COURSE FILE

COURSE: Bachelor of Technology (B. Tech.)

SEMESTER: VI

SUBJECT: Measurement and Metrology

SUBJECT CODE: 6ME3-01

SESSION: 2021-2022

NAME OF FACULTY: Kalpit Jain

DEPARTMENT: Mechanical Engineering

ISI-6, RIICO Institutional Area, Sitapura, Jaipur-302022 (Rajasthan)

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Vision & Mission Statements of the Institute

Vision of Institution

To create knowledge based society with scientific temper, team spirit and dignity of labor to face the global competitive challenges

Mission of Institution

To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication & commitment to excellence in all spheres of life

Vision & Mission Statements of the Department

Vision of Department

To be recognized for quality education in the field of Mechanical Engineering and identified for its innovation & excellence

Mission of Department

• To provide education that transforms students through rigorous teaching and thought process to fulfill the needs of the society and industry

• To collaborate with leading industry partners and other academic & research institutes around the world to strengthen the education and research ecosystem.

• To prepare students with life-long learning for their career by fostering in them the ethical & technical capabilities pertinent to mechanical & allied engineering.

PEO of the Department

Program Educational Objectives (PEOs)

PEO 1: Graduate will have Fundamental & multidisciplinary knowledge with an ability to analyze, design, innovates and handles the realistic problems.

PEO 2: Graduate will possess ethical conduct, sense of responsibility to serve society and protect the environment.

PEO 3: Graduate will have strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.

Program Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSOs)

PSO1. Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.

PSO2. Exhibit the knowledge and skills in the field of Mechanical & Allied engineering concepts.

PSO3. Apply the knowledge of skills in HVAC&R and Automobile engineering.

MAPPING OF THE INSTITUTE MISSION STATEMENT WITH OF INSTITUTES VISION STATEMENT

To **evolve and develop skill based systems** for **effective delivery of knowledge** so as to equip young professionals with **dedication & commitment** to excellence in all spheres of life	To create knowledge based society with **scientific temper**, **team spirit** and **dignity of labor** to face the global competitive challenges		
	IV1: Scientific temper	**IV2:** Team spirit	**IV3:** Dignity of labor
IM1: Evolve and develop skill based systems	2	3	2
IM2: Effective delivery of knowledge	3	1	1
IM3: Dedication &Commitment	1	2	3

MAPPING OF THE DEPARTMENT VISION STATEMENT WITH OF INSTITUTES MISSION STATEMENT

To be recognized for quality education in the field of Mechanical Engineering and identified for its innovation & excellence	To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication & commitment to excellence in all spheres of life		
	IM1: Evolve and develop skill based systems	**IM2: Effective delivery of knowledge**	**IM3: Dedication & Commitment**
DV1: To be recognized for quality education	3	3	3
DV2: To be identified for innovation	3	2	3
DV3: To be identified for excellence	3	3	3

MAPPING OF DEPARTMENTS MISSION STATEMENT WITH DEPARTMENTS VISION STATEMENT

Key Phrases of the Mission Statement of the Department	To be recognized for **quality education** in the field of Mechanical Engineering and identified for its **innovation & excellence**		
	DV1: To be recognized for quality education	**DV2: To be identified for innovation**	**DV3: To be identified for excellence**
DM1:- To provide **education** that transforms students through rigorous teaching and **thought process** to fulfill the needs of the society and industry.	3	2	2
DM2:- To **collaborate** with leading industry partners and other academic & research institutes around the world to strengthen the education and research ecosystem.	2	3	2
DM3:- To prepare students with **life-long** learning for their career by fostering in them the **ethical technical** capabilities pertinent to mechanical & allied engineering.	3	2	3

MAPPING OF PEOs STATEMENT WITH MISSION STATEMENT OF THE DEPARTMENT

PEOs	PEO Statements	M1	M2	M3
PEO 1	Graduate will have Fundamental & multidisciplinary knowledge with an ability to analyze, design, innovate and handle the realistic problems.	3	2	2
PEO 2	Graduate will Possess ethical conduct, sense of responsibility to serve society and protect the environment.	2	2	3
PEO 3	Graduate will have strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.	2	3	2

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MAPPING OF DEPARTMENT PSOs STATEMENT WITH DEPARTMENT MISSION STATEMENT

PSO Statements	Key Phrases of the Mission of the Department		
	DM1:- To **provide education** that transforms students through rigorous teaching and thought process **to fulfill the needs of the society and industry.**	DM2:- To collaborate with **leading industry partners and other academic & research institutes** around the world **to strengthen the education and research ecosystem.**	DM3:- To prepare students with **life-long learning** for their career by fostering in them the **ethical & technical capabilities** pertinent to **mechanical & allied engineering.**
PSO1:-Design, analyze and innovate solutions to technical issues in **Thermal, Production and Design Engineering.**	3	3	3
PSO2:-Exhibit the **knowledge and skills in the field of Mechanical & Allied engineering** concepts	3	2	3
PSO3:-Apply the knowledge of skills in **HVAC & R** and **Automobile engineering**	3	3	3

MAPPING OF DEPARTMENT PEO STATEMENT WITH POs STATEMENT AND DEPARTMENT PSOs

PEOs POs & PSOs	PEO 1: Graduates will have good fundamental & multidisciplinary knowledge with an ability to analyze, design, innovate and handle the realistic problems	PEO 2: Graduates will possess ethical conduct, sense of responsibility to serve society and protect the environment.	PEO 3: Graduates will have a strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career
1. Engineering knowledge:	3	-	2
2. Problem analysis:	3	-	2
3. Design/development of solutions:	3	-	2
4. Conduct investigations of complex problems:	3	-	2
5. Modern tool usage:	3	-	2
6. The engineer and society:	2	3	
7. Environment and sustainability:	2	3	2
8. Ethics:		3	3
9. Individual and team work:	1	2	3
10. Communication:	1	2	3
11. Project management and finance:	1	2	3
12. Life-long learning:	2	2	3
PSO1: Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.	3	-	2
PSO2: Exhibit the knowledge and skills in the field of Mechanical & Allied engineering concepts	3	2	2
PSO3: Apply the knowledge of skills in HVAC&R and Automobile engineering	3	3	3

MAPPING OF DEPARTMENT PSOs WITH DEPARTMENT PEOs

PSO / PEO	PSO1: Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.	PSO2: Exhibit the knowledge and skills in the field of Mechanical & Allied engineering concept	PSO3: Apply the knowledge of skills in HVAC&R and Automobile engineering
PEO 1: Graduates will have good fundamental & multidisciplinary knowledge with an ability to analyze, design, innovate and handle the realistic problems.	3	3	2
PEO 2: Graduates will possess ethical conduct, sense of responsibility to serve society and protect the environment.	1	2	3
PEO 3: Graduates will have a strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.	1	1	3

6ME3-01: MEASUREMENT AND METROLOGY
B.Tech. (Mechanical) 6th semester   Max. Marks: 100

UNIT-1
Introduction: Objective, scope and outcome of the course.

UNIT-2
Concept of measurement: General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability, Range of accuracy, Precision, Accuracy Vs precision, Uncertainty. Repeatability and reproducibility, Errors in measurement, Types of error, Systematic and random error, Calibration, Interchange ability.

UNIT-3
Linear and angular measurements: Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements:- Slip gauges, Checking of slip gauges for surface quality, Optical flat, Limit gauges:- Gauge design, Problems on gauge design, Application of limit gauges.
Comparators: Mechanical comparators, Electrical comparator, Optical comparator, Pneumatic comparator.
Sine bar, Use of sine bar, Limitations of sine bars, Sources of error in sine bars, Bevel protractor, Applications of bevel protractor, Autocollimator, Angle dekkor.

UNIT-4
Form measurement: Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors,
Surface finish measurement: Introduction, Elements of surface texture, Analysis of surface finish, Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements.

UNIT-5
Coordinate measuring machine (CMM):- Types of CMM, Features of CMM, Computer based inspection, Computer aided inspection using robots.

Measurement of power, flow and temperature related properties: Measurement of force, Direct methods, Indirect methods:- Accelerometer, Load cells, Bourdon tube.
Torque measurement: Prony brake, Torque measurement using strain gauges, Torque measurement using torsion bars, Measurement of power: Mechanical dynamometers,

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UNIT-6

Measurement of flow: Orifice meter, Venturimeter, Flow nozzle,Variable area meters–rotameter, Hot wire anemometer, Pitot tube.

Temperature measurement, Bimetallic strip, Thermocouples (Thermo electric effects), Thermistors, Pyrometers.

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Department of Mechanical Engineering, Poornima College of Engineering

Odd Semester 2021-22

ABC Analysis

Course: B. Tech. **Class/Section: IIIrd year** **Date: 04/01/2022**
Name of Faculty: Kalpit Jain **Name of Subject: M&M** **Subject Code: 6ME3-01**

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics
1			Introduction: Objective, scope and outcome of the course.	
2	Range of accuracy, Precision, Accuracy Vs precision, Uncertainty Errors in measurement, Types of error, Systematic and random error, Comparison between systematic error and random error, Correction, Calibration, Interchange ability.	General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability Comparators: Mechanical comparators, Electrical comparator	Repeatability and reproducibility Correction	
3	Checking of slip gauges for surface quality, Optical flat, Limit gauges:- Gauge design, Problems on gauge design, Application of limit gauges, Optical comparator, Pneumatic comparator, Sources of error in sine bars	Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements Slip gauges, Sine bar, Use of sine bar, Limitations of sine bars,	Bevel protractor, Applications of bevel protractor, Autocollimator Angle Dekkor**.**	
4	Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors,	Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements	Introduction, Elements of surface texture, Analysis of surface finish,	

5	Prony brake, Torque measurement using strain gauges, Torque measurement using torsion bars, Measurement of power: Mechanical dynamometers,	Measurement of force, Direct methods, Indirect methods:- Accelerometer, Load cells, Bourdon tube.	Coordinate measuring machine (CMM):- Types of CMM, Features of CMM, Computer based inspection, Computer aided inspection using robots	
6	Temperature measurement, Bimetallic strip,	Orifice meter, Venturimeter, Flow nozzle, Variable area meters– rotameter, Hot wire anemometer, Pitot tube.	Thermocouples (Thermo electric effects), Thermistors, Pyrometers.	

