


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

	Course Title: MACHINE TOOL TECHNOLOGY		
	Scheme (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15ME43T
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Core
CIE- 25 Marks		SEE- 100 Marks	

Prerequisites: Applied science, Basic work Shop practice

Course Objectives:

1. Expose to the Concept and Basic Mechanics of Metal Cutting
2. Familiarise with Working Of Standard Machine Tools Such As Lathe, Shaping And planer, Milling, Grinding And Super finishing Process and other Non conventional machining practices

Course Outcomes:

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

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand The Concept And Basic Mechanics Of Metal Cutting	<i>R/U/A</i>	1,2,3,4,5,10	07
CO2	Know the Working Of Standard Machine Tools Such As Lathe, Milling, Reciprocating Machine tools and demonstrate the need of such machine tools for sustainable development	<i>R/U/A</i>	1,2,3,4,10	33
CO3	Selection of super finishing process for an application and understand the impact of such process in environmental context	<i>R/A</i>	1,2,3,4,5,6,10	05
CO4	Expose and appreciate the application Un conventional machining process area and understand the impact of such process in environmental context	<i>U/A</i>	1,2,3,4,5,6,10	07
			Total sessions	52



COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MACHINE TOOL TECHNOLOGY	3	3	3	3	2	1	-	-	-	3
<p>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.</p>										

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	THEORY OF METAL CUTTING	07	05	05	05	15	10
2	LATHE AND OPERATIONS	11	05	10	15	30	21
3	RECIPROCATING MACHINE TOOLS	10	05	05	20	30	21
4	DRILLING AND MILLING MACHINES	12	10	20	10	40	28
5	SUPER FINISHING PROCESSES	05	05	-	10	15	10
6	NON CONVENTIONAL MACHINING PROCESS	07	-	05	10	15	10
Total		52	30	45	70	145	100

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



UNIT I: THEORY OF METAL CUTTING **07Hrs**

Introduction: Metal Removal Processes, Types Of Machine Tools – Theory Of Metal Cutting: Chip Formation, Orthogonal Cutting- Oblique Cutting- Machinability of metal. Cutting Tool-Classification of cutting tools-Single point Cutting Tool Geometry-Cutting Tool Materials, Tool Wear, Tool Life, and Cutting Fluids-Functions and properties.

UNIT II:LATHE AND OPERATIONS **10Hrs**

Centre Lathe-Construction- Various Operations, Taper Turning Methods, Thread Cutting operation, Lathe Attachments& Accessories. Capstan and Turret Lathes – Automats – Single Spindle, Swiss Type, Multi Spindle Automatic lathe.

UNIT III: RECIPROCATING MACHINE TOOLS **11Hrs**

Shaper -Principal parts, Classification, Specification of shaper, Shaper Mechanisms, Types-Hydraulic shaper. Cutting Speed, Feed, Depth of cut & machining time-Variou shaper operations-Introduction to Planer -Principal parts and working of Double housing Planer, Principal parts of Slotter-Working of slotter

UNIT IV:DRILLING AND MILLING MACHINES **12Hrs**

Drilling operations- Twist drill geometry –Radial drilling machine-Jigs and Fixtures-Definition-Need of Jigs and Fixtures Drill Jig-Locating devices. Milling-Classification, Column and knee type milling machine - Milling cutters and classification-Fundamentals of milling processes-Milling operations. Indexing methods-Simple and compounding. Cutting speed, feed, depth of cut and machining time.

UNIT V:SUPER FINISHING PROCESSES **05Hrs**

Abrasive Processes- Grinding Wheel – Specifications And Selection, Types Of Grinding Process – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping, Super Finishing, Polishing And Buffing

UNIT VI: NON CONVENTIONAL MACHINING PROCESS **07Hrs**

Unconventional Machining Process - Classification, Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Ultrasonic Machining, Abrasive Jet Machining. Additive manufacturing-Concept – Various applications of Additive manufacturing

**TEXT BOOKS**

1. Rao, P.N., *Manufacturing Technology, Vol I & II*, Tata Mcgraw Hill Publishing Co., New Delhi, 1998
2. Seropekalpakjian, Steven R Schmid *Manufacturing Engineering and Technology*-Pearson Education-Delhi

**REFERENCES**

1. Sharma, P.C., *A Textbook Of Production Technology – Vol I And II*, S. Chand & Company Ltd., New Delhi, 1996
2. HMT – “*Production Technology*”, Tata Mcgraw-Hill, 1998



