



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	III
Course Code	20ME33P	Type of Course	Programme Core
Course Name	Manufacturing Processes	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: Diploma Engineers are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is essential. This requires training the students in casting and metal forming domain so as to equip them with adequate theoretical and practical knowledge about the various metal casting and forming processes like rolling, forging, drawing, extrusion, Sheet metal work etc. Hence this course is introduced to provide hands on experience on various manufacturing processes.

2. Course Outcomes: At the end of the Course, the student will be able to

CO-01	Produce patterns, moulds, and casting of a given component drawing and estimate the cost of casting.
CO-02	Demonstrate forging operation for a given component drawing and estimate the cost of forging.
CO-03	Prepare sheet metal drawing, demonstrate sheet metal operation and estimate the costs of Sheet metal operation.
CO-04	Explain rolling and extrusion operation and list applications of metals forming processes.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01,04	1. Introduction to foundry – You tube videos on foundries Explain the safety Precautions to be taken in foundries 2. Explain the need of a Pattern- Types of Patterns—Solid or Single Piece pattern, Split Pattern, Loose Piece Pattern, Match Plate Pattern, Gated Pattern, Sweep Pattern, Skeleton-Pattern 3.Allowances- Materials used for Pattern	Refer Table 1	1. Identify the tools and equipment used in foundry with application 2. Prepare a single Piece wooden Pattern considering all allowances
2	01	01,04	1.Molding Sand-Types 2.Ingredients and Properties of Molding Sand	Refer Table 1	1.Prepare a molding sand 2. Preparation of Mold with the help of Pattern

			3. Importance of Core and Core prints-Gates-Runner-Riser		3. Melt the metal (wax) and pouring it into the mold cavity
3	01	01,04	1. Explain Defects in Casting 2. Inspection of Casting 3. Determination of Production Cost of a given material considering Raw material, Process cost, Overheads and other expenses	Refer Table 1	1. Cutting Runner and riser in the casted component 2. Cleaning of the casted component 3. Inspection of the casted component 4. Record the defects, if any
4	02	01,04	1.Introduction to basic Metal Forming Process and Applications- Show You tube Video's on Metal Forming Process 2. Explain Hot and Cold Working Process with Application Show You tube Videos on Hot and Cold Working Process 3.Introduction to forging operation- Types of forging- Hand forging and Power forging	Refer Table 1	1.Demonstrate safety precautions to be followed in Forging 2. Identify the tools and equipment's used in forging 3. Forging Practice (Hammering)
5	02	01,04	1.Explain forging Operations - Upsetting, drawing down, Cutting, Bending 2. Explain Punching and Drifting, Setting down and Finishing, Forge Welding 3 Estimation of Length of Raw material required to convert Circular rod to Square and Calculate the Production Cost considering direct and Indirect expenses.	Refer Table 1	Conversion of Circular rod to Square
6	02	01,04	1. Estimation of Length of Raw material required to convert Circular rod to Hexagon and Calculate the Production Cost considering direct and Indirect expenses. 2. Explain the working principle of Power hammer 3. Show the you tube videos on components produced by Power forging	Refer Table 1	Conversion of Circular rod to Hexagon
7	02	01,04	1. Estimation of Length of Raw material required to convert Hexagon to " L " shaped Nail and Calculate the Production Cost considering direct and Indirect expenses 2. Explain Forging losses- Forging Defects	Refer Table 1	Conversion of Hexagon to " L " Nail as per the given drawing

			3. Show the you tube videos on components produced by forging operations		
8	03	01,04	1.Introduction to sheet metal- Show You tube videos on sheet metal operations and Applications 2.Explain sheet metal materials – Standard Gauges of sheet - Specification of Sheet 3.Explain different Sheet metal operations	Refer Table 1	1. Identify and demonstrate the various tools used for sheet metal operations. 2. Measure the gauges of sheet 3. Demonstrate the operations performed on Shearing machine
9	03	01,04	1.Explain the Development of Cone and Cylinder 2. Explain the Development of Prism and Pyramid 3. Explain the Development of Funnel	Refer Table 1	1. Prepare Cone, Cylinder, Prism, Pyramid and Funnel 2. Join end surfaces by means of Seam Joint
10	03	01,04	1.Explain the Development of Tray 2.Explain the Development of Transition pieces 3. Explain the Development of Transition pieces	Refer Table 1	1. Prepare a Tray 2. Prepare any Transition Piece
11	03	01,04 07	1. Find the total Production cost of a sheet metal components like Open container, Cylindrical Drum 2. Introduction to Power Press -Press size- Press tools – Die Accessories 3. Types of Die and its operations	Study the latest technological changes in this course and present the impact of these changes on industry	1. Present You tube Videos on Press work operations 2. Record the observations made and prepare a report.
12	04	01,07	1.Introduction to Rolling- Nomenclature of Rolled Products- Dies used in rolling process 2.Types of Rolling mills-2 high mill- 3 High mill – 4 High mill- Cluster mill, Tandem Mill, Planetary mill, Defects in Rolling 3. Introduction to Extrusion and Drawing – Types of Extrusion Process. Wire and Tube Drawing Process, Dies used in Extrusion and Drawing Process		Video/ Virtual exposure on Rolling and Extrusion
13	04	01,07	Demonstrate the manufacturing of following components using YouTube Videos 1. Crank Shaft 2. Valves 3. Wheel 4. Gear case 5. Hair springs		Demonstrate the manufacturing of following components using YouTube Videos 1. TMT Steels 2. Channel sections 3. Pump Casings 4. Rolling of Sheets