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DEPARTMENT OF MECHANICAL ENGINEERING

1. Course Outcomes

CO1: Describe the measuring concept and working principle of metrological instruments.

CO2: Identify the appropriate measuring device and method as per their application.

CO3: Apply metrological concept for measuring engineering parameters.

CO4: Evaluate various parameters of measurement in Instrumentation and Metrological Engineering.

2. CO-PO-PSO Mapping: Mapping Levels: 1- Low, 2- Moderate, 3-Strong

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-	3	2	-

CO-PO Justification

CO1	PO1	Students will be able to apply the science and engineering fundamentals of subject to solve complex engineering problems so it can be strongly mapped with PO1.
CO2	PO2	Students will be able to identify the complex engineering problems so it can be moderately mapped with PO2.
CO3	PO2	Students will be able to apply the metrological concept after getting the knowledge of metrology so it can be moderately mapped with PO2.
CO4	PO2	Students will be able to evaluate the various parameters of measurement after getting the knowledge of metrology so it can be moderately mapped with PO2.

CO-PSO Justification

CO1	PSO1	Using basic concept of measurement and metrology student can design and analyze the solution to technical issues related to the thermal, production and design engineering. So it can be strongly mapped with PSO1.
	PSO2	Basic concept of measurement and metrology can help students to exhibit the knowledge and skill for mechanical and allied engineering. So it can be moderately mapped with PSO2.
CO2	PSO1	Identify the appropriate measuring device student can design and analyze the solution to technical issues. So it can be strongly mapped with PSO1.
	PSO2	Identify the appropriate measuring device, it can help students to exhibit the knowledge and skill for allied engineering. So it can be moderately mapped with PSO2.
CO3	PSO1	Apply metrological concept for measuring the parameters, student can design and analyze the solution to technical issues. So it can be strongly mapped with PSO1.
	PSO2	Apply metrological concept for measuring the parameters of the automobile parts. So it can be moderately mapped with PSO2.
CO4	PSO1	Evaluate various parameters of measurement in Instrumentation and Metrological Engineering, students, student can design and analyze the solution to technical issues. So it can be strongly mapped with PSO1.
	PSO2	Evaluate various parameters of measurement in Instrumentation and Metrological Engineering can help students to exhibit the knowledge and skill for mechanical and allied engineering. So it can be moderately mapped with PSO2.

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DEPARTMENT OF MECHANICAL ENGINEERING

Course Outcomes

Subject Name: Measurement and Metrology

Subject Code: 6ME3-01

Rules for CO/LO Attainment Levels: (Targets)

S. No	Tool		Attainment
1	Mid Term Examinations	B	Attainment Level 1: 40-50-% students scoring more than target 65% of marks Attainment Level 2: 50–60 % students scoring more than target 65% of marks Attainment Level 3: 60 % students scoring more than target 65% of marks
2	RTU Examinations	B	Attainment Level 1: 35-45--% students scoring more than target 60 % of marks Attainment Level 2: 45–55 % students scoring more than target 60% of marks Attainment Level 3: 55 % students scoring more than target 60% of marks
3	Tutorial / Assignment	B	Attainment Level 1: 40-50-% students scoring more than target 65% of marks Attainment Level 2: 50–60 % students scoring more than target 65% of marks Attainment Level 3: 60 % students scoring more than target 65% of marks
5	Survey and Feedback	B	Attainment Level 1: 40-50-% students scoring more than target 70% of marks Attainment Level 2: 50–60 % students scoring more than target 70% of marks Attainment Level 3: 60 % students scoring more than target 70% of marks

S. No.	Course Type	Attainment Level=1	Attainment Level=2	Attainment Level=3
1	**Theory Courses** Mid Semester Exams	Attainment Level 1: 40-50-% students scoring more than target 65% of marks	Attainment Level 2: 50–60 % students scoring more than target 65% of marks	Attainment Level 3: 60 % students scoring more than target 65% of marks
2	**Theory Courses** University Exam	Attainment Level 1: 35-45--% students scoring more than target 60 % of marks	Attainment Level 2: 45–55 % students scoring more than target 60% of marks	Attainment Level 3: 55 % students scoring more than target 60% of marks
6	**Assignments/Unit Test**	Attainment Level 1: 40-50-% students scoring more than target 65% of marks	Attainment Level 2: 50–60 % students scoring more than target 65% of marks	Attainment Level 3: 60 % students scoring more than target 65% of marks
7	Any other			

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CO wise Assessment Activities (as Mentioned In Session Plan):

Attainment of Course Outcomes

List of assessment processes for the evaluation of CO attainment

Course Type	Processes (Tools)	CO / LO	Assessment Frequency	Facilitator
Theory	Tutorial/Assignment/ Quiz	CO	As per the course requirement	Course Coordinator
	Mid Team	CO	**Mid Term-I:** In the middle of the semester (60% course coverage)	Exam Cell
			Mid Term-II: At the end of semester (40% course coverage)	
	Survey	CO	Once: End of semester	Course Coordinator
	University exams	CO	Once: End of semester	Rajasthan Technical University

Detail assessment processes for each category course has been elaborated considering maximum marks 100 as described below:-

Theory assessment process for the evaluation of CO attainment

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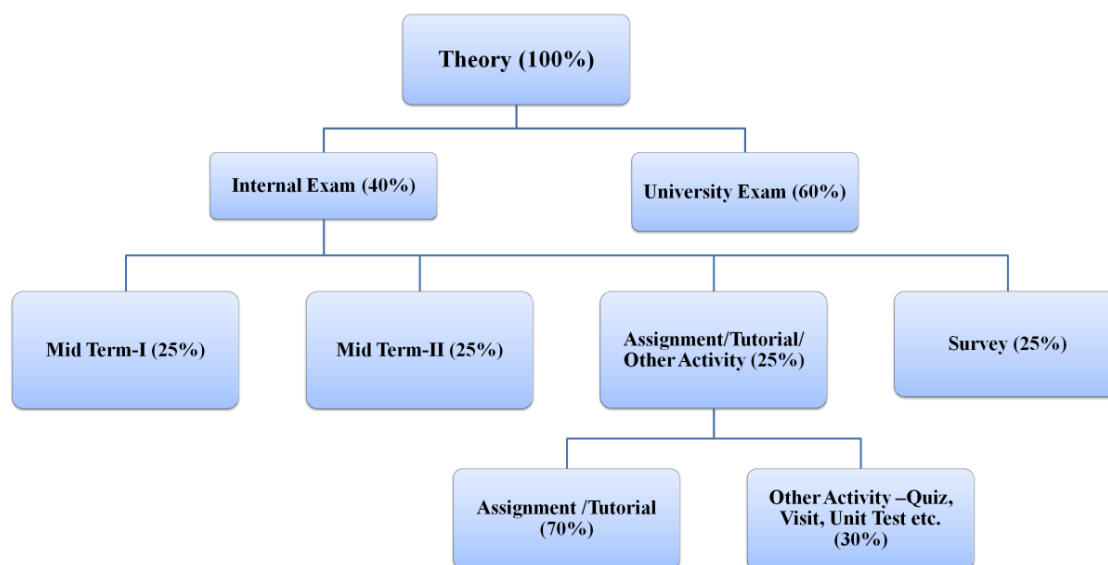# Course Outcome Attainment Process:

Figure Course Outcome attainment Process

CO	Assignment 1	Assignment 2	Mid 1	Mid 2
CO1	Y	Y	Y	Y
CO2	Y	Y	Y	Y
CO3	Y	Y	Y	Y
CO4	Y	Y	Y	Y

CO wise Assessment Activities:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	2	-	-	-	-	--	-	-	-	-	-	3	2	-

Activity wise Assessment Tools:

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	Assignment 1	Direct	Marks	5	For CO1,CO2,CO3,CO4
2.	Assignment 2	Direct	Marks	5	For CO1,CO2,CO3,CO4
3.	Mid Term 1	Direct	Marks	10	For CO1,CO2,CO3,CO4
4.	Mid Term 2	Direct	Marks	10	For CO1,CO2,CO3,CO4
5.	University	Direct	Marks	60	For CO1,CO2,CO3,CO4
6.	Survey	Direct	Marks	10	For CO1,CO2,CO3,CO4
Note that for every rubrics you need to decide assessment criteria, range of marks or weightage – above values are indicative					

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BLOWN UP SYLLABUS

Campus: PCE	Course: B.TECH	Class/Section: 3 Year	Date: 04/01/2022
Name of Faculty: Kalpit Jain		Name of Sub: Measurement and Metrology	Code:6ME3-01

S.No.	Topic as per Syllabus	BLOWN UP TOPICS (Up to 10 TIMES SYLLABUS)
1	**UNIT:-1** Introduction: Objective, scope and outcome of the course.	1.1 Objective 1.2 Scope and 1.3 Outcome of the course.
2.1	**UNIT:-2** **Concept of Measurement:-** Introduction to measurement.	2.1.1 What is measurement? 2.1.2 Definition of measurement. 2.1.3 Need for measurement. 2.1.4 Measuring systems.
2.2	Basics regarding measurement.	2.2.1 Units. 2.2.2 System of units. 2.2.3 Symbol of units. 2.2.4 Definition of units.
2.3	Standards.	2.3.1 Standards. 2.3.2 System of standards. 2.3.3 Line standard. 2.3.4 End standard.

2.4	Measuring instruments.	2.4.1 Sensitivity. 2.4.2 Definition of sensitivity. 2.4.3 Readability.
.		
2.5	Precision and accuracy.	2.5.1 Definition of accuracy. 2.5.2 Definition of precision. 2.5.3 Requirement for accuracy. 2.5.4 Accuracy and cost. 2.5.6 Elements of accuracy in measuring system.
2.6	Uncertainty.	2.6.1 Need for uncertainty.
	UNIT:-3 **Linear and angular measurement:-**	
3.1	Linear measuring instrument.	3.1.1 Vernier Calipers. 3.1.2 Definition of Vernier caliper. 3.1.3 Reading the Vernier scale. 3.1.4 Types of Vernier calipers. 3.1.5 Errors in measurement with Vernier caliper. 3.1.6 Precaution in use of Vernier caliper. 3.1.7 Micrometer. 3.1.8 Definition of micrometer. 3.1.9 Description and parts of micrometer. 3.1.10 Important terms in micrometer.
3.2	Interval measurement.	3.2.1 Slip gauges. 3.2.2 Classification of slip gauges. 3.2.3 Major requirement of slip gauges. 3.2.4 Checking of slip gauges for surface quality. 3.2.5 Optical flats. 3.2.6 Definition of optical flats.