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. www.freevideolectures.com

SUGGESTED LIST OF STUDENT ACTIVITIES

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

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repeating should occur

1	Make Visit to nearest work shop ,observe the lathe and make list of real time machine components which are machined ,Submit hand written report of 500 words
2	Observe the milling machine of your polytechnic and study its specifications. List the possible milling operation can done on that machine, Submit hand written report of 500 words
3	Dismantle some important parts of drilling machine and carry servicing activities and Submit hand written report of 500 words
4	Compare various unconventional machines by collecting their brochures. Make comparative hand written report of 500 words
5	Visit nearest Machine tool work shop and map the machining activity of a particular component, prepare a drawing, list the sequence of operation, tools and machineries used. Submit hand written report of 500 words
6	Motivate student to take case study on particular manufacturing activity to inculcate self and continues learning, Submit hand written report of 500 words on selected case study

Course Delivery:

The course will be delivered through lectures and Power point presentations/ Video Teachers can prepare or download ppt or Videos of different Machines usage in mechanical engineering application

• MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS MODEL

RUBRICS FOR 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
Fulfil 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.

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
				Student activities	05	Report	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4 Effectiveness of Delivery of instructions & Assessment Methods

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

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 and should be assessed on RUBRICS
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	MACHINE TOOL TECHNOLOGY	20			
	Year:	Course code:15ME43T				
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	MACHINE TOOL TECHNOLOGY	20			
	Year: 2015-16	Course code:15ME43T				
Name of Course coordinator :			Units:1,2 Co: 1,2			
Note: Answer all questions						
Question no	Question	MARKS	CL	CO	PO	
1	Describe briefly the Metal removal process.	05	R	1	1,2	
2	Give four examples for Orthogonal Cutting & Oblique Cutting.	05	U	1	1,2	
3	Sketch and Explain taper turning attachment in a lathe OR Sketch and Explain the thread cutting operation in a lathe	10	A	2	1,2	



MODEL QUESTION PAPER

3- Semester Diploma Examination

MACHINE TOOL TECHNOLOGY

Time: **3 Hours**]

[Max Marks: **100**

Note: Answer any SIX from **Part A** and any SEVEN from **Part B**

PART-A6x5=30 marks

1. Give four examples for Orthogonal Cutting & Oblique Cutting
2. Explain steady rest and follower rest
3. Differentiate between capstan and turret lathe.
4. Write specification of shaper
5. Define w.r.t shaper: Cutting Speed, Feed, and Depth of cut machining time
6. Explain with sketch end milling
7. Explain Counter sinking and counter boring
8. Explain wheel truing and dressing
9. Discuss Additive manufacturing.

PART-B

7x10=70 marks

11. Explain the Process of chip formation with sketch
12. Explain the three taper turning methods with line sketch
13. Explain the important method of holding work in a lathe
14. Explain with neat sketch the working of Hydraulic shaper mechanism
15. Explain with neat sketch the working of planer.
16. Explain with sketch twist drill geometry
17. Explain with sketch Column and knee type of milling machine.
18. Explain with neat sketch cylindrical grinder
19. Sketch and explain Electric Discharge Machining
20. Describe briefly the principle of Additive manufacturing.



MODEL QUESTION BANK

III Semester Diploma in Mechanical Engineering COURSE TITLE: MACHINE TOOL TECHNOLOGY

CO1: UNDERSTAND THE CONCEPT AND BASIC MECHANICS OF METAL CUTTING

LEVEL: REMEMBER

1. Describe briefly the Metal removal process.
2. State the condition that would allow continuous chips formation.
3. State the difference between orthogonal cutting & Oblique Cutting.
4. List the cutting tool materials.
5. List how tool wear can be minimised.
6. State the important characteristics of cutting tool materials.
7. List the factors to be considered for the selection of tool materials.
8. List the properties of cutting fluid.
9. List the factors affecting tool life.
10. Name five cutting Tools Material.
11. State the tool variables & machine variables affecting the machinability.
12. Give the classification of Cutting Fluids. List few examples in case.
13. Define tool wear and State the reasons for tool wear.
14. Define Tool Life.
15. Define cutting fluid. State the Function of Cutting Fluids.
16. Describe briefly the Mechanics of Metal cutting.

LEVEL: UNDERSTANDING

17. Explain orthogonal cutting.
18. Explain Oblique Cutting.
19. Give four examples for Orthogonal Cutting & **Oblique** Cutting.
20. Explain the Different type of chips.

LEVEL: APPLICATION

21. Write the classification of machine tools.
22. Outline the classification of cutting tools.
23. Write and explain Taylor's Tool Life Equation.
24. Illustrate the importance of various Single point cutting tool angles.
25. Sketch the geometry of single point cutting tool.
26. Sketch the Process of chip formation.

