

ENGINEERING MATERIALS & MANUFACTURING PROCESSES

Course Title:	Engineering Materials and Manufacturing Processes	Course Code	26PK-106
Year	I	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	120:30:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours :	150Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of Basic Workshop Practice.

On completion of the course, the student will be able to:

Course Outcomes

CO1	Identify the various materials for manufacturing process for a particular application.
CO2	Analyze the mechanical properties of engineering metals and used in engineering applications.
CO3	Construct Iron-Carbon Equilibrium diagram and indicate the salient points.
CO4	Select the various types of Fabrication Process for Mechanical applications.
CO5	Identify the varies types of drilling machines and their operations
CO6	Classify the varies types of Forming operations and explain their principles

MID SEM –I EXAM					
S. No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM					
S. No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION							
Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
					11(b)	15(b)	
6	VI			7,8	10(b)	14(b)	
					12(a)	16(a)	
					12(b)	16(b)	
Total Questions		8		8	8		
	Remembering (R)	1 Mark					
	Understanding (U)	3 Marks					
Legend:	Application (A)	5 Marks					

Course Content

UNIT 1 - Mechanical properties and Testing of Materials

Duration: 25 HOURS

Mechanical Engineering Materials, Importance of their study with applications – Various mechanical properties of engineering materials - Tensile strength, Compressive strength, Ductility, Malleability, Hardness, Toughness, Brittleness, Impact strength, Fatigue, Creep resistance. Testing of materials: Destructive testing tests on UTM to determine tensile, compressive and shear strengths – Tests on Brinell & Rock Well hardness test – Impact test on Izod & Charpy tester. Non destructive testing – Procedure for testing materials by X-ray, gamma ray, magnetic flux and ultrasonic testing.

UNIT 2 - Structure of Materials and Iron Carbon Equilibrium Diagram

Duration: 25 HOURS

Crystals of metals, Space lattices, Unit cell, three main types of metallic space lattices, namely Face Centered Cubic, Body Centered Cubic, Hexagonal Close Packed. Crystallisation of metal, formation of grains by dendrite growth, grain boundary, grain size control, effect of grain size on properties – factors. Iron - Carbon Equilibrium Diagram: Cooling curve for pure metal. Allotropic forms of pure Iron - Iron carbon equilibrium diagram

UNIT 3 - Welding

Duration: 25 HOURS

Introduction - Classification of welding processes - Advantages and limitations of welding. Principles of arc welding - Principle of gas (oxy – acetylene) welding - Welding procedures (arc & gas) - Soldering and Brazing techniques - Types and applications of solders & fluxes. Defects in welding - Testing and inspection - Brief description of MIG & TIG Welding

UNIT 4 - Drilling

Duration: 25 HOURS

Type of drilling machines: sensitive & radial and their constructional detail and specifications - Drill bits: Terminology - geometry of twist drill - functions of drill elements - Operations: Drilling, reaming, boring, counter boring, counter sinking, tapping, spot facing and trepanning

UNIT 5 - Mechanical working of metals

Duration: 25 HOURS

Introduction: Hot working and cold working - Hot working processes: rolling - types of rolling, two high mill, three high mills, four high mills, piercing or seamless tubing, drawing or cupping, spinning, extrusion - direct or forward extrusion, indirect or backward extrusion, tube extrusion, Impact extrusion - Effects of hot working of metals, advantages & limitations of hot working of metals. Cold working process: Rolling, drawing - wire drawing, tube drawing, bending, roll forming, angle bending, spinning, extrusion, squeezing, cold heading, thread rolling, peening - Effects of cold working of metals, advantages & limitations of cold working.

UNIT 6 - Lathe, Shaper, and Milling

Duration: 25 HOURS

Lathe: Working Principle of Lathe - Types of Lathes - Engine lathe – construction details – Specifications - General operations: Turning, facing, taper turning - thread cutting, knurling, forming, drilling, boring, reaming, key way cutting. **Shaping:** Introduction to shaper - Constructional details and specifications of shaper - Operations on shaper. **Milling: Introduction** - Types of milling machines: plain, Universal, vertical - Constructional details – specifications - Milling operations

Reference Books

1. Engg. Materials - Pakirappa
2. Machine Tools - Hazra Chowdary
3. Workshop Technology - Hazra Chowdary

SUGGESTED LEARNING OUTCOMES

1.0 Mechanical properties and Testing of Materials

1. Identify the importance of various Engineering Materials
2. Applications in Mechanical industries.
3. Analyze the different Properties of metals.
4. Difference between destructive and non-destructive tests of metals
5. Identify the different non-destructive tests.

