

PRECISION ENGINEERING

V Semester: MECH								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME512	Elective	L	T	P	C	CIA	SEE	Total
		3	1	-	3	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 45	
<p>COURSE OBJECTIVES: The course should enable the students to: I. Understand the BIS code fits and tolerances for geometrical dimensioning and tolerance (GD & T). II. Understand the principal application of different measuring instruments. III. Summarize the application of latest manufacturing techniques (Nano).</p> <p>COURSE OUTCOMES (COs):</p> <p>CO 1: Describes the General concept of accuracy, dimensional wear of cutting tools, location of rectangular prism alignment tests. CO 2: Understand the Influence of static stiffness, thermal effects, compliance of work piece, Influence of vibration on accuracy. CO 3: Explains Top down and bottom up approach, development of Nanotechnology, precision and micro-machining, Stereo microlithography. CO 4: Describes Nano Measuring Systems such as mechanical measuring systems, optical measuring systems. CO 5: Explores various types of Lithography ,ion Beam lithography, optical lithography, LIGA process, dip pen lithography, deep UV.</p> <p>COURSE LEARNING OUTCOMES (CLOs):</p> <ol style="list-style-type: none"> 1. Describes the General concept of accuracy. 2. Describe dimensional wear of cutting tools, clamping errors & setting errors. 3. Describes how to location of rectangular prism & cylinder. 4. Describes basic type of tests and measuring instruments used for testing machine tools. 5. Describes the Influence of static stiffness. 6. Describes thermal effects and methods of decreasing thermal effects. 7. Describes the compliance of work piece. 8. Describes the Influence of vibration on accuracy. 9. Describes the importance of Top down and bottom up approach. 10. Explains the development of Nanotechnology, precision and micro-machining, Stereo microlithography. 11. Explains the development of precision and micro-machining. 12. Explains the development Stereo microlithography. 13. Classify the various Nano Measuring systems. 14. Discuss the various Mechanical measuring systems. 15. Discuss the optical measuring systems, electron beam measuring system. 16. Discuss the pattern recognition and inspection systems. 17. Classify the various Lithographies. 18. Describe the importance of Nano lithography & electron beam lithography. 19. Describe the importance of ion Beam lithography & optical lithography. 								

20. Explain LIGA Process, Dip Pen Lithography & deep UV.		
UNIT-I	ACCURACY AND ALIGNMENT TEST	Classes: 09
Accuracy and alignment tests: General concept of accuracy, Spindle rotation accuracy, test methods, displacement accuracy, dimensional wear of cutting tools, accuracy of NC systems, clamping errors, setting errors, location of rectangular prism, cylinder, basic type of tests, measuring instruments used for testing machine tools, alignment tests, straightness, flatness, parallelism, squareness, Circularity, cylindricity.		
UNIT -II	INFLUENCE OF STATIC STIFFNESS, THERMAL EFFECTS	Classes: 09
Influence of static stiffness, thermal effects: Static stiffness, nature of deformation in a machine tool, overall stiffness of a lathe, compliance of work piece, errors due to the variation of the cutting force and total compliance, accuracies due to thermal effects, methods of decreasing thermal effects-Influence of vibration on accuracy.		
UNIT-III	PRECISION MACHINING	Classes: 09
Top down and bottom up approach, development of Nanotechnology, precision and micro-machining, diamond turning of parts to nanometer accuracy.		
Stereo microlithography, machining of micro-sized components, mirror grinding of ceramics, ultra precision block gauges.		
UNIT-IV	NANO MEASURING SYSTEMS	Classes: 09
In-process measurement of position of processing point, post process and online measurement of dimensional features, mechanical measuring systems, optical measuring systems, electron beam measuring systems, pattern recognition and inspection systems.		
UNIT-V	LITHOGRAPHY	Classes: 09
Nano Lithography: Photolithography, nano lithography, photolithography, electron beam lithography, ion Beam lithography, optical lithography, LIGA process, dip pen lithography, deep UV.		
Text Books:		
1. Murthy.R.L, —Precision Engineering in Manufacturing, New Age International, New Delhi, 2005. 2. Norio Taniguchi, —Nanotechnology, Oxford university press, Cambridge, 1996		
Reference Books:		
1. Lee Tong Hong, —Precision Motion control, Design and Implementation, Springer Verlag, U.K.2001 2. Liangchi Zhang, —Precision Machining of Advanced Materials, Trans Tech Publications Ltd., Switzerland, 1 st Edition, 2001. 3. Hiromu Nakazawa, —Principles of Precision Engineering, Oxford university press, 1 st Edition, 1994.		
Web References:		
1. http://nptel.ac.in/courses/112106138/		
E-Text Books:		
1. https://accessengineeringlibrary.com/browse/precision-engineering		