

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: WORK SHOP TECHNOLOGY	Course Code: 15ME11T
	Credits (L:T:P) : 4:0:0	Core/Elective: Core
	Type of course: Lecture	Total Contact Hours: 52
	CIE : 25 Marks	SEE : 100 Marks

Prerequisites: Enthusiasm to learn the subject.

COURSE OBJECTIVES

1. Appreciate the various materials available for manufacturing.
2. Gain the knowledge about manufacturing process for particular application.
3. Powder metallurgy application for various types of cutting tools.

COURSE OUTCOMES

On successful completion of the course, the students will be able to attain CO:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Identify the various materials for manufacturing process for a particular application.	<i>R/U/A</i>	1,2,3,4,6, 10	10
CO2	Identify the manufacturing process for a particular application.	<i>R/U/A</i>	1,2,3,4,6, 10	08
CO3	Select the various types of Fabrication Process for Mechanical applications.	<i>R/U/A</i>	1,2,3,4,6, 10	10
CO4	Understand the Metal casting Techniques and basic structure of products.	<i>R/U/A</i>	1,2,3,4,6, 10	10
CO5	Understand the various Sheet metal works in practice for production.	<i>R/U/A</i>	1,2,3,4,6, 10	06
CO6	To know the application of powder metallurgy techniques in Engineering and specially in cutting tools area	<i>R/U/A</i>	1,2,3,4,6, 10	08
Total sessions				52

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
WORK SHOP TECHNOLOGY	3	3	3	3	-	3	-	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE/

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	Materials for Manufacturing	10	05	20	05	30	21
2	Basic Manufacturing process	08	05	05	20	30	21
3	Basic Fabrication Process	10	05	10	15	30	21
4	Metal casting processes	10	05	10	10	25	17
5	Sheet metal processes	06	05	05	05	15	10
6	Powder metallurgy	08	05	05	05	15	10
	Total	52	30	55	60	145	100

Legend: R; Remember, U: Understand A: Application

CONTENTS

UNIT: I	MATERIALS FOR MANUFACTURING	CONTACT HOURS: 10 Hours
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Introduction of Engineering Materials- Classification, mechanical Properties of metals and uses of Ferrous Metals-Pig Iron, Cast Iron, Wrought Iron, steel, Classification of Steels according to Carbon content, Introduction to High speed Steels-18-4-1 HSS & uses. Introduction, Purposes and methods of Heat treatment -Annealing-Normalizing-Hardening-Tempering and Case Hardening- Properties and uses of Nonferrous metals- Aluminum, Copper,Lead,Tin,zinc,Magnesium,Nickel, Properties and uses of Plastics- Thermo plastics & Thermosetting-Properties and Uses of Ceramics , Composite Materials and uses.

UNIT: II	BASIC MANUFACTURING PROCESS	CONTACT HOURS: 08 Hours
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Introduction to manufacturing processes- Mechanical working of metal – Introduction to Hot working and cold working of metals. - Hot Rolling and types-Three High, Four high rolls. Principle of Drawing, Deep drawing. Principle of Extrusion, Direct, Indirect and tube Extrusion. Introduction to Forging, Smith forging operations. .

UNIT: III	BASIC FABRICATION PROCESS	CONTACT HOURS:10 Hours
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Introduction to Welding-Classification of welding- Principle of Arc welding, Gas welding. Types of Arc welding-MIG Welding, TIG Welding, Submerged arc welding. Principle of resistance welding – Spot, butt, seam Welding. -Welding Defects and remedies. Comparison of welding, soldering and Brazing.

UNIT: IV	METAL CASTING PROCESSES	CONTACT HOURS: 10 Hours
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Introduction to metal castings, Use of patterns, Pattern materials, types of Patterns-single, Split, loose Piece, Sweep, Skeleton, gated Patterns - allowances – Types of Moulding sand and Properties. Concept of Cope, Drag, Runner, Riser & core. Permanent mould casting – Die casting, Slush Casting, Centrifugal casting, Name and brief explanation of Defects in Castings

UNIT: V	SHEET METAL PROCESSES	CONTACT HOURS:06 Hours
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Introduction to Sheet Metal Work and Applications, metals used for Sheet Metal work, Standard Gauge numbers. Sheet metal operations-shearing, cutting off, Parting, blanking, Punching, notching, slitting, Lancing, Bending, Drawing and squeezing. Introduction to Press working- Types of presses- Power press and Ball or Fly press. Applications of presses.