			Discuss and Prepare a Report on the videos Presented for each manufactured component		5. Tooth paste tube 6. Pipes 7. Tubes etc., Discuss and Prepare a Report on the videos Presented for each manufactured component
Total in hours			39	13	52

- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Coordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	From heavy casting of 300Kg to small casting of 30 kg, investment casting method is used for as wide for hi-tech industrial applications. Investment casting is largely relied on for complicated designs that cannot be casted using any other method. Discuss. Also, Present the Preparation of Patterns for the Process. Compare the relative surface finish of this process with other Casting Processes.
02	Discuss the forging defects commonly occurring in forgings, their causes and Remedies. Present the methodology for measuring Forging defects. https:// studentlesson.com
03	A Gas cylinder is produced by Sheet metal operations. Prepare the development and Present the procedure involved in making the given component.
04	Identify the forming process adopted in making Tooth Paste Tubes. Present the process. List the limitations involved and solutions to overcome these limitations.
05	Estimation of Length of Raw material required for a forged bolt and Calculate the Production Cost considering direct and Indirect expenses.

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Manufacturing Processes	Test	I/II/III	Sem	III/IV
Course Code	20ME33P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels	Course Outcome	Marks

I	1			
	2			
II	3			
	4			
III	5			
	6			

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.

5. (a) For CIE Skill Test - 4

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	Question on Casting Process With Process plan, Costing of the product for a Given parameters including pattern, melting and other expenses <ul style="list-style-type: none"> • Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks • Preparation of Mold by using Pattern=25 Marks • Costing including Raw material ,process and finding Total cost , selling Price =25 Marks • Operation performed =20 marks • Dimensional accuracy = 05 Marks 	90
2	01	Portfolio evaluation based on the average of all Practice Sessions (1-6 weeks)	10
Total Marks			100

5. (b) For CIE Skill Test -5

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	Question on Forging operation with Process plan, Calculation of Raw material Length, Costing of the product for a Given parameters considering all Possible Losses. <ul style="list-style-type: none"> • Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks • Costing including Raw material length ,process time and finding Total cost , selling Price = 25 marks • Operations Performed with Dimensional accuracy= 20Marks. 	60
2	03	One Skill oriented Question on Sheet Metal work <ul style="list-style-type: none"> • Development for a given drawing =20 Marks • Sheet metal Operation with Dimensional accuracy =10 marks 	30
3	02,03	Portfolio evaluation based on the average of all Practice Sessions (7-12 weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6

3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
		Average Marks= (8+6+2+2)/4=4.5					5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Elements of Workshop Technology (Vols. 1 and II) by Hajra Chaudhary
2	Production Technology By R.K. Jain
3	Foundry Technology By O.P.Khanna
4	Engineering Drawing Vol-2 By K.R.Gopala Krishna
5	Engineering Drawing By N.D.Bhat

8. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01,02	<p>One Skill oriented Question on Casting</p> <ul style="list-style-type: none"> Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks Preparation of Mold by using Pattern=30Marks Other Operations performed =10 marks <p style="text-align: center;">OR</p> <p>One Skill oriented Question on Forging operation with Process plan, Calculation of Raw material Length, Costing of the product for the Given parameters considering all Possible Losses.</p> <ul style="list-style-type: none"> Process plan including Component Drawing ,process list and Tool/Equipment's selection= 20 marks Costing including Raw material length ,process time and finding Total cost , selling Price =25marks Operations Performed with Dimensional accuracy=10 Marks. 	55
2	03	<p>One Skill oriented Question on Sheet Metal work</p> <ul style="list-style-type: none"> Development of product=15 Marks Performance and Operation with Dimensional accuracy =10 marks 	25
4	01,02,03,04	Viva voce	20
		Total Marks	100

9. Equipment list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Moulding box	300*300*100mm	20
02	Moulding Rammer	Standard size	20
03	Moulding tool kit	Standard size	20
04	Electric furnace for melting (Wax/Low melting point metal with crucible and ladder for pouring)	Standard size	04
05	Portable grinder for cleaning of casting	Standard size	02
06	Sand Blaster	Standard size	04
07	Ball peen Hammer	½ lb	05
08	Pattern Making Tool kit	Standard size	10
09	Anvil For Forging	Standard size	05
10	Sledge hammer	2 LB	10

11	Hand hammer	1 lb	10
12	Flatteners	Standard size	20
13	Flat Tongs	Standard size	20
14	Round Tongs	Standard size	20
15	Steel scale	300mm	20
16	G I Bucket for Quenching	15 lts capacity	10
17	Open Heart Furnace with stand and Blower	Standard size	04
18	Hot Chisel	24mm size	10
19	Sheet shearing Machine(Manual or M/c type)	Standard size	04
20	Sniper for cutting sheet	Standard size	20
21	Metal stake	Standard size	10
22	Wooden mallet	Standard size	20
23	Plastic Hammer	Standard size	20
24	Bench vice for Bending of sheet	Standard size	05
25	Brazing Gun	Standard size	10