Paper

The units in the syllabus are divided in two equal sections. Question paper consists of two sections A and B. Section A includes first three units (1, 2, and 3) and Section B includes sections 4 and 5. Question paper should cover the entire syllabus.

1. Attempt any three questions from each section.
2. Five questions in each section.

Note: All the units must be dealt with schematic representation and supported with the industrial applications.

2. Introduction to Mechanical and Mechatronic Systems, by David G. Alcacer. Michael
3. pneumatic systems, principles and applications, by S.R. Mujumdar (TMH)
4. pneumatic systems, principles and applications, by S.R. Mujumdar (TMH)
5. pneumatic controls, by J. P. Wally (India Pvt Ltd)
6. industrial hydraulics manual, by Sperry Vickers
7. ABCs of hydraulic circuits, by Harry L. Stewart (Taraporewala)
8. ABCs of hydraulic circuits, by Harry L. Stewart (Taraporewala)
9. ABCs of hydraulic circuits, by Harry L. Stewart (Taraporewala)
10. Electro-Hydraulic Principles, by Harry L. Stewart (Taraporewala)
11. Electro-Pneumatic Principles, by Harry L. Stewart (Taraporewala)
12. Mechanical, by Harry L. Stewart (Taraporewala)
MED354 TOOL ENGINEERING

Teaching Scheme

Examination Scheme

Lectures: 4 Hrs/Week
Theory Examinations: 80 Marks (4 Hrs)
Class Test: 20 Marks

Unit 1: Theory of Metal Cutting

- Introduction
- Mechanics of Machining
- Geometry of Single Point Cutting Tool, Designation of Cutting Tools, ORS and ASA System, Importance of Tool Angles, Mechanism of Chip Formation, Orthogonal and Oblique Cutting, Use of Chip Breakers, Machining of Tool Materials

Unit 2: Design of Cutting Tools

- Introduction
- Types, Geometry, Nomenclature and Design of Drills, Milling Cutters, Reamers, Taps

Unit 3: Design of Jigs & Fixtures

- Introduction
- Process Planning, Need of Fixtures, Locating & Clamping Principles, Common to Jigs & Fixtures, Drilling Jigs
- Design Principles, Drill Bushes, Design Principles for Drill Bushings
- Types of Drilling Jigs
- Template Jig, Plate Type Jig, Swinging Leaf Jig, Box Type Jig, Channel Type Jig
- Milling Fixtures
- Essential Features of a Milling Fixtures, Design Principles

Unit 4: Press Tool Design

- Introduction of Press Operations
- Classification of Presses, Working Pressure, Selection of Press, Working Terminology
- Types of Dies
- Simple Dies, Inverted Dies, Compound Dies, Combination Dies, Progressive Dies, Transfer Dies, Multiple Dies
- Principle of Metal Cutting, Strip Layout, Clearance, Angular Clearance, Cutting Forces, Method of Reducing Cutting Forces, Profile of a Press, Back up Plates, Punches, Strippers

Unit 5: Forming & Drawing Dies

- Bending
- Bending Terminology, Press Selection, Bending Pressure, Prevention of Bending
- Design Principles

Objectives:

To understand the methodology of component design and all the required
To understand the standard practice followed in industries for tool design
Enhance information visualization, design and interpretation skills
Forming Dies

p Introduction, Types: solid form dies, pad type form dies, and Embossing dies, coining dies, Bulging dies.

Drawing Dies

p Introduction, Difference between bending, forming & drawing, Metal flow during drawing, Design consideration: Radius of draw die, Punch radius, Draw clearance, Drawing speed, Calculating blank size, Number of draws, Drawing pressure, Blank holding pressure.

Forging Die Design

p Introduction, Single impression dies, Multiple impression dies, Forging design factors: draft, fillet & corner radius, parting line, shrinkage & die wear, mismatch, finish allowances, webs & ribs Preliminary forging operation: fullering, edging, bending, flattening, blackening finishing, Die design for machine forging: determination of stock size in closed & open die forging, materials & manufacture of forging dies.

Mould Design

p Introduction: single impression, Multiple impression dies, Mould materials, Mould base, Design of simple two plate injection moulds, Pattern of Question Paper

The units in the syllabus are divided in two equal sections. Question paper consists of two sections A and B. Section A includes first three units (1, 2, and 3) and Section B includes sections 4, 5 and 6. Question paper should cover the entire syllabus.

