


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

Prerequisites: Enthusiasm to learn the subject.

	Course Title: MECHANICAL WORK SHOP TECHNOLOGY		
	Scheme (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15ME05T
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Core
25 Marks		100 Marks	

Course Objectives:

1. Appreciate the various materials available for manufacturing.
2. Gain the knowledge about manufacturing process for particular application.
3. Gain the knowledge about machine tools for particular application
4. 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 available for automobiles for a particular Usage	<i>R/U/A</i>	1,2,10	10
CO2	Select Particular Fabrication Process for specific automobile field applications	<i>R/U/A</i>	1,2,10	10
CO3	Analyse the various Sheet metal works in practice in Automobile field	<i>R/U/A</i>	1,2,10	06
CO4	Know the Working Of Standard Machine Tools Such As Lathe, Milling, Drilling Machines	<i>R/U/A</i>	1,2,10	10
CO5	Understand the Metal casting Techniques and basic structure of products.	<i>R/U/A</i>	1,2,10	10
CO6	Expose and appreciate the application of powder metallurgy techniques in Engineering	<i>U/A</i>	1,2,10	06
		Total sessions		52



COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICAL WORK SHOP TECHNOLOGY	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 AUTOMOBILES	10	05	05	15	25	18
2	BASIC FABRICATION PROCESS	10	05	10	10	25	18
3	SHEET METAL PROCESSES	06	05	05	10	20	14
4	BASIC MACHINE TOOLS	10	05	15	10	30	20
5	METAL CASTING PROCESSES	10	05	10	15	30	20
6	POWDER METALLURGY	06	-	05	10	15	10
	Total	52	25	50	70	145	100

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

UNITI: MATERIALS FOR AUTOMOBILES

10Hrs

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- Aluminium, Copper, Properties and uses of Plastics- Thermo plastics &Thermosetting-Properties and Uses of Ceramics Composite Materials and uses.



UNITII: BASIC FABRICATION PROCESS**10Hrs**

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.

UNITIII: SHEET METAL PROCESSES**06Hrs**

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 - Power press.

UNIT IV: BASIC MACHINE TOOLS**10Hrs**

Centre Lathe-Constructional Features, Single point Cutting Tool Geometry, Various Operations, Taper Turning Methods, Thread Cutting Methods-Shaper-Principle and working of shaper-Hole making operations-Drilling- Reaming-Boring Milling- Column and knee type milling machine - Milling cutters and classification- Fundamentals of milling processes

UNIT: V**METAL CASTING PROCESSES****CONTACT HOURS: 10 Hours**

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, Investment casting, Name and brief explanation of Defects in Castings Introduction to Forging, Smith forging operations. .

UNIT VI: POWDER METALLURGY**06Hrs**

Introduction to Powder Metallurgy –Manufacture of Metal Powders by Different Methods-Atomization, reduction, Electrolysis and Spotting. Powder Metallurgy Process, Secondary Operations. Products of Powder Metallurgy. Advantages and Limitations of powder metallurgy.

**TEXT BOOKS:**

1. *Elements of Workshop Technology* Vol-I Manufacturing Process edition-By HajraChoudry
2. *Elements of Workshop Technology* Vol-II Manufacturing Process edition-By HajraChoudry
3. Seropekalkpakjian, Steven R Schmid *Manufacturing Engineering and Technology*-Pearson Education-Delhi

**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



LIST OF SOFTWARE/LEARNING WEBSITES

1. www.nptel.ac.in/courses/112105126/36
2. www.youtube.com/watch?v=T5gjkYvMg8A
3. www.youtube.com/watch?v=ESKoaZtoB1E
4. <http://www.weldingtechnology.org>
5. <http://www.youtube.com/watch?v=TeBX6cKKHWY>
6. <http://www.piehtoolco.com>
7. <http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/>

SUGGESTED LIST OF STUDENT ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

1	Make market survey; list the important materials being used for manufacturing automobile components.
2	Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
3	Visit nearer bodybuilding works. Collect the information on sheet metal material, sheet metal gauges, tools used, operation carried out being used by them.
4	Make Visit to nearest work shop ,observe the lathe and make list of real time machine components which are machined and how servicing of lathe being carried
5	Observe the milling machine of your polytechnic and study its specifications. List the possible milling operation can done on that machine

Course Delivery:

- The course will be delivered through lectures and Power point presentations/ Video
- Teachers can prepare or download PPT of different topic's of automobile engineering application can prepare alternative slides.