CO 02: KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH AS LATHE MACHINE TOOLS AND DEMONSTRATE THE NEED OF SUCH MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT

LEVEL: REMEMBER

1. List various operations that can be performed in lathe.
2. State the advantages of turret lathe over capstan lathe.



3. List the difference between capstan lathe and automats.
4. List the important method of holding work in a lathe.

LEVEL: UNDERSTANDING

5. Distinguish capstan lathe with centre lathe.
6. Differentiate between capstan and turret lathe.
7. Differentiate between steady rest and follower rest.
8. Explain with sketch 3 jaw chuck.
9. Explain with sketch 4 jaw chuck.
10. Explain the process of cutting internal threads in a lathe.
11. Explain any Two taper turning methods with sketch.
12. Explain the thread cutting operation with sketch.
13. Explain with neat sketch lathe mandrel.
14. Explain with sketch face plate.

LEVEL: APPLICATION

15. Write the Specification Of a centre Lathe.
16. Sketch taper turning attachments.
17. Compare the applications and disadvantages of 3 jaw chuck & 4 jaw chucks
18. Sketch and explain the working of single spindle automats.
19. Sketch and explain the working of multiple spindle automats.

**CO 02: KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH
RECIPROCATING MACHINE TOOLS AND DEMONSTRATE THE NEED OF
SUCH MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT**

LEVEL: REMEMBER

1. Define w.r.t shaper: Cutting Speed, Feed, and Depth of cut machining time.
2. List the operation performed on a shaper.
3. List the various operations performed in planer.
4. List the various operations performed in slotter.

LEVEL: UNDERSTANDING

5. Differentiate between shaper and planer.
6. Classify the shapers

LEVEL: APPLICATION

7. Write specification of shaper.
8. Sketch and Explain the working of slotter.
9. Sketch and Explain the working of Shaper
10. Sketch and Explain the working of Hydraulic shaper mechanism.
11. Sketch and Explain the working of Planer.

**CO 02: KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH DRILLING
AND MILLING MACHINE TOOLS AND DEMONSTRATE THE NEED OF SUCH
MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT**



LEVEL: REMEMBER

1. Define Jig and fixture.
2. State the importance of jig.
3. List the importance of fixture.
4. Describe briefly any two locating devices with sketch
5. State the advantages of up milling.
6. State the advantages of down milling.
7. Define w.r.t milling: Cutting Speed, Feed, and Depth of cut machining time.

LEVEL: UNDERSTANDING

8. Explain with sketch twist drill geometry.
9. Explain reaming and tapping process.
10. Explain Counter sinking and counter boring
11. Explain with neat sketch face milling.
12. Explain with neat sketch slab milling.
13. Differentiate between jigs and fixture.
14. Explain with neat sketch up milling and down milling process.
15. Write the classification of milling cutters.
16. Distinguish between a plain milling cutter and a side-milling cutter.

LEVEL: APPLICATION

17. Sketch and Explain the working of radial drilling machine.
18. Sketch and Explain end milling.
19. Sketch and explain drill jig.
20. Sketch Column and knee type of milling machine and label the parts

CO 03:SELECTION OF SUPER FINISHING PROCESS FOR AN APPLICATION AND UNDERSTAND THE IMPACT OF SUCH PROCESS IN ENVIRONMENTAL CONTEXT

LEVEL: REMEMBER

1. State the specification of grinding wheel.
2. How the grinding wheels are selected.
3. List various super finishing process.
4. State the advantages of centre less grinding over cylindrical grinding.
5. Describe wheel truing and dressing.

LEVEL: APPLICATION

6. Sketch and Explain the working of surface grinding.
7. Sketch and Explain the working of centre less grinding.
8. Sketch and Explain the working of cylindrical grinder.
9. Write the classification of grinding process.

CO 04: EXPOSE AND APPRECIATE THE APPLICATION NON CONVENTIONAL MACHINING PROCESS AREA AND UNDERSTAND THE IMPACT OF SUCH PROCESS IN ENVIRONMENTAL CONTEXT.

LEVEL: UNDERSTANDING



1. Describe briefly the principle of Additive manufacturing.
2. Give the classification of non conventional machining process.
3. Differentiate between AJM and ultra sonic machining.
4. Give the classification of nonconventional machining process.
5. Discuss Additive manufacturing.

LEVEL: APPLICATION

6. Sketch and explain Ultrasonic Machining.
7. Sketch and explain Abrasive jet machining process.
8. Sketch and explain Electric Discharge Machining.
9. Sketch and explain Electron Beam Machining.
10. Sketch and explain Laser Beam Machining.