		3.2.7 Types of optical flats.
		3.2.8 Testing of Optical flats.
		3.2.8.1 Flatness test.
		3.2.8.2 Parallelism test.
3.3	Limit gauge.	3.3.1 Gauge design.
		3.3.2 Taylor's Principle.
		3.3.3 Wear allowance consideration on Gauge Maker's.
		3.3.4 Important Points for design.
		3.3.5 Limit Gauges.
		3.3.6 Types of limit gauges.
		3.3.6.1 Full form cylindrical plug gauge.
		3.3.6.2 Full form spherical plug or disc gauge.
		3.3.6.3 Segmental cylindrical bar gauge.
		3.3.7 Problems on gauge design.
		3.3.8 Application on gauge design.
3.4	Comparators.	3.4.1 Comparators.
		3.4.2 Introduction to comparators.
		3.4.3 Classification of comparators.
		3.4.4 Characteristics of comparators.
		3.4.5 Uses of comparators.
		3.4.6 Advantages of comparators.
		3.4.7 Disadvantages of comparators.
		3.4.8 Mechanical comparators.
		3.4.8.1 Types of mechanical comparator.
		3.4.9 Electrical comparators.
		3.4.10 Optical comparators.
		3.4.11 Pneumatic comparators.
3.5	Sine bar.	3.5.1 Introduction to sine bar.
		3.5.2 Measuring angle with sine bar.
		3.5.3 Uses of sine bar.
		3.5.4 Limitations of sine bar.
		3.5.5 Errors in sine bar.
3.6	Bevel protractor.	3.6.1 Introduction to protractor.
		3.6.2 Universal bevel protractor.
		3.6.3 Applications of bevel protractor.

4.1	**UNIT:-4** **Form measurement:-** Introduction to form measurement.	4.1.1 Definition of form measurement.
4.2	Screw thread measurement.	4.2.1 Introduction to screw threads. 4.2.2 Screw thread terminology. 4.2.3 Thread Gauges.
4.3	Measurement of gears.	4.3.1 Gear errors.

4.4	Surface finish measurement.	4.4.1 Introduction to surface finish.
		
		4.4.2 Meaning of surface texture.
		
		4.4.3 Elements of surface finish.
		
		4.4.4 Analysis of surface finish.
		
		4.4.5 Methods of measuring surface finish.
		
		    3.4.5.1 Surface inspection of comparisons method.
		
		    3.4.5.2 Direct instrument method.
		
		4.4.6 Straightness measurement.
		
		4.4.7 Flatness testing.
		
		4.4.8 Roundness measurement.

5.1 5.2	**UNIT:-5** Co-ordinate Measuring Machines.	5.1.1 Introduction to CMM. 5.1.2 Features of CMM. 5.1.3 Causes of error in CMM. 5.1.4 Accuracy specification for CMM> 5.1.5 Types of CMM. 5.1.6 Applications of CMM.

	Computer based inspection.	5.2.1 Introduction to computer based inspection.
5.3	**Measurement of power, flow and temperature related properties:-** Measurement of force.	
5.4	Toque Measurement	5.3.1 Introduction to measurement of force. 5.3.2 Methods of measuring the force. 5.3.3 Direct method. 5.2.1.1 Analytical balance. 5.2.1.2 Platform balance. 5.3.4 Accelerometer. 5.3.5 Load cells. 5.3.6 Bourdon tube. 5.4.1 Introduction to torque measurement. 5.4.2 Reasons of torque measurement. 5.4.3 Torque measurement types. 5.4.3.1 Torsion-bar dynamometer. 5.4.3.2 Servo controlled dynamometer. 5.4.3.3 Absorption dynamometer. 5.4.4 Torque measurement using strain gauges.
5.5	Dynamometer	5.5.1 Mechanical dynamometers. 5.5.2 D.C dynamometers. 5.5.3 Eddy current or inductor dynamometer.
	UNIT:-6	
6.1	Measurement of flow.	6.1 Variable area meters:- 6.1.1 Rota meter. 6.1.2 Hot wire anemometer. 6.1.3 Pitot tube.
6.2	Temperature measurement	6.2 Temperature measurement:- 6.2.1 Bimetallic strip.
6.3	Calibration of temperature measuring devices:-	6.3 Calibration of temperature measuring devices:- 6.3.1 Thermocouples.

		6.3.2 Thermistors. 6.3.3 Pyrometers.

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE PLAN (Deployment)

Campus: Poornima College of Engineering Class/Section: 3rd A Date: 04 Jan. 2022

Course: B.Tech.

Name of Faculty: Kalpit Jain Name of Subject :Measurement & Metrology Code: 6ME3-01

Lecture No.	Topics	CO/LO	Target Date of Coverage	Actual Date of Coverage	Teaching method	Ref. Book/Journal with Page No.
1	**Zero lecture**		24/01/22	24/01/22	Online+PPT	
2	**UNIT-1**	CO1	31/01/22	02/02/22	Online+PPT	
3	**UNIT-2** **Introduction to Unit** **Introduction to lecture** 2.1.1 What is measurement? 2.1.2 Definition of measurement 2.1.3 Need for measurement. 2.1.4 Measuring systems. **Conclusion of the lecture** **Brief of next lecture**	CO1	31/01/22	15/03/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
4	**Introduction to lecture** 2.2.1 Units. 2.2.2 System of units. 2.2.3 Symbol of units. 2.2.4 Definition of units. **Conclusion of the lecture** **Brief of next lecture**	CO1	02/02/22	17/03/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
5	**Introduction to lecture** 2.3.1 Standards. 2.3.2 System of standards. 2.3.3 Line standard. 2.3.4 End standard. **Conclusion of the lecture** **Brief of next lecture**	CO1	07/02/22	18/03/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher

1

6	**Introduction to lecture** 2.4.1 Sensitivity. 2.4.2 Definition of sensitivity. 2.4.3 Readability. **Conclusion of the lecture** **Brief of next lecture**	CO2	07/02/22	01/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
7	**Introduction to lecture** 2.5.1 Definition of accuracy. 2.5.2 Definition of precision. 2.5.3 Requirement for accuracy. 2.5.4 Accuracy and cost. 2.5.6 Elements of accuracy in measuring system. **Conclusion of the lecture** **Brief of next lecture**	CO1	09/02/22	04/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
8	**Introduction to lecture** 2.6.1 Need for uncertainty. **Conclusion of the lecture** **Brief of next lecture**	CO1	14/02/22	04/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
9	**UNIT-3** **Introduction to Unit** **Introduction to lecture** 3.1.1 Vernier Calipers. 3.1.2 Definition of Vernier caliper. 3.1.3 Reading the Vernier scale. 3.1.4 Types of Vernier calipers. 3.1.5 Errors in measurement with Vernier caliper. **Conclusion of the lecture** **Brief of next lecture**	CO3	15/03/22	04/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
10	**Introduction to lecture** 3.1.6 Precaution in use of Vernier caliper. 3.1.7 Micrometer. 33.1.8 Definition of micrometer. 3.1.9 Description and parts of micrometer. 3.1.10 Important terms in micrometer. **Conclusion of the lecture** **Brief of next lecture**	CO3	17/03/22	04/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
11	**Introduction to lecture** 3.2.1 Slip gauges.	CO3	18/03/22	05/04/22		Engineering Metrology

	3.2.2 Classification of slip gauges. 3.2.3 Major requirement of slip gauges. 3.2.4 Checking of slip gauges for surface quality. **Conclusion of the lecture** **Brief of next lecture**				Chalk & Board	by R K Jain, Khanna Publisher
12	**Introduction to lecture** 3.2.5 Optical flats. 3.2.6 Definition of optical flats. 3.2.7 Types of optical flats. 3.2.8 Testing of Optical flats. 3.2.8.1 Flatness test. 3.2.8.2 Parallelism test. **Conclusion of the lecture** **Brief of next lecture**	CO3	22/03/22	05/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
13	**Introduction to lecture** 3.3.1 Gauge design. 3.3.2 Taylor's Principle. 3.3.3 Wear allowance consideration on Gauge Maker's. 3.3.4 Important Points for design. 3.3.5 Limit Gauges. 3.3.6 Types of limit gauges. **Conclusion of the lecture** **Brief of next lecture**	CO4	24/03/22	05/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
14	**Introduction to lecture** 3.3.6.1 Full form cylindrical plug gauge. 3.3.6.2 Full form spherical plug or disc gauge. 3.3.6.3 Segmental cylindrical bar gauge. 3.3.6.4 3 Segmental spherical plug gauge. 3.3.7 Problems on gauge design. 3.3.8 Application on gauge design 3.2.8.2 Parallelism test. **Conclusion of the lecture** **Brief of next lecture**	CO3	25/03/22	07/04/2022	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
15	**Introduction to lecture** 3.4.1 Comparators. 3.4.2 Introduction to comparators. 3.4.3 Classification of comparators.	CO1	29/03/22	08/04/2022	Chalk & Board	Engineering Metrology by R K Jain, Khanna