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY

Dimension	Scale					Students Score				
	Unsatisfactory	Developing	satisfactory	Good	Exemplary	1	2	3	4	5
1. Research and gather information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	2				
2.Full fills teams roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	3				
3.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	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	4				
4. listen to other team mates	Is always talking, never allows any one to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but some times talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	5				
Grand Average/Total=2+3+4+5/4=14/4=3.5=4						4				



Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests(Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Activities	05	Activities sheet	1,2,4
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
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.

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

Sl. No	Bloom's Category	%
1	Understanding	30
2	Applying the knowledge acquired from	50
3	Analysis	10
4	Evaluation & Creating new knowledge	10

Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.



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		20			
	Year:					
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).

MODEL 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	III SEM	MECHANICAL WORK SHOP TECHNOLOGY	20			
	Year: 2015-16	Course code:15ME05T				
Name of Course coordinator :			Units:1, Co: 1,2,3,9			
Note: Answer all questions						
Question no	Question		CL	CO	PO	
1	Explain Annealing process in heat treatment --05 MARKS		U	1	1,2,10	
2	a) Explain use of composite materials in engineering. b) State the five properties and uses of Ceramics 10 MARKS		A	1	1,2,10	
3	Differentiate between Brazing & Soldering. 5 MARKS		A	2	1,2,10	



MECHANICAL WORK SHOP TECHNOLOGY (AUTO)Time: **3 Hours**][Max Marks: **100****Note:** Answer any SIX from Part A and any SEVEN from Part B**Section A**

- 1) Classify the engineering Materials with Examples. 05
- 2) Explain Annealing process in heat treatment. 05
- 3) State the properties and uses of Aluminium 05
- 4) Explain with sketch 4 jaw chuck? 05
- 5) State the Differences between Arc welding & Gas welding. 05
- 6) Explain with neat sketch TIG welding. 05
- 7) State the properties of moulding sands. 05
- 8) Name different metals used for sheet metal work. 05
- 9) State any five advantages of powder metallurgy 05

Section B

- 1) a) Differentiate between Pig Iron And Cast Iron. 06
b) Indicate any four uses of Cast Iron. 04
- 2) a) Explain uses of composite materials in engineering. 04
b) State the five properties and uses of Ceramics 06
- 3) Explain with neat sketch following operations
a) Honing 05
b) Lapping 05
- 4) a) Explain with a neat sketch radial drilling machine? 06
b) Explain tail stock set over method of taper turning 04
- 5) a) List Three uses of Arc welding. 03
b) Explain with neat sketch Gas welding. 07
- 6) Explain briefly with sketches
a) Spot welding 05
b) Seam welding 05
- 7) Explain the working of Capstan lathe with neat sketch? 10
- 8) a) Explain TIG welding with neat sketch 05
b) Define Forging. List the common forging operations. 05
- 9) Explain with sketch the following sheet metal operations
a) Bending 05
b) Drawing 05
- 10) a) Name the different products of powder metallurgy. 04
b) State the advantages & limitations of powder metallurgy 06