UNIT:VI	POWDER METALLURGY	CONTACT HOURS: 08 Hours
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Introduction to Powder Metallurgy –Manufacture of Metal Powders by Different Methods-Automization, reduction, Electrolysis and Shotting.Powder Metallurgy Process, Secondary Operations. Products of Powder Metallurgy. Advantages and Limitations of powder metallurgy.

TOTAL CONTACT HOURS:52



TEXT BOOKS:

1. *Elements of Workshop Technology* Vol-I Manufacturing Process edition-By Hajra Choudry



Reference:

1. *Manufacturing Technology -I* By P.C Sharma of S.CHAND Publications.
2. *Engineering Materials* by Er.R.K.RAJPUT of S.CHAND Publications
3. *Work shop technology* By R.S KHURMI & J.K GUPTA of S.CHAND & Co.Ltd

Course Delivery: The course will be delivered through lectures and presentations, suitable Videos

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE*	IA	Students	Three tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student Activity	05	Log of Activity	1,2,3,4,5,6
				Total	25		
	SEE*	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5&6 Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation

*SEE – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	WORKSHOP TECHNOLOGY	20			
	Year:	Course code: 15ME11T				
Name of Course coordinator :			Units:___ CO's:___			
Question no	Question		MARKS	CL	CO	PO
1						
2						
3						
4						

Note: Internal choice may be given in each CO at the same cognitive level (CL).

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

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| 1. Remembering and Understanding : | - 30% weightage |
| 2. Applying the knowledge acquired from the course : | - 50 % weightage |
| 3. Analysis : | - 10% weightage |
| 4. Evaluation : | - 5% weightage |
| 5. Creating new knowledge : | - 5% weightage |

• MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS FOR STUDENT ACTIVITY(5 Marks)						
Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the Concerned faculty (Course Coordinator) for assessing the given activity.

MODEL QUESTION PAPER

Diploma in Mechanical Engineering

1 Semester

Course Title: WORK SHOP TECHNOLOGY

Time: 3 hrs

Max marks:100

- 1 Answer any SIX question from Part A
2. Answer any SEVEN full questions From Part B

Section A

5x6= 30

1. Name the different engineering materials with Examples.
2. Explain the following processes of heat treatment with applications
 - a) Annealing
 - b) hardening
- 3.State the uses of manufacturing process.
- 4.Explain common forging operations.
- 5)Explain with a neat sketch Tube Extrusion.
- 6)Define Welding and Classify.
- 7)Explain with neat sketch MIG welding
- 8)List the differences between Sand casting and Die casting.
- 9)Sketch and show the basic steps involved in powder metallurgy process.

Section B

10x7=70

- 10 a) Explain briefly Ductility & Malleability property of metal
 - b)Explain use of composite materials in engineering.
- 11 a)Explain Thermo plastics & thermosetting.
 - b) Differentiate between Pig Iron And Cast Iron.
- 12)Explain with neat sketch the following extrusions
 - a) Direct Extrusion.
 - b) Indirect Extrusion.
- 13) a)Explain with a neat sketch three high rolling.
 - b)Name different metals used for sheet metal work.
- 14) Explain with sketch Gas welding and mention its advantages.
- 15)Explain with neat sketch
 - a) Split pattern
 - b) Gated pattern
- 16) a)Explain briefly manufacture of metal powder by Reduction method.
 - b)Name the different products of powder metallurgy.
- 17) a)Differentiate between welding & Soldering.
 - b)Compare MIG welding & TIG Welding.
- 18) a) Explain briefly Runner and Raiser used in casting process.
 - b)Explain briefly any five defects in casting
- 19) a)Explain Gauges of sheet metal.
 - b) Sketch Ball press neatly and labels its parts.

MODEL QUESTION BANK

Diploma in Mechanical Engineering

1st Semester

Course Title: WORK SHOP TECHNOLOGY

CO 1: IDENTIFY THE VARIOUS MATERIALS FOR MANUFACTURING PROCESS FOR A PARTICULAR APPLICATION

Remember

3. Define Engineering Materials? List any four important applications of them.
4. Name the different engineering materials with Examples.
5. State plasticity & Elasticity of metals.
6. List any five properties and uses of Cast Iron.
7. State five uses and Properties of Wrought Iron.
8. Define Heat treatment? And Indicate Any Four purpose
9. Name the Different Heat treatment Process?
10. Define Non Ferrous metal and Name any four Non ferrous metals.
11. State any five properties of Non ferrous metals.
12. State any five uses of Non ferrous metals.
13. State any five properties and uses of aluminium.
14. State any five properties and uses of copper.
15. State any five uses of nickel.
16. State any five properties and uses of Plastics.
17. State any five uses & properties of Ceramics.
18. Define composite materials. Indicate any four uses of them.
19. State any five uses of Cast Iron.
20. State any four uses of wrought Iron
21. State the Differences between Ferrous & Non Ferrous Metals.
22. State any four Examples for ferrous & non ferrous metals
23. State the five properties and uses of plastics.
24. State the five properties and uses of Ceramics