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						Publisher
	3.4.4 Characteristics of comparators. 2.4.5 Uses of comparators. 3.4.6 Advantages of comparators. 3.4.7 Disadvantages of comparators. 3.4.8 Mechanical comparators. 3.4.8.1 Types of mechanical comparator. 3.4.9 Electrical comparators. 3.4.10 Optical comparators. 3.4.11 Pneumatic comparators. **Conclusion of the lecture** **Brief of next lecture**					
16	**Introduction to lecture** 3.5.1 Introduction to sine bar. 3.5.2 Measuring angle with sine bar. 3.5.3 Uses of sine bar. 3.5.4 Limitations of sine bar. 3.5.5 Errors in sine bar. **Conclusion of the lecture** **Brief of next lecture**	CO3	31/03/22	15/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
17	**Introduction to lecture** 3.6.1 Introduction to protractor. 3.6.2 Universal bevel protractor. 3.6.3 Applications of bevel protractor. **Conclusion of the lecture** **Brief of next lecture**	CO1	01/04/22	19/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
18	**Introduction to lecture** 3.7.1 Introduction to auto collimator. 3.7.2 Types of auto collimator. 3.7.3 Angle Dekkor **Conclusion of the lecture** **Brief of next lecture**	CO1	05/04/22	19/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
19	**Introduction to lecture** **Revision of Unit-1 & Unit-2** **Conclusion of the lecture** **Brief of next lecture**	CO1	07/04/22	20/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
20	**UNIT-4** **Introduction to Unit** **Introduction to lecture** 4.1.1 Definition of form measurement.	CO2	08/04/22	21/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher

	4.2.1 Introduction to screw threads. 4.2.2 Screw thread terminology. **Conclusion of the lecture** **Brief of next lecture**					
21	**Introduction to lecture** 4.3.1 Thread Gauges. 4.3.2 Gear errors. **Conclusion of the lecture** **Brief of next lecture**	CO2	19/04/22	22/04/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
22	**Introduction to lecture** 4.4.1 Introduction to surface finish. 4.4.2 Meaning of surface texture. 4.4.3 Elements of surface finish. **Conclusion of the lecture** **Brief of next lecture.**	CO3	21/04/22	12/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
23	**Introduction to lecture** 4.5.1 Elements of surface finish. 4.5.2 Analysis of surface finish. **Conclusion of the lecture** **Brief of next lecture.**	CO1	22/04/22	12/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
24	**Introduction to lecture** 4.6.1 Methods of measuring surface finish. 4.6.2 Surface inspection of comparisons method. 4.6.3 Direct instrument method. **Conclusion of the lecture** **Brief of next lecture.**	CO2	09/05/22	13/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
25	**Introduction to lecture** 4.7.1 Straightness measurement. 4.7.2 Flatness testing. 4.7.3 Roundness measurement. **Conclusion of the lecture** **Brief of next lecture.**	CO2	11/05/22	13/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
26	**Introduction to lecture** **Revision of Unit**	CO1	12/05/22	14/05/22	Chalk & Board	Engineering Metrology

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					Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
	Conclusion of the unit **Brief of next unit**					
27	**UNIT-5** **Introduction to lecture** 5.1 Introduction to CMM. 5.2 Features of CMM. 5.3 Causes of error in CMM. 5.4 Accuracy specification for CMM> 5.5 Types of CMM. 5.6 Applications of CMM **Conclusion of the lecture** **Brief of next lecture.**	CO1	13/05/22	14/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
28	**Introduction to lecture** 5.7 Various tests for surface grinders. 5.8 Introduction to computer based inspection. 5.9 Introduction to inspection using robots. **Conclusion of the unit** **Brief of next unit**	CO1	16/05/22	16/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
29	**Introduction to lecture** 5.10 Introduction to measurement of force. 5.11 Methods of measuring the force. 5.12 Direct method. 5.13 Analytical balance. 5.14 Platform balance. **Conclusion of the lecture** **Brief of next lecture.**	CO2	18/05/22	18/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
30	**Introduction to lecture** 5.15 Accelerometer. 5.16 Load cells. 5.17 Bourdon tube. **Conclusion of the lecture** **Brief of next lecture.**	CO1	19/05/22	19/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher

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31	**Introduction to lecture** 5.18 Introduction to torque measurement. 5.19 Reasons of torque measurement. 5.20 Torque measurement types. 5.21 Torsion-bar dynamometer. 5.22 Servo controlled dynamometer. 5.23 Absorption dynamometer.. **Conclusion of the lecture** **Brief of next lecture.**	CO2	20/05/22	19/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
32	**Introduction to lecture** 5.24 Torque measurement using strain gauges. 5.25 Mechanical dynamometers. 5.26 D.C dynamometers. 5.27 Eddy current or inductor dynamometer. **Conclusion of the lecture** **Brief of next lecture.**	CO1 CO2	23/05/22	20/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
33	**UNIT-6** **Introduction to lecture** 6.1 Orifice meter. 6.2 Venturimeter. 6.3 Flow nozzle. 6.4 Variable area meters:- 6.4.1 Rota meter. 6.4.2 Hot wire anemometer. 6.4.3 Pitot tube. **Conclusion of the lecture** **Brief of next lecture.**	CO2	25/05/22	23/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
34	**Introduction to lecture** 6.5 Temperature measurement:- 6.5.1 Bimetallic strip. 6.6 Calibration of temperature measuring devices:- 6.6.1 Thermopcouples. 6.6.2 Thermistors. 6.6.3 Pyrometers. **Conclusion of the unit** **Brief of next unit**	CO2	26/05/22	25/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher

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35	**REVISION CLASS**		27/05/22	26/05/22	Chalk & Board	Engineering Metrology by R K Jain, Khanna Publisher
		CO1				

5E6203

B. Tech. V Sem. (Main / Back) Exam., Dec. 2014
Mechanical Engg.
5ME3A Measurement & Metrology
(Common with PI, ME)

Time: 3 Hours   **Maximum Marks: 80**
                                                          Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL_____   2. NIL_____

UNIT – I

Q. 1 (a) Explain the terms Interchangeability, precision, reproducibility and accuracy as applied to the method of measurements, with examples?   [8]

(b) How accuracy and sensitivity of a measuring instrument is distinguish, elaborate with an example? Compare systematic error with random error.   [8]

OR

(a) Explain various type of error in measurement, and important ways to eliminate them.   [16]

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UNIT – II

Q. 2 (a) Define comparators and elaborate its various types. [8]

(b) Explain the principle of sin bar and comment on its accuracy. [8]

OR

(a) Explain the method of using vernier calliper and micrometer in linear measurement with examples/diagrams. [8]

(b) compute the slip gauge block combination necessary to check 'GO' & 'NO GO' dimensions of a limit gauge $38 \, {}^{-0.025}_{-0.064}$ mm, using M87 special set as per IS:2984

  [8]

UNIT – III

Q. 3 (a) While measuring the effective diameter of an external screw thread; gauge of 3.5 mm, pitch, 30.500 mm diameter cylindrical standard and 2.000 mm wire were used. The micrometer reading over the standard & wires, and gauge & cylinders were 13.3768 and 12.2428 mm respectively. Calculate the thread gauge effective diameter. [8]

(b) In the measurement of surface roughness, height of 20 successive peaks and troughs were measured from a reference datum. These were: 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If these measurements were obtained over a length of 20 mm. determine the CLA and RMS value of a rough surface. [8]

OR

(a) Why assessment of the surface texture is important? Describe two method used for obtaining a numerical value of the texture from a given graphical record. [8]

(b) Elaborate various gear error and comment on the problems of gear measurement.

  [8]

UNIT – IV

Q. 4 Write short note on (any two):

    (a)   Laser interferometry

    (b)   Alignment test on lathe

    (c)   Scanning laser gauge   [16]

OR

    (a)   Distinguish 'alignment test' from 'performance test' of machine tools with example.   [8]

    (b)   Explain various geometrical checks on machine tools and explain acceptance test for surface grinder.   [8]

UNIT –V

Q. 5 (a)   Write short note on (any one):

    (a)   Measurement of force

    (b)   Measurement of power   [16]

OR

    (a)   Write short note on (any one):

    (a)   Measurement of flow

    (b)   Measurement of temperature   [16]

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5E6203

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME3A Measurement & Metrology
Common with PI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL   2. NIL

UNIT-I

Q.1 (a) Explain accuracy and precision with suitable examples.   [8]

(b) Define error in measurement. Explain various types of errors in measurement. [8]

OR

Q.1 Write brief notes on following: [4×4=16]

(a) Correction

(b) Calibration

(c) Interchangeability

(d) Repeatability and reproducibility

UNIT-II

Q.2 Enlist various types of comparators. And explain working of electrical and mechanical comparator with sketches. [16]

OR

Q.2 Write brief notes on following: [4×4=16]

   (a)   Micrometer

   (b)   Slip gauges

   (c)   Optical flat

   (d)   Sine bar

UNIT-III

Q.3 (a) Define any eight terms from screw thread terminology. [8]

   (b)   Calculate the effective diameter of screw if the diameter over standard cylinder with two wires is 15.64mm, diameter over plug screw gauge is 15.26mm, pitch thread is 2.5mm, wire diameter is 2mm and standard cylinder diameter is 18mm. [8]

OR

Q.3 (a) Explain any two direct methods of surface roughness measurement. [8]

   (b)   In the measurement of surface roughness, heights of 20 peaks and valleys were measured in microns from a datum over a length of 20 mm, calculate the CLA and RMS values for surface. [4+4=8]

      35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20

UNIT-IV

Q.4 (a) What are CMM probes? Explain various types of CMM probes. [8]

   (b)   What is Laser interferometry? Explain working of Laser telemetric system. [8]

Q.4 Describe the use of Laser in alignment tests on lathe, milling machine and pillar type drilling machine. [16]

UNIT-V

Q.5 (a) What are the direct and indirect methods of force measurement? Explain various types of load cells. [8]

(b) Explain the working of Bourdon tube type pressure gauge with a neat sketch. [8]

OR

Q.5 Explain following in brief - [4×4=16]

(a) Orifice meter

(b) Venturimeter

(a) Thermistors

(b) Pyrometers

5E6203

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Mechanical Engineering
5ME3A Measurement & Metrology
Common with EI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL _____   2. NIL _____

UNIT – I

Q.1 (a) Draw the block diagram of generalized measurement system and explain different stages with examples. [8]

(b) Distinguish between Repeatability and Reproducibility & Systematic and Random Errors. [8]

OR

Q.1 Define the following terms: - [16]

(a) Measurand,   (b) Metrology,

(c) True size,   (d) Actual size,

(e) Hysteresis,   (f) Span,

(g) Resolution,   (h) Standards

UNIT – II

Q.2 (a) Explain the working principle of mechanical comparator and briefly explain its applications. [8]

