DEPARTMENT OF PRODUCTION ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN– PART I			
Course Title	**METROLOGY (Theory & Lab)**		
Course Code	**PRPC18**	**No. of Credits**	**03**
Course Code of Pre-requisite subject(s)	PHIR12		
Session	**Jan. 2018**	**Section (if, applicable)**	**A**
Name of Faculty	**Dr. V. Anandakrishnan**	**Department**	**Production**
Email	**krishna@nitt.edu**	**Telephone No.**	**0431-2503521**
Name of Course Coordinator(s) (if, applicable)	**-**		
E-mail		**Telephone No.**	
Course Type	✔ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)
Introduction to Measurement – objectives – classification of methods of measurements - Precision and Accuracy - Standards and their evolution -Types of errors in measurements – Limit gauging
Comparators – types – applications – Linear, angular and form measurements – Surface roughness methods of surface finish – Direct instrument measurements.
Screw Thread Measurement- Standard thread profiles, Effective diameter, Terminology of gear tooth – Gear measurement – Parkinson gear tester- Alignment testing of machine tools – Coordinate measuring machines – Machine vision – Nano measurements.
Measurement of field quantities like temperature, pressure, velocity by intrusive and non-intrusive techniques under various conditions met with in practice like steady and transient conditions. Measurement of derived quantities like heat flux, volume/mass flow rate, temperature in flowing fluids. Measurement of thermo-physical properties, radiation properties of surfaces, vibration and noise. Measurement of length, measurement of angle. Limits and fits.
LAB EXERCISES
Study and use of Electronic comparator - Profile projector - sine bar - precision measuring instruments - coordinate measuring machine Measurement of Gear tooth thickness - Adjacent base pitch error - surface roughness.

COURSE OBJECTIVES
➢ To apply various measurement techniques to inspect and test products ➢ To apply statistical tools for quality assurance purpose

> ➢ To test and evaluate various components using various measuring instruments

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Describe the fundamental concepts in measurement methods, techniques	**1, 11**
2. Apply various instruments for measurements	**1, 2, 11**
3. Apply quality control tools to achieve defects free quality products	**11**
4. Take precise measurements using various instruments.	**1, 11**
5. Develop data for engineering analysis.	**9, 6, 12**

COURSE PLAN – PART II

COURSE OVERVIEW

The quality and reliability of any product in service highly relies on its dimensional control. Hence Metrology, the science of measurements both theoretically and practically needs ample attention to meet out the demand for precise measurements in different scales. Also in order to crater the uncertainty in measurements the necessity of statistical inferences about the measurements becomes vital. The course Metrology deals with fundamentals of measurements, methods, errors, instruments, and statistical tools to meet quality assurance both in theory and practice.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1	Introduction to Measurement	Lecture - C&T/ PPT, Video – 2 Hrs Practical – 2 Hrs
2	Week 1	Objectives of Measurement	
3	Week 1	Classification of methods of measurements - Precision and Accuracy	
4	Week 1	Standards and their evolution of errors in measurements	
5	Week 2	Types of errors in measurements	
6	Week 2	Limit gauging	
7	Week 2	Introduction of Comparators and applications	
8	Week 2	Comparator types	

9	Week 3	Linear measurements	
10	Week 3	Angular and form measurements	
11	Week 3	Surface roughness methods of surface finish	
12	Week 3	Direct instrument measurements	
	Week 4	**Cycle test 1**	
13	Week 4	Screw Thread Measurement	
14	Week 4	Standard thread profiles	
15	Week 4	Effective diameter, Terminology of gear tooth	
16	Week 4	Gear measurement – Parkinson gear tester	
17	Week 5	Alignment testing of machine tools	
18	Week 5	Coordinate measuring machines	
19	Week 5	Machine vision	Lecture - C&T/ PPT, Video – 2 Hrs Practical – 2 Hrs
20	Week 5	Nano measurements	
21	Week 6	Measurement of field quantities - temperature	
22	Week 6	Measurement of field quantities - pressure	
23	Week 6	Measurement of field quantities - velocity by intrusive	
24	Week 6	Measurement of field quantities - velocity by non-intrusive techniques	
	Week 7	**Cycle test 2**	
25	Week 7	Measurement of derived quantities - heat flux, volume in flowing fluids	
26	Week 7	Measurement of derived quantities - mass flow rate, temperature in flowing fluids	
27	Week 7	Measurement of thermo-physical properties	
28	Week 7	Radiation properties of surfaces	
29	Week 8	Vibration and noise	

30	Week 8	Measurement of length, measurement of angle	Lecture - C&T/ PPT, Video – 2 Hrs Practical – 2 Hrs
31	Week 8	Limits and fits	
32	Week 8	Study and use of Electronic comparator	
33	Week 9	Profile projector	
34	Week 9	Sine bar	
35	Week 9	Precision measuring instruments	
36	Week 9	Coordinate measuring machine Measurement of Gear tooth thickness	
37	Week 10	Adjacent base pitch error	
38	Week 10	Surface roughness	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test 1	Week 4	1 hour	20 marks
2.	Cycle Test 2	Week 7	1 hour	20 marks
3.	Assignments	Week 3&6	1 week	10 marks
4.	Final Examination - Theory	Week 11	3 hours	50 marks
5.	Final Examination – Practical	Week 11	2 hours	100 marks
			Total (75% Theory+25% Practical)	100 marks

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

l. Class committee meetings

2. Feedback through MIS

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc)
krishna@n,itt.edu
0431-2503521

ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours and the students are expected to attend all the hours.

2. Minimum 75% of attendance need to be maintained in the contact hours.

3. Students not having sufficient attendance (75%) at the end of the semester will have to RE-DO the course.

COMPENSATION ASSESSMENT

1. Attending all the assessments are MANDATORY for every student.

2. One Compensation Assessment (CPA) will be conducted for those students who are being physically absent due to valid reasons for any of the assessment and it covers the entire contents of the course.

3. At any case, CPA will not be considered as an improvement test.

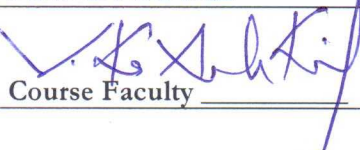4. Relative grading will be adopted for the course.

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form (paper, mobile phone etc.,) for copying during any assessments is considered dishonest.

2. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.

3. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.

4. Any evidence of such academic dishonesty will result in the loss of marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD of the concerned department.

ADDITIONAL INFORMATION

Contact the Course Teacher : Dr.V.Anandakrishnan
Room No.: MTB304 / 2nd Floor / Manufacturing Technology Building
Timings: Office Hours
Email ID: krishna@nitt.edu
Telephone No.: 0431-250-3521

FOR APPROVAL

Course Faculty _____   CC-Chairperson _____   HOD _____