MODEL QUESTION BANK

Course Title: MECHANICAL WORK SHOP TECHNOLOGY

CO I: IDENTIFY THE VARIOUS MATERIALS AVAILABLE FOR AUTOMOBILES FOR A PARTICULAR USAGE

1. Define Engineering Materials? Write any four important applications of them.
2. Classify the engineering Materials with Examples.
3. Explain briefly Ductility & Malleability property of metal
4. State plasticity & Elasticity of metals.
5. Indicate Five Properties and uses of Pig Iron.
6. List any five properties and uses of Cast Iron.
7. Indicate five uses and Properties of Wrought Iron.
8. Define Heat treatment? And Indicate Any Four purpose
9. Name the Different Heat treatment Process
10. Explain Annealing process in heat treatment.
11. Explain Normalizing Process.
12. Explain Hardening Process of heat treatment.
13. Explain Tempering Process of Heat treatment.
14. Explain Case Hardening Process of heat treatment.
15. Define Non Ferrous metal and Name any four Non ferrous metals.
16. Indicate any five properties of Non ferrous metals.
17. State any five uses of Non ferrous metals.
18. State any five properties and uses of aluminium.
19. State any five properties and uses of copper.
20. State any five properties and uses of Plastics.
21. Explain Thermo plastics & thermosetting.
22. Indicate any five uses & properties of Ceramics.
23. Define composite materials. Indicate any four uses of them.

1. a). Differentiate between Pig Iron And Cast Iron.
b) Indicate any five uses of Cast Iron.
2. a) Distinguish wrought Iron With steel
b) State any four uses of wrought Iron
3. Explain the following processes of heat treatment with applications
a) Annealing b) hardening
4. Explain the following processes of heat treatment with applications
a) Normalizing b) Tempering.
5. a) state the Differences between Ferrous & Non Ferrous Metals.
b) Indicate any four Examples for ferrous & non ferrous metals
6. a) Compare thermoplastics and thermosetting
b) State the five properties and uses of plastics.
7. a) Explain use of composite materials in engineering.
b) State the five properties and uses of Ceramics

CO2: SELECT PARTICULAR FABRICATION PROCESS FOR SPECIFIC AUTOMOBILE FIELD APPLICATIONS



- 1) Define Welding and Classify.
 - 2) State the Differences between Arc welding & Gas welding.
 - 3) List the welding defects.
 - 4) Explain with neat sketch MIG welding.
 - 5) Explain with neat sketch TIG welding.
 - 6) Differentiate between welding & Soldering.
 - 7) Differentiate between Brazing & Soldering.
- 8) a) State three uses of Arc welding
b) Explain with sketch arc welding.
 - 9) a) List any three uses of Gas welding.
b) Explain with neat sketch Gas welding.
 - 10) a) Name the different types of Resistance Welding.
b) Explain with neat sketch Spot welding.
 - 11) Explain briefly with sketches
a) Spot welding
b) Seam welding
 - 12) a) Explain with neat sketch butt welding.
b) Compare welding with soldering.
 - 13) a) Explain with neat sketch Submerged arc welding.
b) Explain briefly Soldering.
 - 14) a) Explain with neat sketch MIG welding.
b) Compare MIG welding & TIG Welding.
 - 15) a) Explain with neat sketch TIG welding.
b) List the equipments used for Arc welding.

CO 3 : ANALYSE THE VARIOUS SHEET METAL WORKS IN PRACTICE IN AUTOMOBILE FIELD

- 1) State the uses of sheet metal in Engineering
 - 2) Explain properties and Gauges of sheet metal.
 - 3) Name different metals used for sheet metal work.
 - 4) Explain shearing and bending operation of sheet metals.
 - 5) Explain briefly with sketch drawing operation of sheet metal.
 - 6) Explain briefly squeezing and blanking operation of sheet metal.
- 1) Explain with necessary sketches of different Shearing operations in sheet metals.
 - 2) Explain with sketch the following sheet metal operations
a) Bending b) Drawing
 - 3) a) State any Four applications of sheet metals
b) Explain following shearing operation in sheet metal
a) Cutting off b) Blanking
 - 4) a) State any three applications of presses
b) Explain Power press with a neat sketch
 - 5) a) State any three applications of presses
b) Explain Ball or fly press with a neat sketch

CO 4:KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH AS LATHE, MILLING, DRILLING MACHINES