Understanding

25. Classify the engineering Materials with Examples.
26. Explain briefly Ductility & Malleability property of metal
27. Explain plasticity & Elasticity of metals.
28. Explain Annealing process in heat treatment.
29. Explain Normalizing Process.
30. Explain Hardening Process of heat treatment.
31. Explain Tempering Process of Heat treatment.

32. Explain Case Hardening Process of heat treatment.
33. Explain Thermo plastics & thermosetting.
34. Differentiate between Pig Iron And Cast Iron.
35. Distinguish wrought Iron With steel
36. Indicate Five Properties and uses of Pig Iron.
37. Explain the following processes of heat treatment with applications
 - a) Annealing
 - b) hardening
- 36.Explain the following processes of heat treatment with applications
 - a) Normalizing .
 - b) Tempering.
- 37.Compare thermoplastics and thermosetting
- 38.Explain use of composite materials in engineering.

Application

38. Explain Annealing process in heat treatment.
39. Explain Normalizing Process.
40. Explain Hardening Process of heat treatment.
41. Explain Tempering Process of Heat treatment.
42. Explain Case Hardening Process of heat treatment.
43. Explain Thermo plastics & thermosetting.
44. Explain the following processes of heat treatment with applications
 - a) Annealing
 - b) hardening
- 43.Explain the following processes of heat treatment with applications
 - a) Normalizing .
 - b) Tempering.
44. Explain use of composite materials in engineering.
45. Write short notes ceramics.

1. CO 2: IDENTIFY THE MANUFACTURING PROCESS FOR A PARTICULAR APPLICATION

Remember

- 1) Define Forging. List the common forging operations.
- 2) Define Rolling operation. List the types of rolling
- 3) Define Extrusion. State the uses of it.
- 4) State the uses of manufacturing process.
- 5) Describe the uses of hot working & cold working.

Understand

- 1) Explain hot working and cold working of metals.
- 2) Explain the Principle of wire drawing operation.
- 3) Explain common forging operations.
- 4) Compare hot working with cold working

Application

- 1) Explain hot working and cold working of metals.

- 2) Explain with a neat sketch three high rolling.
- 3) Explain with a neat sketch four high rolling.
- 4) Explain with a neat sketch Direct Extrusion.
- 5) Explain with a neat sketch Indirect Extrusion.
- 6) Explain with neat sketch Tube Extrusion.
- 7) Explain with a neat sketch Tube Extrusion.
- 8) Explain with neat sketch the following extrusions
 - a) Direct Extrusion.
 - b) Indirect Extrusion.
- 9) Explain with neat sketch following Rolling operations
 - a) Three high Rolling
 - b) Four High Rolling
- 10) Explain with neat sketch
 - a) Indirect Extrusion
 - b) Three high rolling

CO3: SELECT THE VARIOUS TYPES OF FABRICATION PROCESS FOR MECHANICAL APPLICATIONS.

Remember

- 1) Define Welding and Classify.
- 2) State the Differences between Arc welding & Gas welding.
- 3) List the welding defects.
- 4) State three uses of Arc welding
- 5) List any three uses of Gas welding.
- 6) Name the different types of Resistance Welding.
- 7) Define Soldering and classify
- 8) List the equipments used for Arc welding.
- 9) Define Welding and Classify.
- 10) State the Differences between Arc welding & Gas welding.
- 11) List the welding defects.
- 12) Explain with neat sketch MIG welding.
- 13) State three uses of Arc welding
- 14) List any three uses of Gas welding.
- 15) Name the different types of Resistance Welding.
- 16) List the equipments used for Arc welding.

Understanding

- 17) Explain with neat sketch MIG welding.
- 18) Differentiate between welding & Soldering.
- 19) Differentiate between Brazing & Soldering.
- 20) Compare welding with soldering.
- 21) Explain briefly Soldering.
- 22) Compare MIG welding & TIG Welding.

Application:

- 23) Explain with neat sketch MIG welding.
- 24) Explain with neat sketch TIG welding.
- 25) Explain with sketch arc welding.
- 26) Explain with neat sketch Gas welding.