(b) State and explain the Tyler's principle of gauge design. [8]

OR

Q.2 (a) What is sine bar? Write its use, limitations and applications. [8]

(b) Describe the principle and construction details of Vernier Caliper & Bevel Protractor. [8]

UNIT – III

Q.3 (a) What is surface metrology? Why surface finish is important in engineering applications? Define surface roughness. [8]

(b) Calculate the CLA (Ra) value of a surface for which the sampling length was 0.8 mm. The graph was drawn to a vertical magnification of 10,000 and a horizontal magnification of 100 and the area above and below the datum line were: [8]

Above (mm^2):   150   80   170   40
Below (mm^2):   80   60   150   120

OR

Q.3 (a) Define gear terminology with sketch. Discuss and explain the gear errors. [8]

(b) Explain the working principle of gear tooth caliper and Parkinson gear tester. [8]

UNIT – IV

Q.4 (a) How laser interferometry can be utilized for measurement? Discuss its applications and limitations. [8]

(b) Explain the working metrology of laser scanning gouge with neat sketch, and limitations. [8]

OR

Q.4 (a) Write the name of equipments for alignment test. Discuss the working principle, advantages and applications of pillar type drilling machine. [8]

(b) Explain the coordinate measuring machine with respect to its types, features and advanced technologies. [8]

UNIT – V

Q.5 (a) Differentiate the direct methods and indirect methods for measurement. Explain the working principle of load cell with neat sketch. [8]

(b) Differentiate the Orifice meter and Venturimeter with respect to neat sketch, use and limitations. [8]

OR

Q.5 (a) What is flow? How hot wire anemometer can be utilized for flow measurement? [8]

(b) Explain the thermoelectric effect? Compare the working principle for thermocouples and thermistors. [8]

Campus: PCE   **Course: B.TECH**   **Class/Section: 3rd Year**

Name of Faculty: Kalpit Jain

Zero Lecture

1). Name of Subject: Measurement & Metrology   Code: 6ME3-01

2). Self-Introduction:
a). Name :Kalpit Jain
b). Qualification: M.Tech (Production Engineering)
c). Designation:Asst.Prof
d). Research Area: Production Engineering
e). E-mail Id: Kalpit.jain @poornima.org
f). Other details:
Subject taken (i) Automobile Engineering, (ii) Engineering Thermodynamics
              (iii) Industrial Engineering-I,   (iv) Operation Management
              (v) Manufacturing Processes   (vi) Machining and Machine Tools
              (vii) Manufacturing Science & Technology (viii) Robotics

3). Introduction of Students:
a*). Records of students in 12th*

Sr. No.	Average result of 12th	Name of student scored highest marks	Marks 60% above (No. of students)	Marks between 40%-60% (No. of students)	English Medium Students (No.)	Hindi Medium Students (No.)	No. of Hostellers	No. of Day Scholar
1	65.83%	Akshit Singh (87.2%)	35	18	41	17	14	44

b*). Name of best students based on previous results:*

I Sem.			II Sem.		
Registration No	**Name of Students**	**SGPA %**	**Registration No**	**Name of Students**	**SGPA %**
PCE19ME043	RAVI SHARMA	85.12	PCE19ME009	AKSHIT SINGH	96.10
PCE19ME029	MANVENDRA PRATAP SINGH CHAUHAN	84.88	PCE19ME029	MANVENDRA PRATAP SINGH CHAUHAN	95.61
PCE19ME511	SHIVAM BHAT	83.90	PCE19ME043	RAVI SHARMA	93.90
PCE19ME022	JIGNESH SAINI	77.80	PCE19ME511	SHIVAM BHAT	
PCE19ME512	JATINDER SINGH	77.07	PCE19ME053	UMES	

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III Sem.			IV Sem.		
Registration No	Name of Students	SGPA %	Registration No	Name of Students	SGPA %
PCE19ME009	AKSHIT SINGH	102.86	PCE19ME029	MANVENDRA PRATAP SINGH CHAUHAN	98.3
PCE19ME029	MANVENDRA PRATAP SINGH CHAUHAN	102.65	PCE19ME043	RAVI SHARMA	96.17
PCE19ME043	RAVI SHARMA	100.00	PCE19ME511	SHIVAM BHAT	95.74
PCE19ME511	SHIVAM BHAT	99.39	PCE20ME801	AMARJEET KUMAR	95.32
PCE19ME052	UMESH KUMAR	95.10	PCE19ME018	GARIMA SINGH	93.83

c) Department Vision, Mission, PEOs, POs and PSOs:

Vision:-

To generate well trained & skilled workforce with life-long learning in the field of Mechanical Engineering.

Mission:-

- To provide education that transforms students through rigorous teaching and thought process to fulfill the needs of the society and industry.
- To collaborate with leading industry partners and other academic & research institutes around the world to strengthen the education and research ecosystem.
- To prepare students with life-long learning for their career by fostering in them the ethical & technical capabilities pertinent to mechanical & allied engineering.

Program Educational Objectives (PEOs)

- Graduates will have good fundamental & multidisciplinary knowledge with an ability to analyze, design, innovate and handle the realistic problems.
- Graduates will possess ethical conduct, sense of responsibility to serve society and protect the environment.
- Graduates will have a strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

- Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.
- Exhibit the knowledge and skills in the field of Mechanical & Allied engineering concepts.
- Apply the knowledge of skills in HVAC&R and Automobile engineering.

4). Instructional Language: - 100%English

5). Introduction to subject: -

a). Relevance to Branch: Scientific or fundamental metrology concerns the establishment of quantity systems, unit systems, units of measurement, the development of new measurement methods, realization of measurement standards and the transfer of traceability from these standards to users in society. As without measurement no one can survive in the society.

b). Relevance to Society: Measurement has become a natural part of our everyday life. We require measurement for measuring lengths, temperature, and force. Measurements mean determination of anything that exists in some amount. Measurement of any quantity is essential in order to control it. For ex, one must be able to measure a variable such as 'temperature' or 'flow' in order to control it. The accuracy of control is dependent on the accuracy of measurement. Hence, good knowledge of measurement is essential for design of systems.

c). Relevance to Self: As an Engineer, a material problem is selecting the right from the many thousands that are available. There are several criteria on which the final decision is normally based. The more familiar an engineer is with the various characteristics and structure-property relationships, as well as processing techniques of materials, the more proficient and confident he or she will be to make judicious choices.

d). Relation with laboratory: In the lab we are emphasizing more on practical approach of measurement rather than having theoretical knowledge of the various mechanical and metrological instruments and unless an experiment is not performed by ourselves, the theory knowledge is of no use.

e) Connection with previous year and next year: In previous year, students have performed the experiment in form practical in Production Engineering Lab (5ME4-23) and next year students again perform the experiments in Metrology Lab (8ME4-22).

f) *Significance of Gate:* Graduate Aptitude Test in Engineering (GATE) is an all-India examination being conducted and administered by the Indian Institute of Science and seven Indian Institutes of Technology. It is conducted by the National Coordination Board GATE, Department of Higher Education, Ministry of Human Resource Development, and Government of India. Clearing GATE is also eligibility to (i) Higher Execution ME./M.Tech (ii) Junior Research Fellowship in CSIR Laboratories (iii) PSU, & Many more

g) Connection with Poornima Mission for becoming English Proficient Institution (PMEPI):
English language is widely used in official communications. It is a second language in a number of multilingual countries (including India, Singapore, and the Philippines). It is the language, which is spoken globally and significance is relevant in every professional field. With the view of significance, it has become necessary to inculcate the use of English language in class and after the class. As far as branch is concerned, now mechanical engineers are working at national and international level so it has become the requirement to boast the communication up.

6). Syllabus of R.T.U. Kota

UNIT-1
Introduction: Objective, scope and outcome of the course.

UNIT-2
Concept of measurement: General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability, Range of accuracy, Precision, Accuracy Vs precision, Uncertainty. Repeatability and reproducibility, Errors in measurement, Types of error, Systematic and random error, Calibration, Interchange ability.

UNIT-3
Linear and angular measurements: Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements:- Slip gauges, Checking of slip gauges for surface quality, Optical flat, Limit gauges:- Gauge design, Problems on gauge design, Application of limit gauges.
Comparators: Mechanical comparators, Electrical comparator, Optical comparator, Pneumatic comparator.
Sine bar, Use of sine bar, Limitations of sine bars, Sources of error in sine bars, Bevel protractor, Applications of bevel protractor

UNIT-4
Form measurement: Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors,
Surface finish measurement: Introduction, Elements of surface texture, Analysis of surface finish, Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements.

UNIT-5
Coordinate measuring machine (CMM):- Types of CMM, Features of CMM, Computer based inspection,

Measurement of power, flow and temperature related properties: Measurement of force, Direct methods, Indirect methods:- Accelerometer, Load cells, Bourdon tube.
Torque measurement: Prony brake, Torque measurement using strain gauges, Torque measurement using torsion bars, Measurement of power: Mechanical dynamometers,

UNIT-6
Measurement of flow: Variable area meters–rotameter, Hot wire anemometer, Pitot tube, Temperature measurement, Bimetallic strip, Thermocouples (Thermo electric effects), Therm...