2.0 Structure of Materials and Iron Carbon Equilibrium Diagram

1. Meaning of space lattice, unit cell, space lattice
2. Formation of grains by dendrite growth.
3. Identify the allotropic forms of pure iron with temperatures, their crystal structures.
4. Construction of the iron carbon diagram
5. Identifying various structures of the iron carbon system.

6. Identification of salient points like Eutectic, Peritectic and Eutectoids in the Iron Carbon diagram

7. Composition of phases in a steel/cast Iron from the iron carbon diagram.

3.0 Welding.

1. Selection of joining processes and necessity of welding.
2. Describe the principle of arc welding, gas welding, Soldering and Brazing.
3. Different welding procedures in arc and gas welding along with soldering and brazing. Identifying the various defects in welds and know the reasons for the defects.

4.0 Drilling

1. Identify the various types of drilling machines and working principle of drilling.
2. Construct the line diagrams of the sensitive and radial drilling machines.
3. Identify the parts of these machines
4. Different operations can perform on drilling machine.

5.0 Mechanical working of metals

1. Identifying the various types of mechanical working of metals
2. Working principle of hot rolling, piercing, spinning, extrusion and drawing.
3. Identify various cold working processes such as rolling, bending and squeezing.
4. Difference between cold working and hot working.

6.0 Lathe, Shaper, and Milling

1. Classification of lathes.
2. Identify the different types of lathes,
3. Construction of line diagram
4. Operations on lathe
5. Shaper - Constructional details, specifications of and operations on shaper.
6. Classification of milling machines
7. Constructional details, specifications of milling machines
8. Milling operations

Suggested Student Activities

1. Each student should visit the Lab to know the materials used for mechanical operations
2. Each student should visit nearby workshops and industries to know the machine operations like lathe, drilling, milling, grinding etc.
3. Each student will do the report on types of operations can performed on machines.
4. Identify and prepare a list of materials used in the Different industrial applications.

5. Quiz, Seminars and Group discussion,
6. Surprise test

Suggested e-Resources:

1. www.wikihow.com
2. <http://nptel.ac.in>
3. www.packagingclinic.com
4. www.iip.in.com
5. <https://pcri.org>
6. <https://www.youtube.com/watch?v=mmmcj53TNic>

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Identify the various materials for manufacturing process for a particular application.	R/U/A	1,2,9	25
CO2	Analyze the mechanical properties of engineering metals and used in engineering applications.	R/U/A	1,2,9,10	25
CO3	Construct Iron-Carbon Equilibrium diagram and indicate the salient points.	R/U/A	1,2,6,9	25
CO4	Select the various types of Fabrication Process for Mechanical applications.	R/U	1,2	25
CO5	Identify the varies types of drilling machines and their operations	R/U/A	1,2,5	25
CO6	Classify the varies types of Forming operations and explain their principles	R/U/A	1,2,3,8,9,10	25
				150

Model Question papers

MODEL QUESTION PAPER

BOARD DIPLOMA MID EXAMINATIONS

D.PKGT –I Year - MID EXAMINATION

26PK-106- Engineering materials and Manufacturing Processes

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 4 X 1 = 4

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Define the “Fatigue” and “Creep”.
2. What is Space lattice and draw a neat sketch of any one space lattice.
3. Sketch the cooling curve for pure Iron.
4. Define “Pearlite” and “Bainite”.

PART –B

MARKS: 2 X 3 = 6

NOTE: Answer ALL questions. Each question carries THREE marks.

- 5.(a). Explain the following Mechanical properties.

(i) Brittleness. (ii) Ductility.

(OR)

- 5 (b) What is the effect of recrystallisation on properties of cold worked metals.

- 6 (a). What are the factor effecting the grain size of a metal ?

(OR)

- 6.(b). What are the different micro-constituents of “Iron and steel” explain any two.

PART –C

MARKS: 2 X 5 = 10

NOTE: Answer ALL questions. Each question carries FIVE marks.

- 7(a). Draw “Iron Carbon equilibrium diagram” and explain.

(OR)

- 7(b). Explain the following Mechanical properties.

(i) Tensile strength. (ii) Compression strength.

- 8(a) Explain the following Mechanical properties.

(i) Malleability. (ii) Ductility.

(OR)

- 8(b). Define the “Toughness’ and “Stiffness”.

MODEL QUESTION PAPER
BOARD DIPLOMA END EXAMINATIONS
D.PKGT – I Year –END EXAMINATION

26PK-106- Engineering Materials and Manufacturing Processes

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X1 = 8

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Define the “Hardness” and “Stiffness”.
2. Define “Pearlite” and “Cementite”.
3. Define soldering and brazing ?
4. What are the work holding devices used in drilling?
5. What are the different types of extrusion methods?
6. Write about wire drawing process.
7. Define “Drilling” and “Boring”.
8. What is Shapping?