- 27) Explain with neat sketch Spot welding.
- 28) Explain briefly with sketches
 - a) Spot welding
 - b) Seam welding
- 29) Explain with neat sketch butt welding.
- 30) Explain with neat sketch Submerged arc welding.
- 31) Explain with neat sketch MIG welding.
- 32) Explain with neat sketch TIG welding.

CO4: UNDERSTAND THE METAL CASTING TECHNIQUES AND BASIC STRUCTURE OF PRODUCTS.

Remember

- 1) Define metal Casting process.
- 2) Define Pattern. List the materials used for Pattern.
- 3) Name the different types of patterns.
- 4) State the properties of moulding sand.
- 5) list defects in casting
- 6) state the importance of metal casting.
- 7) State the Ingredients of Foundry Sand
- 8) List the differences between Sand casting and Die casting.
- 9) State the uses of metal casting

Understanding

- 10) Explain metal Casting process.
- 11) Explain briefly Runner and Raiser used in casting process.
- 12) Explain briefly any five defects in casting
- 13) Explain briefly Cope, Drag and Core used in casting process
- 14) Explain pattern making materials
- 15) Explain casting allowance

Application

- 1) Explain with sketch Split pattern.
- 2) Explain with sketch loose pattern.
- 3) Explain with sketch gated pattern.
- 4) Explain with sketch sweep pattern.
- 5) Explain with sketch slush Casting.
- 6) Explain briefly with a neat sketch centrifugal casting.
- 7) Explain with sketch slush Casting.
- 8) Explain with neat sketch centrifugal casting
- 9) Explain with neat sketch
 - a) Split pattern
 - b) Gated pattern
- 10) Explain with neat sketch die casting

CO5: UNDERSTAND THE VARIOUS SHEET METAL WORKS IN PRACTICE FOR PRODUCTION.

Remember

- 1) State the uses of sheet metal in Engineering
- 2) Describe properties and Gauges of sheet metal.
- 3) Name different metals used for sheet metal work.
- 4) State any Four applications of sheet metals
- 5) State any three applications of presses
- 6) State any three applications of presses

Understanding

- 1) Explain properties and Gauges of sheet metal.
- 2) Explain shearing and bending operation of sheet metals.
- 3) Explain briefly squeezing and blanking operation of sheet metal
- 4) Explain following shearing operation in sheet metal
 - a) Cutting off
 - b) Blanking

Application

- 1) Explain briefly with sketch drawing operation of sheet metal.
- 2) Explain with necessary sketches of different Shearing operations in sheet metals.
- 3) Explain with sketch the following sheet metal operations
 - a) Bending
 - b) Drawing
- 4) Explain Power press with a neat sketch
- 5) Explain Ball or fly press with a neat sketch
- 6) Sketch Ball press neatly and labels its parts.

CO6: TO KNOW THE APPLICATION OF POWDER METALLURGY TECHNIQUES IN ENGINEERING AND SPECIALLY IN CUTTING TOOLS AREA

Remember

- 1) List the uses of powder metallurgy in engineering.
- 2) State any five Limitations of powder metallurgy.
- 3) State any five advantages of powder metallurgy.
- 4) Define metal powder. And name the different methods of manufacture.
- 5) Indicate the dis-advantages of powder metallurgy.
- 6) Name the different products of powder metallurgy.
- 7) State the advantages & limitations of powder metallurgy.
- 8) Name the different methods used for metal powder.

Understanding

- 1). Explain the uses of powder metallurgy in engineering.
- 2) Explain briefly manufacture of metal powder by mechanical method.

- 3) Explain briefly manufacture of metal powder by Automization method.
- 4) Explain briefly manufacture of metal powder by Reduction method.
- 5) Explain briefly manufacture of metal powder by Electrolysis method.
- 6) Explain briefly manufacture of metal powder by shotting method.
- 7) Explain secondary operations of powder metallurgy process.
- 8) Explain the following metal powder manufacturing methods.
 - a) Mechanical method
 - b) Automization
- 9) Explain the following metal powder manufacturing methods.
 - a) Reduction method
 - b) Electrolysis

Application

- 1) Explain with neat sketch powder metallurgy process
- 2) Explain the following metal powder manufacturing methods with sketch.
 - a) Mechanical method
 - b) Automization
- 3) Explain the following metal powder manufacturing methods.
 - a) Reduction method
 - b) Electrolysis
- 4) Explain basic steps involved powder metallurgy with diagram.