Course Outcomes: Students will able:

CO1: Describe the measuring concept and working principle of metrological instruments.
CO2: Identify the appropriate measuring device and method as per their application.
CO3: Apply metrological concept for measuring engineering parameters.
CO4: Evaluate various parameters of measurement in Instrumentation and Metrological Engineering.

b). ABC analysis (RGB method) of unit & topics

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics
1			Introduction: Objective, scope and outcome of the course.	
2	Range of accuracy, Precision, Accuracy Vs precision, Uncertainty Errors in measurement, Types of error, Systematic and random error, Comparison between systematic error and random error, Correction, Calibration, Interchange ability.	General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability Comparators: Mechanical comparators, Electrical comparator	Repeatability and reproducibility Correction	
3	Checking of slip gauges for surface quality, Optical flat, Limit gauges:- Gauge design, Problems on gauge design, Application of limit gauges, Optical comparator, Pneumatic comparator, Sources of error in sine bars	Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements Slip gauges, Sine bar, Use of sine bar, Limitations of sine bars,	Bevel protractor, Applications of bevel protractor, Autocollimator Angle Dekkor.	
4	Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors,	Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements	Introduction, Elements of surface texture, Analysis of surface finish,	
5	Prony brake, Torque measurement using strain gauges, Torque measurement using torsion bars, Measurement of power: Mechanical dynamometers,	Measurement of force, Direct methods, Indirect methods:- Accelerometer, Load cells, Bourdon tube.	Coordinate measuring machine (CMM):- Types of CMM, Features of CMM, Computer based inspection, Computer aided inspection using robots	
6	Temperature measurement, Bimetallic strip,	Orifice meter, Venturimeter, Flow nozzle, Variable area meters–rotameter, Hot wire anemometer, Pitot tube.	Thermocouples (Thermo electric effects), Thermistors, Pyrometers	

7). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	Title of Book	Authors	Publisher	Cost (Rs.)	No. of books in Library
Text Books					
T1	Metrology and Measurements	G.K. Vijayaraghavan & R. Rajappan, Engineering	A.R.S. Publications, Chennai, Fourth Edition June		34
T2	Engg Metrology and Measurements	N.V Raghavendra & L.Krishnamurthy	Oxford Higher Education	445	20
T3	Engineering Metrology	R.K.Jain	Khanna Publishers	300	12
Reference Books					
R1	Dimensional Metrology	Khare & Vajpayee	Oxford & IBH		2
R2	Metrology & Precision Engineering	Scarr	McGraw Hill		1
R3	Handbook of Industrial Metrology		ASTME		2
Websites related to subject					
1	Nptel.iitm.ac.in				
2	ocw.mit.edu				

b). Journals & Handbooks: - To give information about different Journals & Handbooks available in library related to the subject and branch.
- IEEE
- ASME
- Science Direct

c). Associations and Institutions: - To give information about different Associations and Institutions related to the subject and branch.
- Indian Society of Heating Refrigerating and Air-Conditioning Engineers (ISHRAE)
- Indian Society for Technical Education (ISTE)
- Institution of Engineers (India) (IEI)

8). Syllabus Deployment: -
a). Total weeks available for academics (excluding holidays) as per Poornima Foundation calendar-

Semester	V
No. of Working days available(Approx.)	88
No. of Weeks (Approx.)	35

- Total weeks available for special activities (as mentioned below)- 02 weeks (Approx.)

Note: Individual faculty must calculate the exact no. of lectures available according to ~~~~ etc. after consultation with HOD.

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b). Special Activities (To be approved by HOD & Dean & must be mentioned in deployment):

- Open Book Test- Once in a semester
- Quiz - Once in a semester
- Special Lectures (SPL)- Minimum 10% of total no. of lectures including following
    - i. Smart Class by the faculty, who is teaching the subject
    - ii. SPL by expert faculty
    - iii. SPL by expert from industry/academia
- Revision classes (Solving Important Question Bank):- 1 class before Mid Term and 2 classes before End Term Exam

c). Lecture schedule per week

  i). University scheme (L+T+P) = 4+0+0

Sr. No.	Name of Unit	No. of lectures	Broad Area	Degree of difficulty (High/Medium/Low)	Text/ Reference books
1.	**Introduction**	1	Concept & Outcome	L	R.K Jain
2.	**Concept of measurement**	6	Accuracy and Precision, Errors.	L	R.K Jain
3.	**Linear and angular measurements**	11	Vernier caliper Comparators	M	M.Mahajan
4.	**Form measurement and Surface finish measurement**	7	Screw thread Methods of measuring surface finish	M	M.Mahajan
5.	**Measurement of power, flow and temperature**	6	CMM & Dynamometer	H	Anand K Bewoor
6.	**Measurement of Flow**	4	Temperature and Thermocouple	M	R.K.Rajput

d). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

e). Time Distribution in lecture class: - Time allotted: 60 min.

  i. First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days + taking attendance by calling the names of the students and also sharing any new/relevant information.
  ii. Actual lecture delivery should be of 50 min.
  iii. Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
  iv. After completion of any Unit/Chapter a short quiz should be organized.
  v. During lecture student should be encouraged to ask questions**.**

Note: Pl. ensure that each student is having Lecture Note Book. Also, write on the black board day and date, name of the teacher, name of subject with code, unit and lecture no. and topics to be covered at the beginning of each lecture and ensure that students write in lecture note book. Ask students to leave 4/5 pages blank for copying the note from fellow students in case of their absenteeism.

9). Tutorial: - An essential component of Teaching- Learning process in Professional Education.

  Objective: - To enhance the recall mechanism.

  To promote logical reasoning and thinking of the students.

  To interact personally to the students for improve numerical solving ability.

a). *Tutorial processing:* - Tutorial sheet shall be provided to each students

  I[st] Phase: - It is consisting of questions to be solved in the class assignment session in test mode on perforated sheet given in tutorial notebook and to be collected & kept by respective faculty review & analysis (20 minutes).

IInd Phase: - Indicating/Initializing the weak issues/ drawback and Evaluating and providing the grade. Making a group with good student for assisting the weak students to explain/solve questions by every student on plain papers given in tutorial note book (20 minutes).

IIIrd Phase: - Solving/ explaining difficulties of lecture class and providing the new home assignment (20 minutes). To be done in tutorial note book.

b). *Home assignment shall comprise of two parts:*

Part (i) Minimum essential questions, which are to be solved and submitted by all with in specified due date.

Part (ii) Other important questions, which may also be solved and submitted for examining and guidance by teacher.

10). Examination Systems:

Sr. No.	Name of the Exam	Weightage	Max. Marks	% of passing marks	Nature of paper Theory + Numerical	Syllabus coverage (in %)	Conducted by
1.	1st Mid Term (IA)	20%	60	40 (24 marks)	T+N	67 (4 units)	College
2.	2nd Mid Term (IA)		60	40 (24 marks)	T+N	33(Remaining 2 units)	College
3.	University Exam	80%	100	33 (33 Marks)	T+N	100	RTU, Kota

11). Any other important point:- It is important to give more focus to the numerical problems and also How to solve those problems in university exams.

Mapping of CO-PO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	-	-	-	-	-	-	-	-	-	-	-
2	-	2	-	-	-	-	-	-	-	-	-	-
3	-	2	-	-	-	-	-	-	-	-	-	-
4	-	2	-	-	-	-	-	-	-	-	-	-

CO	PSO1	PSO2	PSO3
1	3	2	-
2	3	2	-
3	3	2	-
4	3	2	-

Kalpit Jain
Assistant Professor
Place & Date: Jaipur
Name of Faculty with Designation

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POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Campus: PCE .... Course: B.Tech ...... Class/Section: .... III rd yr ...... Date: 2/2/22

Name of Faculty: Kalpit Jain ...... Name of Subject: MSM ...... Code: 6ME3.01

Date (Prep.): 2/01/22 ...... Date (Del.): 2/2/22 ...... Unit No.: 1 ...... Lect. No: 02

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction

Objective of Metrology

Scope

outcome of Metrology.

IMPORTANT & RELEVANT QUESTIONS:

Q1 Explain the Concept of Measurement and Metrology.

Q2 Explain the objectives of measurement and Metrology.

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q1 Explain the Scope of Measurement & Metrology.

Q2 Define the outcomes of measurement & Metrology.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture. level of understanding of this lecture by students etc.)

Student ask about the use of various instru-ments for the measurement purpose.

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Engg. Metrology - R.K. Jain - Kh publication.

Introduction

- Metrology is a science of measurement. Measurement may be defined or divided depending upon the quantity under consideration into:

- Metrology of length

- Metrology of time. etc.

Depending upon the field of application, it is divided into industrial Metrology, medical Metrology, etc.

- Eng. Metrology is restricted to measurement of length angle and other quantities which are expressed in linear or angular terms.

- for ever kind of quantity measured, there must be a unit to measure it. This will enable the quantity to be measured in that no. of unit.

- It is also neccessary to tee weather the result is given with sufficient correctness and accuracy for a particular need or not. This will depend on the method of measurement, device etc.

In a broader sense, metrology is not limited to length and angle measurement but also concerned with numerous problem as well as practical related with measurements, such as

1) Error of measurement

2) Method of measurement based on agreed units and standard.

3) Unit of measure and their standard

4) Measuring instruments and devices

5) Accuracy of measuring instruments.

6) Industrial inspection & its various techniques.

7) Design, Mfg and testing of guages of all kind.

Scope and focus

- Improvement, optimization and harmonization of the legislative and regulatory base in the field of metrology and instrument making, trends, and prospect for their development.

- theoritical & Methodological aspects of Metrology.

- Creation of documents in the field of stand

→ ardization, certification and ensuring the uniformity of Measurement, Resources - Saving technologies, Product safety, health environmental Production.

→ Development of new & improvement of existing Methods & measuring instruments, systems for Collecting, Processing and use of metrological information.

→ Methodology of Callibration of instru -ments.

→ Metrological support of Production, operation and repair of Metrological equipments and measuring instruments.

→ Creation of new and improvement of existing tools & method of assessing the accuracy of measurements & indicators of Product quality.

objective.

The basic objective of Metrology & Measurement is to provide the required accuracy of minimum cost. Metrology would have further objectives in a modern engineering plant with diff. shops like Tool Room, M/C & press shop, Plastic shop, Pressure Die Casting shop.

In such an engineering organization, the further objectives would be as follow.

1) Thorough evaluation of newly developed product to ensure that component designed is within the process and measuring instrument capabilities available in plant.

2) To determine the Process Capabilities and ensure that these are better than the relevant Component tolerance.

3) To determine the measuring instruments capabilities and ensure that these are adequate for their respective Measurements.

4) Standardization of Measuring Method.

5) Maintenance of accuracies of Measurements.

6) To minimize the cost of inspection by effective & efficient use of facilities and to reduce the cost
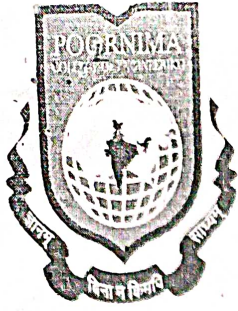
LECTURE NOTES

rejects and rework through application of SQC Techniques.