Pattern of Question Paper

7. Techniques of Press Working Sheet Metal by Emy Redd
2. Hitomar, "Introduction to Jigs and Fixtures.
1. Fundamentals of Metal Machining by Geoffrey Boothroyd

Recommended Books:
1. A. B. Chippendale, Machine tool design, S. Chand publishers.

Reference Books
1. Fundamentals of Metal Machining By Geoffrey Boothroyd
2. Hoffman, "Introduction to Jigs and Fixtures design.
7. production Technology-HMT, Pune, McGraw-Hill, Publisher.
8. Fundamentals of Metal Cutting By V. Arshinov, S. Alekseev

Section A: Units: 1, 2, and 3

Section B: Units 4, 5, and 6
MED355 - COMPUTER AIDED DESIGN/ COMPUTER AIDED MANUFACTURING/ COMPUTER AIDED ENGINEERING

Teaching Scheme

Examination Scheme

Lectures: 4 Hrs/Week
Theory Examination: 80 Marks (3 Hrs)
Class Test: 20 Marks

OBJECTIVES:

To develop programming skills required for NC machining.
To develop 3D modeling skills required for product design.
To understand use of computers for product design and manufacturing.
To give an overview of CAD/CAM/CAE technology.

Units:

Unit 1: Introduction to Computer Aided Design/Manufacturing

- Overview of modern design and manufacturing systems: Kinematic, static, and dynamic simulations.
- Benefits of CAD/CAM/CAE technology.
- Types of CAD/CAM/CAE systems: Postprocessor, CNC, and DNC systems.

Unit 2: Basic Components of NC, CNC, and DNC Systems

- Definition of NC, CNC, and DNC systems.
- Elements of an NC system.
- Principles of CAD/CAM/CAE technology.
- Introduction to computer-aided design/programming.

Unit 3: 3D Modelling

- Wireframe modeling.
- Solid modeling.
- Modern solid modeling techniques.
- Feature-based modeling.
- Parametric modeling.
- Constraint-based modeling.
- Hybrid solid modelers.

Unit 4: Automation

- Definition, types, advantages, and limitations of automation.
- Elements of flexible manufacturing systems (FMS).
- Group technology.
- Computer-aided process planning (CAPP).

Unit 5: NC Machine Tools

- Basic components of NC, CNC, and DNC systems.
- NC motion control systems.
- Drive of NC systems.
- Manual, APT, post processor, etc.
Unit 6: Robotics and Introduction to CAE (6 Hrs)

Physical configuration, basic robot motion, technical features of a robot, methods of robot programming, introduction to direct and inverse kinematics, forward kinematics using transformation matrices, end effectors, industrial applications.

Introduction to CAE: Phases in CAE (Pre Processing, Analysis Solver & Post Processing), Applications of FEA in Mechanical Engineering, FEA Softwares.

Section A:

Unit 1, 2 and 3

Section B:

Unit 4, 5 and 6

Reference Books

3. CAD/CAM Theory and Practice, Ibrahim Zeid, TMH.
4. CAD/CAM Principles and Application, Rao P.N., p. TMH.
7. CAD/CAM/ CIM, P.Radhakrishnan, S.Subramanayan and V.Raju, New Age International.

Pattern of Question Paper

The units in the syllabus are divided into two sections A and B. Question paper should cover the entire syllabus. Remaining three units (4, 5, and 6) question paper includes first three units (1, 2, and 3) and Section B includes sections A and B. Question paper consists of two sections A and B. Question paper should cover the entire syllabus. Section A includes first three units (1, 2, and 3) and Section B includes sections A and B. Question paper should cover the entire syllabus.

1. Attempt any three questions from each section.
2. Five questions in each section.

For 60 marks Paper:

1. Attempt any three questions from each section.
2. Five questions in each section.

The units in the syllabus are divided into two equal sections. Question paper consists of two sections A and B. Question paper should cover the entire syllabus. Remaining three units (4, 5, and 6) question paper includes first three units (1, 2, and 3) and Section B includes sections A and B. Question paper should cover the entire syllabus.

Pattern of Question Paper

1. Attempt any three questions from each section.
2. Five questions in each section.

Reference Books

1. Application of FE in Mechanical Engineering, FE Solutions.
2. Introduction to CAE: Phases in CAE (Pre Processing, Analysis Solver, Post Processing).
3. Transformation matrices, end effectors, industrial applications.
4. Physical configuration, basic robot motion, technical features of a robot, methods of robot programming, introduction to direct and inverse kinematics, forward kinematics using transformation matrices.
MED356 - MECHANICAL MEASUREMENT

Teaching Scheme

Examination Scheme

Lectures: 2 Hrs/Week

Online Examination: 40 Marks (2 Hrs)

Examination Scheme

Class Test: 10 Marks

Objectives:

1. To provide an overview of measurement techniques for measuring process parameters in industry.
2. Familiarize students with theoretical response characteristics of transducers, instruments, and signal conditioning equipment used to measure these signals.
3. Enhance students with theoretical response characteristics of transducers, instruments, and signal conditioning equipment used to measure these signals.
4. To provide an overview of measurement techniques for measuring process parameters in industry.