PART –B

MARKS:4 X3 =12

Answer ALL questions. Each question carries THREE marks.

9 (a).What are the different types of drilling machines?

(OR)

9.(b).What are the squeezing operations used in metalworking? Explain Cold heading.

10(a).Explain about “Lathe Operations” with neat sketches?

(OR)

10.(b).Explain the following Mechanical properties.

(i) Brittleness. (ii) Ductility.

11(a).What are the different micro-constituents of “Iron and steel” explain any two.

(OR)

11.(b).Write advantages and disadvantages of welding.

12(a).Define “Milling”,

(OR)

12.(b).What are the different types of milling?

PART –C

MARKS:4 X5 =20

Answer ALL questions. Each question carries FIVE marks.

13 (a).Draw the line diagram of shaper and specify the main parts?

(OR)

13 .(b).Explain about different “Milling” operations with neat sketch.

14 (a).Explain about “ universal Milling machine”

(OR)

14 .(b).Explain working principle of Arc welding.

15 (a).Explain about Radial Drilling machine.

(OR)

15 .(b).What are the hot working processes? and explain hot rolling.

16 (a). What are the defects in welding? Explain.

(OR)

16 .(b).What are the Drilling machine operations? Explain.

QUESTION BANK

26PK-106- Engineering materials and Manufacturing Processes

PART –A

1. Define the “Hardness’ and “Stiffness”.
2. What is “Unit cell” and draw neat sketch of any two crystal systems.
3. Sketch the cooling curve for pure metal/compound.
4. Define “Cementite” and “Ledeburite”.
5. Define the “Fatigue” and “Creep”.
6. What is Space lattice and draw a neat sketch of any one space lattice.
7. Sketch the cooling curve for pure Iron.
8. Define “Pearlite” and “Bainite”.
9. Define the “Toughness’ and “Stiffness”.
10. What is “Unit cell” and draw neat sketch of any two crystal systems.
11. Sketch the cooling curve for pure Iron.
12. Define “Pearlite” and “Cementite”.
13. Define welding?
14. What are the different types of gas welding flames?
15. Write the Difference between pressure welding and fusion welding.
16. Explain about oxy-acetylene flames.
17. What are the steps involved in arc welding.
18. Define soldering and brazing ?
19. What are the tool holding devices used in drilling?
20. What are the work holding devices used in drilling?
21. What are the different types of drills?
22. What are the advantages and disadvantages of Cold working process?
23. What is Blanking and Piercing?
24. What are the advantages and disadvantages of hot working process
25. What are the different types of cold working processes?
26. What are the different types of extrusion methods?
27. Write about wire drawing process.
28. Define “Drilling” and “Boring”.
29. Define “Reaming” and “Knurling”.
30. What are the lathe operations?
31. Explain about taper turning, thread cutting

32. Define “Drilling” and “Boring”.
33. Explain about taper turning, thread cutting”.
34. What is Shapping?
35. Define “Milling”,
36. What are the different types of milling?
37. Define the term up-ward milling.
38. What are the different types of milling tools?
39. Define the term up-ward milling.
40. What are the different types of milling?

PART –B

1. Explain the following Mechanical properties.
(a) Brittleness. (b) Ductility.
2. (a)What is the effect of recrystallisation on properties of cold worked metals.
(a) What are the factor effecting the grain size of a metal ?
3. What are the different micro-constituents of “Iron and steel” explain any two.
4. Write advantages and disadvantages of welding.
5. Explain working principle of gas welding.
6. What are the different types of welding processes and explain.
7. What are the different types of drilling machines?
8. What are the squeezing operations used in metalworking? Explain Cold heading.
9. Explain about Direct and Indirect Extrusion process.
10. Explain about “Lathe Machine” with line diagram
11. Explain about “Lathe Machine main parts”
12. Explain about “Lathe Operations” with neat sketches?
13. Explain working principle of Shaper.

PART –C

1. Draw “Iron Carbon equilibrium diagram” and explain.
2. Explain the following Mechanical properties.
(a) Tensile strength. (b) Compression strength.
3. Explain the following Mechanical properties.
(a) Malleability. (b) Ductility.
4. Explain working principle of Arc welding.
5. What are the defects in welding? Explain.
6. What are the equipment and accessories used in arc welding? Explain.
7. Explain about Radial Drilling machine.

8. What are the Drilling machine operations? Explain.
9. What are the hot working processes? and explain hot rolling.
10. Draw the line diagram of shaper and specify the main parts?
11. Explain about different “Milling” operations with neat sketch.
12. Explain about “ universal Milling machine”
13. Explain about different “Milling” operations with neat sketch.