Outcomes.

1) Describe the concept of measurement like linear, angular, form, surface finish, torques measurement of power and flow along with the CMM.

2) Explain the use of instruments for measuring pressure, flow, speed, displacement and tempr.

3) Categorise all type of measurements i.e. direct, indirect, contact & non contact type.

4) Justify the working of equipments for measuring tempr, velocity, pressure.

5) Design the components with the tolerance in mfg through the concept of metrology.

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LECTURE NOTES

Campus: P.C.E. ...... Course: B.Tech. ...... Class/Section: IIIrd y.9 ...... Date: 15/3/22

Name of Faculty: Kapil Jain ...... Name of Subject: MSM ...... Code: 6MG3-01

Date (Prep.): 4/21/22 ...... Date (Del.): 15/3/22 ...... Unit No.: 02 ...... Lect. No: 3

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction

What is measurement   Measuring System.

Defination of measurement

Need of Measurement

IMPORTANT & RELEVANT QUESTIONS:

Q1   What is the Measurement & Metrology? Explain.

Q2   What is the measuring system? Explain.

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q1 Explain the need of the measurement & metrology

Q2   Define the measurement & Metrology in detail.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture. level of understanding of this lecture by students etc.)

Student understand the Concept of measurement & listen the lecture carefully.

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Engineering Metrology - R.K. Jain - Khanna

LECTURE NOTES

What is Measurement

It is the act, or the result, of a quantitative comparison b/w a predetermined standard and an unknown magnitude.

Need of Measurement

Inspection means checking of all Materials, Product or Component parts at various stages during Mfg. It is the act of Comparing Materials, Products or Components with which some established standard.

In old days the production was on a small scale, different component parts were made and assembled by the same draftman. if the part did not fit property at the time of assembly, he used to make the neccessary adjustments in either of the mating parts so that each assembly functioned properly.

"Metrology word is derived from two Greek words such as metro which means Measurement and logy which means

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Metrology is the science of precision measurement. The engg. can say, it is the science of Measurement of length and angles and all related quantities like width, depth, diameter and straightness with high accuracy.

Metrology demand fine knowledge of certain basics mathematical and physical principle. The development of industry largely depend on the engg. Metrology.

The need of inspection can be summarized as:

1) To ensure that all the part, material or component conforms to the established standard.

2) To Meet interchangeability of manufacture.

3) To maintain customer relation by ensuring that no faulty product reaches the customers.

4) It also helps to purchase the good quality of raw materials, tools, equipments which governs the quality of raw finished products.

5) It also helps to co-ordinate the function of quality control, production, purchasing and other departments of the organization.

5) To take decision on the defective parts i.e., to judge the possibility of making some of these parts acceptables after minor repairs.

Introduction of Measurements.

It is defined as the process of numerical evaluation of a dimension or the process of comparison with standard measuring instruments. The elements of measuring system include the instrumentation, calibration standard, environmental influence, human operator limitation and features of w/p.

The basic aim of measurements in industries is to check the whether a component has been manufactured to the requirement of a specification or not.

Principles.

Mech. & Production engineers are concerned with special aspects of measurement, designing

and manufacturing engineering products. The latter which vary widely in size, shape etc., have one thing common, namely, they have to be performed to a specification involving dimensional accuracy.

- Measurement is an essential part of the development of technology and as technology becomes more complex the techniques of measurement become more sophisticated.

Process and system of Measurement.

The sequence of operations neccessary for the execution of measurement is called Process of measurement.

i) Measured

ii) References

iii) Comparator.

i) **Measured**: It is the physical quantity or property like length, angle, diameter, thickness etc. to be measured.

ii) **Reference**: It is the physical quantity of or property to which comparison are made.

III) **Comparator:** It is the means of comparing measurement with some references.

Suppose, a fitter has to measure the length of m.s. flat — he first lays his rule along the flat. He then carefully align the zero end of his rule with one end of the m.s. flat/slat and finally compare the length of the flat with the graduation on his rule by his eyes, In this length of ms flat is measured, Steel rule as reference and eye can be considered as a comparator.

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Assignment Sheet NO:- 1

Campus: PCE   Course: B.Tech.   Class/Section: 3/A   Date: 10/04/2022

Name of Faculty: Kalpit Jain   Name of Subject: Measurement   Code: 6ME3-01
& Metrology

Date of Preparation:……………   Scheduled Date of Submission.................... Max. Marks:50

Question No.	Questions	COs	POs	BL
Q.1	Differentiate between sensitivity and range with suitable example.	1	1	1
Q.2	Give any four methods of measurement	1	1	1
Q.3	Define system error and correction.	1	1	1
Q.4	What is Range of measurement?	1	1	1
Q.5	Draw the block diagram of generalized measurement system and explain different stages with examples.	1	1	1
Q.6	Distinguish between Static and dynamic response.	2	2	2
Q.7	Describe the different types of errors in measurements and the causes.	2	2	2
Q.8	Explain the various systematic and random errors in measurements?	3	2	3
Q.9	What are elements of a measuring system? How they affect accuracy and precision? How error due to these elements are eliminated	4	2	3
Q.10	What is the need of calibration? Explain the classification of various measuring methods.	3	2	3

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Department of Mechanical Engineering

Batch			2019-2023			Name of Activity			Assignment-I		
Name of Course			Measurement & Metrology			Name of Faculty			Kalpit Jain		
Course Code			6ME3-01			Semester / Section			VI		

S. No.	Roll No.	Name of Students	Q. No.	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.9	Q.10
			Max. Marks:	5	5	5	5	5	5	5	5	5	5
			University Roll No	CO1	CO1	CO1	CO1	CO1	CO2	CO2	CO3	CO4	CO3
1	19EPCME001	ABHINAV SINGH .	19EPCME001	5	5	4	3	5	4	5	4	3	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	4	3	4	2	4	3	2	3	4	1
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	5	3	2	2	4	1	4	3	5	1
4	19EPCME005	ADITYA KASHYAP	19EPCME005	4	3	3	4	4	4	5	4	4	5
5	19EPCME006	AFROZ ALAM	19EPCME006	5	5	5	5	5	5	5	5	5	5
6	19EPCME007	AHIN JOHNY	19EPCME007	4	3	5	3	3	2	4	4	3	4
7	19EPCME008	AKASH KUMAR	19EPCME008	4	4	4	4	1	4	3	5	5	1
8	19EPCME009	AKSHIT SINGH .	19EPCME009	3	4	4	3	4	5	3	5	5	4
9	19EPCME011	ANIKET VERMA	19EPCME011	3	4	5	3	3	5	2	4	5	1
10	19EPCME012	ANMOL PANWAR	19EPCME012	5	5	5	5	5	4	4	4	3	5
11	19EPCME013	ANMOL SHARMA	19EPCME013	5	5	4	5	4	4	3	4	3	3
12	19EPCME016	DEEPAK SISODIA	19EPCME016	5	5	4	4	5	3	2	5	3	4
13	19EPCME017	DHRUV SINGH RATHOUR .	19EPCME017	3	5	5	4	5	5	4	5	5	4
14	19EPCME018	GARIMA SINGH	19EPCME018	5	5	4	4	5	4	5	4	5	4
15	19EPCME019	GAURAV SAINI	19EPCME019	5	5	3	5	5	5	5	5	3	4
16	19EPCME020	HARSH SHARMA	19EPCME020	3	5	5	4	5	5	4	4	5	5
17	19EPCME021	JATIN ARORA	19EPCME021	3	3	4	4	4	3	2	1	2	4
18	19EPCME022	JATINDER SINGH .	19EPCME022	4	2	5	5	4	3	3	5	5	4
19	19EPCME023	JIGNESH SAINI	19EPCME023	4	5	3	2	4	2	4	5	3	3
20	19EPCME024	JITENDRA KUMAR BAIRWA .	19EPCME024	3	2	5	3	1	3	3	3	4	3
21	19EPCME025	KAPIL SHARMA	19EPCME025	4	5	3	3	2	4	1	3	5	1
22	19EPCME026	KARTIK CHIMNANI	19EPCME026	4	5	4	4	4	5	3	3	3	5
23	19EPCME027	KRASHISH JAIN	19EPCME027	5	5	3	5	2	5	2	4	4	5
24	19EPCME029	KUNAL .	19EPCME029	3	3	3	3	2	2	3	3	5	3
25	19EPCME030	MANISH TONGARIA	19EPCME030	4	4	3	4	5	4	2	4	4	2
26	19EPCME031	MANVENDRA PRATAP SINGH CHAUHAN	19EPCME031	4	4	5	5	4	4	4	5	5	5
27	19EPCME032	NARESH KUMAR .	19EPCME032	4	4	3	3	3	4	1	3	3	2
28	19EPCME034	NIKHIL SIWASIA .	19EPCME034	5	4	5	4	4	4	3	3	4	4
29	19EPCME035	NIMAI JOSHI	19EPCME035	4	5	4	4	2	3	2	3	4	4
30	19EPCME036	OMENDRA SINGH .	19EPCME036	4	5	3	4	4	3	3	4	4	1
31	19EPCME037	PANKAJ YADAV .	19EPCME037	3	3	4	3	4	5	4	3	3	4
32	19EPCME038	PARTH VERMA .	19EPCME038	3	2	2	3	3	3	5	3	3	4
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	4	4	4	3	5	3	5	4	4	5
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	4	4	3	4	5	3	4	4	5	4
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	5	3	5	2	5	4	2	3	2	2

