

**DEPARTMENT OF PRODUCTION ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
<b>Course Title</b>	Precision Engineering (Theory & Lab)		
<b>Course Code</b>	PRPE11	<b>No. of Credits</b>	03
<b>Course Code of Pre-requisite subject(s)</b>	PRPC 12-Machining Technology		
<b>Session</b>	Jan. 2018	<b>Section (if, applicable)</b>	---
<b>Name of Faculty</b>	Dr J Jerald	<b>Department</b>	Production Engg.
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<b>Name of Course Coordinator</b>	Dr V Senthil Kumar		
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<b>Course Type</b>	<input checked="" type="checkbox"/> Elective course		
<b>Syllabus (approved in BoS)</b>			
<p>1. Precision machining – Concepts and significance – Classification - Top down – Bottom up approaches– Precision and micromachining - Machining of micro-sized components - Ultra precision machining grinding 2. Lithography – Photolithography - Electron beam lithography – Ion Beam lithography - Deep UV lithography–MEMS – Principle – Elements – Characteristics – Applications- Design and fabrication approaches 3. Micro-manufacturing- Limits of capability of conventional mechanical manufacturing-Micro- machining-concepts-Types–Tools–Electrical Discharge Micro-Machining–Wire cut EDM– Electro Chemical Micro-Machining–Abrasive Jet Micromachining - Laser based micromachining 4. Nano surface generation-Concepts and applications-Types- Ductile mode of machining- Diamond turning of parts to nanometer accuracy – ELID grinding – Chemo Mechanical Polishing- Magnetorheological finishing 5. Precision metrology –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 – Scanning Tunneling – Atomic Force Microscope.<b>Precision Lab exercises:</b></p> <p>1. Exercise on Micro-turning operation on DT-110 Multi-process micro-machining center. 2. Exercise on Micro-milling operation on DT-110 Multi-process micro-machining center. 3. Exercise on Micro-drilling operation on DT-110 Multi-process micro-machining center.</p>			
<b>COURSE OBJECTIVES:</b>			
To provide knowledge in concepts of precision engineering and micro/nano machining, its processes and applications			
<b>COURSE OUTCOMES (CO)</b>			
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>		
1. Understand the concepts of precision engineering particularly micro/nano machining, its principles, operations and importance as applicable to instruments and machines	√		
2. Lab practicals on mechanical micro-machining processes.	√		



**COURSE PLAN – PART II****COURSE OVERVIEW**

This course is to teach the concepts of precision machining and various processes for micro/nano machining. The students will get practical knowledge in various mechanical micro-machining operations.

**COURSE OBJECTIVES**

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week-1	Precision machining – Concepts and significance – Classification - Top down approach	CT/PPT
2	Week-2	Bottom up approach– Precision and micromachining	CT/PPT
3	Week-3	Machining of micro-sized components - Ultra precision machining grinding	CT/PPT
4	Week-4	Lithography – Photolithography - Electron beam lithography	CT/PPT
5	Week-5	Ion Beam lithography - Deep UV lithography–MEMS – Principle – Elements	CT/PPT
6	Week-6	MEMS Characteristics – Applications- Design and fabrication approaches	CT/PPT
7	Week-7	Micro-manufacturing- Limits of capability of conventional mechanical manufacturing-Micro- machining-concepts	CT/PPT
8	Week-8	Types–Tools–Electrical Discharge Micro-Machining–Wire cut EDM	CT/PPT
9	Week-9	Electro Chemical Micro-Machining- Abrasive Jet Micromachining - Laser based micromachining	CT/PPT
10	Week-10	Nano surface generation-Concepts and applications	CT/PPT
11	Week-11	Types- Ductile mode of machining- Diamond turning of parts to nanometer accuracy	CT/PPT

12	Week-12	ELID grinding – Chemo Mechanical Polishing- Magnetorheological finishing	CT/PPT
13	Week-13	Precision metrology –In-process measurement of position of processing point - Post process and online measurement of dimensional features	CT/PPT
14	Week-14	Mechanical measuring systems - Optical measuring systems - Electron beam measuring systems – Scanning Tunneling – Atomic Force Microscope	CT/PPT

#### **COURSE ASSESSMENT METHODS**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test-I	Week-6	1 Hour	20%
2	Cycle Test-I	Week-12	1 Hour	20%
3	Assignment/Seminar/Quiz	---	---	10%
CPA	Compensation Assessment (Both CT1 & CT2 portions)	Week-14	1 Hour	20%

#### **Final Assessment :**

- Theory – 75% (Internal: 50 % & End Semester Exam: 50 %)
- Lab Practicals – 25%

#### **COURSE EXIT SURVEY**

- Feedback will be collected from students during the semester and also in class committee meetings
- End semester feedback on course outcome

#### **COURSE POLICY**

##### **MODE OF CORRESPONDENCE (email/ phone etc):**

- Preferred mode of correspondence with students by phone

##### **ATTENDANCE:**

- 75% attendance is compulsory to attend the end semester examination

##### **COMPENSATION ASSESSMENT:**

- Retest will be conducted for students those who get prior permission from the faculty before absence.

##### **ACADEMIC HONESTY & PLAGIARISM**

- Copying in any form in assessments and in assignments is considered as academic dishonesty and will attract suitable penalty.

<b>ADDITIONAL INFORMATION</b>		
Nil		
<b>FOR APPROVAL</b>		
Course Faculty <u>Y. S. W. D.</u>	CC-Chairperson <u>[Signature]</u>	HOD <u>[Signature]</u>

**Guidelines:**

- a) The number of assessments for a course shall range from 4 to 6.
- b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**
- c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. This is not applicable for project work/industrial lectures/internship.**
- d) The policy for attendance for the course should be clearly specified.
- e) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.