1. Give the Specification Of Typical Lathe
2. Explain five main parts of lathe



3. How the power is transmitted in lathe spindle to feed shaft and lead screw
4. List the types of surfaces can be machined in engine lathe
5. Explain the important method of holding work in a lathe
6. List various operations that can be performed in lathe
7. Differentiate between steady rest and follower rest
8. Explain with sketch 3 jaw chuck
9. Explain with sketch 4 jaw chuck
10. Compare the applications and disadvantages of 3 jaw chuck & 4 jaw chuck.
11. Explain the three taper turning methods with sketch
12. Explain the thread cutting operation with sketch
13. Explain with neat sketch lathe mandrel
14. Explain the process of cutting internal threads in a lathe
15. List the different guide ways generally used in lathe machines
16. List the different Slide ways generally used in lathe machines
17. Explain taper turning attachment with sketch
18. Explain with sketch face plate
19. Compare the capstan lathe with ordinary lathe
20. Explain the working of Capstan lathe with neat sketch
21. Explain the working of Turret lathe with neat sketch
22. Explain with sketch indexing mechanism of turret
23. Differentiate between capstan and turret lathe
24. State the advantages of turret lathe over capstan lathe
25. List the difference between capstan lathe and automats
26. Give the classification of automats
27. Sketch and explain the working of single spindle automats
28. Sketch and explain the working of multiple spindle automats
29. Explain with neat sketch the working of radial drilling machine
30. Explain reaming process
31. Explain with neat sketch the working of Horizontal boring machine
32. Explain with sketch twist drill geometry
33. Explain with sketch Column and knee type of milling machine
34. Write the classification of milling cutters
35. Describe briefly how milling cutter mounted
36. State the advantages of up milling
37. State the advantages of down milling
38. Explain with neat sketch up milling and down milling process
39. Explain with sketch end milling
40. Explain with neat sketch face milling
41. Explain with neat sketch slab milling
42. Define w.r.t milling: Cutting Speed, Feed, and Depth of cut machining time
43. What is the difference between a plain milling cutter and a side-milling cutter
44. How does a universal dividing head differ from a plain dividing head

CO 5: UNDERSTAND THE METAL CASTING TECHNIQUES AND BASIC STRUCTURE OF PRODUCTS.



- 1) Explain 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) Explain with sketch Split pattern.
- 6) Explain with sketch loose pattern.
- 7) Explain with sketch gated pattern.
- 8) Explain with sketch sweep pattern.
- 9) Explain with sketch slush Casting.
- 10) State the uses of metal casting.
- 11) Explain briefly with a neat sketch centrifugal casting.
- 12) Explain briefly Runner and Raiser used in casting process.
- 13) Explain briefly any five defects in casting
- 14) Explain briefly Cope, Drag and Core used in casting process
- 15) a) state the importance of metal casting.
b) Explain with sketch slush Casting.
- 16) a) State the Ingredients of Foundry Sand
b) Explain with neat sketch centrifugal casting
- 17) Explain with neat sketch
 - a) Split pattern
 - b) Gated pattern
- 18) a) Explain pattern making materials
b) Explain with neat sketch die casting
- 19) a) Explain casting allowance
b) List the differences between Sand casting and Die casting.
- 20) Define Forging. List the common forging operations.

CO 6: EXPOSE AND APPRECIATE THE APPLICATION OF POWDER METALLURGY TECHNIQUES IN ENGINEERING

- 1) a) Explain with neat sketch powder metallurgy process
b) State limitation of powder metallurgy.
- 2) a) Explain secondary operations of powder metallurgy process.
b) Indicate the advantages of powder metallurgy.
- 3) Explain the following metal powder manufacturing methods.
a) Mechanical method b) Atomisation
- 4) Explain the following metal powder manufacturing methods.
a) Reduction method b) Electrolysis
- 5) a) Name the different products of powder metallurgy.
b) State the advantages & limitations of powder metallurgy.
- 6) Explain the uses of powder metallurgy in engineering.
- 7) State any five Limitations of powder metallurgy.
- 8) State any five advantages of powder metallurgy.
- 9) Define metal powder. And name the different methods of manufacture.
- 10) Explain briefly manufacture of metal powder by mechanical method.
- 11) Explain briefly manufacture of metal powder by Atomization method.
- 12) Explain briefly manufacture of metal powder by Reduction method.
- 13) Explain briefly manufacture of metal powder by Electrolysis method.
- 14) Explain briefly manufacture of metal powder by spotting method.