Unit 1: Measurement and measurement systems (3 Hrs)

Significance, types, methods, classification, analog and digital modes, functions of instrument and measurement, elements of generalized measurement system.

Unit 2: Static characteristics of instrument and measurement systems (3 Hrs)

Accuracy, static error, reproducibility, drift, sensitivity, errors in measurements, linearity, hysteresis, threshold, bias, input and output impedance, loading effect.

Unit 3: Detector Transducers: (5 Hrs)

Classification of transducers, primary and secondary transducers, mechanical transducers, resistive transducers, capacitive transducers, piezoelectric transducers, optical transducers.

Unit 4: Measurements - methods and devices (9 Hrs)

(A) Measurement of pressure and vacuums methods and devices such as bourdon tubes, diaphragm gauges, LVDT, bellows, piezoelectric pressure gauge, vacuum gauges, etc.

(B) Measurement of flow methods and devices such as rotameters, gas flow meters, water flow meters, etc.

(C) Measurement of temperature methods and devices such as thermometers, thermocouples, RTD, pyrometers, etc.

(D) Measurement of speed, velocity, and acceleration methods and devices such as tachometers, tachogenerators, stroboscopic methods, accelerometers, strain gauge based and piezoelectric accelerometers.

(E) Measurement of force, torque, and load methods and devices such as load cells, torque sensors, strain gauges.

Recommended Books:

1. Mechanical Measurement and Instrumentation - Dhanpat Rai & Sons Publication
2. Mechanical Measurement - Beckwith and Buck
3. Measurement System - Doeblin Ernest, TMH Publication
5. Pneumatics and Hydraulics - Harry L. Steuer, Audel Series
Teaching Scheme

Examination Scheme

Practical: 2 Hrs/Week

Teaching Scheme - II

MED371 LAB-VII DESIGN MACHINE ELEMENTS - II
The results followed by Viva. Performing experiment shall be allotted 15 marks and 10 marks for Viva.

Note - Practical examination shall consist of performing one of the experiment and producing the results followed by Viva. Performing experiment shall be allotted 15 marks and 10 marks for Viva.

1. Study of design and analysis of heat pipe.
2. Determination of thermal conductivity of a given liquid.
3. Determination of the Stefan-Boltzmann constant.
4. Determination of the emissivity of the given surface.
5. Determination of the heat flux.
8. Trial on parallel and counter-flow heat exchanger.
9. Determination of the thermal conductivity of a given metal rod.
10. Determination of the thermal conductivity of a given powder.
11. Study of design and analysis of heat pipe.

Practical Exam consists of the performance and record of the following Experiments:

- Determination of the thermal conductivity of a given metal rod.
- Determination of the thermal conductivity of a given powder.
- Determination of the Stefan-Boltzmann constant.
- Determination of the emissivity of the given surface.
- Determination of the critical heat flux.
- Determination of the heat flux.
- Determination of droplet-wise and film-wise condensation.
- Trial on parallel and counter-flow heat exchanger.
- Determination of the thermal conductivity of a given liquid.
- Determination of the thermal conductivity of insulating powder.
- Determination of the thermal conductivity of a given metal rod.
- Study of design and analysis of heat pipe.

Practical Exam- 25 Marks
Theory Work- 25 Marks
Examination Scheme
Practical Exam- 25 Marks
Teaching Scheme
MED372 LAB-VIII HEAT TRANSFER
MED373 LAB-IX INDUSTRIAL HYDRAULICS AND PNEUMATICS

Teaching Scheme

Examination Scheme

Practical: 2 Hrs/Week

Term Work: 25 Marks

1. (a) Study of hydraulic and pneumatic circuits, based on the industrial application (at least one in each).
(b) Valve of proportional/ limit switches, solenoid operated 4way direction control valve for
valve of proportional/ limit switches, solenoid operated 4way direction control valve for

10) Circuits with can operated pilot valves operating a pilot operated 4way direction control
   hydraulic/circuit.
9) Hydraulic or Pneumatic Sequencing circuit.
8) Hydraulic or Pneumatic Reversing circuit.
7) Hydraulic or Pneumatic Cut-off circuit.
6) Hydraulic or Pneumatic Cut-off circuit.
5) Cylinders for the use of different direction control valves and valve actuation in single
   or non-circuit.
4) Specified control switches, different control valves, pilot operated 4way control, more in

3) Basic pneumatic circuit for the working of single and double acting cylinder, and

2) Basic hydraulic circuit for the working of double acting cylinder and a hydraulic motor.

Circuit of solenoid valves, limit switches, pressure, distance, flow rate measurement and

pipe layout, circuit of selection of pipes and fittings, etc.
Hydraulic and pneumatic piping and pipe accessories, quick disconnection couplings etc.

Secure, rectangular and polyethylene union, etc.

Study of hydraulic and pneumatic valves, pressure control, flow control and direction

control. Circuits, study of construction and working, pressure control, flow control and direction

hydraulic and pneumatic valves.

Lecture, Polishing, Lathe, Study of Construction and working, Hydraulic and pneumatic
pumps and motors, Hand Practice, etc.

Study of Construction and working, Hydraulic and pneumatic valves.

Pneumatic based on Hydraulic systems and pneumatic systems. Symbols must be studied and
practiced base on Hydraulic systems and pneumatic systems. Symbols must be studied and

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practiced base on Hydraulic systems and pneumatic systems. Symbols must be studied and
MED374 LAB-X TOOL ENGINEERING

Teaching Scheme

Practical: 2 Hrs/Week

Term Work

Practical Exam: 25 Marks

Practical Scheme

Term-Work: (First Angle projection to be adopted)

A. Practical work (Drawings to be drawn on A1 size drawing sheet)

Sheet 1. Drawing of nomenclature of single point cutting tool, milling cutter, drill, reamer, broach and tap.

Sheet 2. Detail drawings of different locating elements.

Sheet 3. Detail drawings of different clamping elements.

Sheet 4. Design and drawing of jig for given component.

Sheet 5. Design and drawing of milling fixture for given component or design and drawing of turning fixture for given component.

Sheet 6. Design and drawing of any one press tool (compound die / progressive die/Drawing Die)

Sheet 7. Design and drawing of forging die or simple Injection Mould

A. Industrial Visit Report

Format:

When 10 pages, individual report on an industrial visit to study the jig & fixtures/press tools.

1. Name of organization / industry. Product information, Machines observed.

2. Types of tools observed, Material of tool components. Sketches of process

3. Process information/industry, Product information, Machining observed.

4. Type of injection moulds.

Practical Examination should be based on Viva-Voce on the above syllabus.

Text Books:


5. M.H.A. Kempster, "Introduction to Jigs and Fixtures design", New Delhi, 1976


Reference Books:

1. Edward Hoffman, "Jigs and Fixtures Design".

2. Production Technology-Tata McGrawhill Publishing Ltd

3. Die Design Fundamentals by J.R. Paquin

The practical examination will consist of performing an experiment based on practical work and preparing record of the experiments.

Practical Examination

1. Creating a 2-D model on any CAD package and get its hardcopy output.
2. Creating of Solid models of any four components using any appropriate high end CAD software and get its hardcopy output.
3. Building two composite assemblies consisting of at least five components using any appropriate high end CAD software and get its hardcopy output.
4. Developing and executing a part program for contouring on NC milling machine.
5. Developing and executing a part program for contouring on NC lathe machine.
6. Developing and executing a part program for contouring on NC drilling machine.
7. Performing an experiment based on practical work done during the course and viva voce based on the syllabus and term work. The practical examination will be assessed by two examiners, one will be the subject teacher and other one will be appointed by the B.A.M.U. Aurangabad.

Term Work

9. Assignment on Unit 7.
8. Assignment on Unit 5.
7. Analysis of a machine component using finite element analysis (FEA) software.
6. Performing an experiment for point to point operation on NC drilling machine.
5. Developing and executing a part program for contouring on NC drilling machine.
4. Developing and executing a part program for contouring on NC lathe machine.
3. Developing and executing a part program for contouring on NC drilling machine.
2. Creating of solid models of any four components using any appropriate high end CAD software and get its hardcopy output.
1. Creating a 2-D model on any CAD package and get its hardcopy output.

Performance minimum 8 experiments out of the following and preparing record of the experiments.

Practical Exam - 25 Marks
Examination Scheme
Teaching Scheme