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36	19EPCME043	RACHIT JAIN	19EPCME043	5	4	3	4	4	4	3	4	4	5
37	19EPCME044	RAJEEV SHARMA .	19EPCME044	3	3	4	3	4	3	4	3	4	4
38	19EPCME045	RAVI SHARMA	19EPCME045	5	4	5	5	5	5	5	4	4	3
39	19EPCME047	SANDEEP SHARMA	19EPCME047	5	3	5	3	3	4	4	3	4	4
40	19EPCME049	SHISHUPAL JADOUN	19EPCME049	5	5	5	5	5	4	4	4	4	4
41	19EPCME050	SHIVAM BHAT	19EPCME050	4	4	5	5	4	4	5	4	5	5
42	19EPCME052	SUDERSEN SEN .	19EPCME052	5	4	3	2	4	4	3	5	3	5
43	19EPCME053	SUMIT SHUKLA	19EPCME053	3	4	3	3	4	3	3	4	5	3
44	19EPCME054	TUSHAR JANGID	19EPCME054	4	3	3	3	3	4	3	5	4	3
45	19EPCME055	UMESH KUMAR	19EPCME055	3	5	4	3	4	3	5	5	4	4
46	19EPCME056	UMESH YADAV	19EPCME056	4	4	2	5	4	3	4	3	3	4
47	19EPCME057	USAMA BAKHED	19EPCME057	2	4	5	2	5	5	4	4	5	4
48	19EPCME058	UTKARSH KUMAR SHARMA .	19EPCME058	3	3	5	4	5	3	3	3	3	2
49	19EPCME059	VENKTESH KUMAR KALBI	19EPCME059	4	3	3	5	2	3	4	4	4	3
50	19EPCME060	VIKASH TIWARI	19EPCME060	4	4	3	1	2	5	4	5	5	5
51	19EPCME064	YASH DAHIYA	19EPCME064	5	3	3	2	4	2	2	3	3	3
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA										
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	5	4	5	5	4	4	4	4	5	5
54	DIPLOMA	HARSHA RAJ SHISODIYA	DIPLOMA	5	5	1	3	4	2	2	4	1	3
55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	4	3	4	5	4	4	4	4	4	4
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	5	5	4	5	4	5	4	5	4	4
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	4	4	5	4	5	5	5	4	4	5
58	DIPLOMA	VIKRAM .	DIPLOMA	4	5	5	4	4	5	4	4	5	5
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	5	5	5	5	5	5	5	5	5	5

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Department of Mechanical Engineering

NBA Process Implementation

CO-PO Attainment Sheet Session 2021-2022

Batch	2019-2023	Name of Activity	Assignment-I
Name of Course	Measurement & Metrology	Name of Faculty	Kalpit Jain
Course Code	6ME3-01	Semester / Section	VI

S. No.	Roll No.	Name of Students	University Roll No	CO1 Level	CO2 Level	CO3 Level	CO4 Level	Overall CO Average Level	PO1 Level	PO2 Level	PSO1 Level	PSO2 Level
1	19EPCME001	ABHINAV SINGH.	19EPCME001	3	3	2	2	3	3	2	2	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	3	2	2	3	2	3	1	1	1
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	2	2	2	3	2	2	2	2	2
4	19EPCME005	ADITYA KASHYAP	19EPCME005	3	3	3	3	3	3	2	2	2
5	19EPCME006	AFROZ ALAM	19EPCME006	3	3	3	3	3	3	2	2	3
6	19EPCME007	AHIN JOHNY	19EPCME007	3	2	3	3	3	3	1	1	2
7	19EPCME008	AKASH KUMAR	19EPCME008	3	3	2	3	3	3	1	2	2
8	19EPCME009	AKSHIT SINGH.	19EPCME009	3	3	3	3	3	3	2	2	2
9	19EPCME011	ANIKET VERMA	19EPCME011	3	3	2	3	3	3	2	2	2
10	19EPCME012	ANMOL PANWAR	19EPCME012	3	3	3	2	3	3	2	2	2
11	19EPCME013	ANMOL SHARMA	19EPCME013	3	3	3	2	3	3	2	2	2
12	19EPCME016	DEEPAK SISODIA	19EPCME016	3	2	3	2	3	3	2	1	2
13	19EPCME017	DHRUV SINGH RATHOUR.	19EPCME017	3	3	3	3	3	3	2	2	2
14	19EPCME018	GARIMA SINGH	19EPCME018	3	3	3	3	3	3	2	2	2
15	19EPCME019	GAURAV SAINI	19EPCME019	3	3	3	2	3	3	2	2	2
16	19EPCME020	HARSH SHARMA	19EPCME020	3	3	3	3	3	3	2	2	2
17	19EPCME021	JATIN ARORA	19EPCME021	3	2	2	2	2	3	1	1	1
18	19EPCME022	JATINDER SINGH.	19EPCME022	3	2	3	3	3	3	2	1	2
19	19EPCME023	JIGNESH SAINI	19EPCME023	3	2	3	2	3	3	2	1	2
20	19EPCME024	JITENDRA KUMAR BAIRWA.	19EPCME024	2	2	2	3	2	2	2	1	2
21	19EPCME025	KAPIL SHARMA	19EPCME025	3	2	2	2	2	3	2	1	2
22	19EPCME026	KARTIK CHIMNANI	19EPCME026	3	3	3	2	3	3	2	2	2
23	19EPCME027	KRASHISH JAIN	19EPCME027	3	3	3	3	3	3	2	2	2
24	19EPCME029	KUNAL	19EPCME029	2	2	2	3	3	2	2	1	2
25	19EPCME030	MANISH TONGARIA	19EPCME030	3	2	2	3	3	3	2	1	2
26	19EPCME031	MANVENDRA PRATAP SINGH CHAUHAN	19EPCME031	3	3	3	3	3	3	2	2	2
27	19EPCME032	NARESH KUMAR.	19EPCME032	3	2	2	2	2	3	1	1	1

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#	ID	Name	CO1	CO2	CO3	CO4	CO	PO1	PO2	PSO1	PSO2
28	19EPCME034	NIKHIL SIWASIA	3	3	3	3	3	3	2	3	2
29	19EPCME035	NIMAI JOSHI	3	2	3	2	3	3	2	3	1
30	19EPCME036	OMENDRA SINGH	3	3	3	3	3	3	2	3	2
31	19EPCME037	PANKAJ YADAV	3	3	3	3	3	2	2	3	1
32	19EPCME038	PARTH VERMA	2	2	2	2	2	2	2	2	2
33	19EPCME040	PRANAV KUMAR SINGH	3	3	3	3	3	3	3	3	2
34	19EPCME041	PRITAM PRAJAPAT	3	2	3	2	3	2	2	2	1
35	19EPCME042	PRIYANSH SHARMA	3	2	2	2	2	2	2	2	1
36	19EPCME043	RACHIT JAIN	3	3	3	3	3	3	3	3	1
37	19EPCME044	RAJEEV SHARMA	3	3	3	3	3	3	3	3	2
38	19EPCME045	RAVI SHARMA	3	3	3	3	3	3	3	3	2
39	19EPCME047	SANDEEP SHARMA	3	3	3	3	3	3	3	3	1
40	19EPCME049	SHISHUPAL JADOUN	3	3	3	3	3	3	3	3	2
41	19EPCME050	SHIVAM BHAT	3	3	3	3	3	3	3	3	2
42	19EPCME052	SUDERSEN SEN	3	3	3	3	3	2	2	2	2
43	19EPCME053	SUMIT SHUKLA	3	2	3	2	3	3	3	3	1
44	19EPCME054	TUSHAR JANGID	3	3	2	3	3	3	3	2	2
45	19EPCME055	UMESH KUMAR	3	3	3	3	3	3	3	3	2
46	19EPCME056	UMESH YADAV	3	2	3	3	3	2	3	2	1
47	19EPCME057	USAMA BAKHED	3	3	3	3	3	3	3	3	2
48	19EPCME058	UTKARSH KUMAR SHARMA	3	2	2	2	2	2	2	3	1
49	19EPCME059	VENKTESH KUMAR KALBI	3	3	3	3	3	3	3	3	2
50	19EPCME060	VIKASH TIWARI	2	2	2	3	3	3	3	2	1
51	19EPCME064	YASH DAHIYA	3	3	3	2	2	2	2	3	1
52	DIPLOMA	ABHISHEK LAXKAR	3	3	3	3	3	3	3	3	2
53	DIPLOMA	AMARJEET KUMAR	3	3	3	3	3	3	3	3	2
54	DIPLOMA	HARSHA RAJ SHISODIYA	3	3	2	3	3	1	2	2	1
55	DIPLOMA	MOHAMMED FAIZAN	3	3	3	3	3	3	3	3	2
56	DIPLOMA	RAJ SHEKHAR	3	3	3	3	3	3	3	3	2
57	DIPLOMA	SHASHI RANJAN SINGH	3	3	3	3	3	3	3	3	2
58	DIPLOMA	VIKRAM	3	3	3	3	3	3	3	3	2
59	DIPLOMA	YOGESH KUMAR SAHU	3	3	3	3	3	3	3	3	3

CO / Overall CO Attainments for PO	CO1	CO2	CO3	CO4	CO	PO1	PO2	PSO1	PSO2
Targets	3	2	2	2	2.5	3	2	3	2
Attainments	2.896551724	1.781609195	1.827586	1.781609	2.356322	2.896552	1.275862069	1.517241	1.287356
Gap	0.103448276	0.218390805	0.172414	0.218391	0.143678	0.103448	0.724137931	1.482759	0.712644

Average	2.827586207
Student Attainment Level 3 Count	48
Student Attainment Level 3 - %	83

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Student Attainment Level 2 Count		10	
Student Attainment Level - 2%		17	
Student Attainment Level 1 Count		0	
Student Attainment Level - 1 %		0	
Course Attainment (%Students getting level 3)		0.83	
Target Achieved		YES	
Gaps Identified:	1	One students not attempt the question related to the accuracy and precesion measurement (CO4).
	2	Many students attend the classes late.
Action To be taken:	1	Provided the soft copy of books and ppt to the students

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POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Campus: ...PCE... Course: ...B.Tech... Class/Section: ...3rd... Date: ...15.11.22...

Name of Faculty: ...Kalpit Jain... Name of Subject: ...M.&M... Code: ...6.1.463-1...

Date (Prep.): ...26.7.22... Date (Del.): ...15/11/22... Unit No./Topic: ...03... Lect. No: ...16...

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction to Sine bar

Measuring angle with Sine bar

use of Sine bar

Limitation & Error of Sine bar.

IMPORTANT & RELEVANT QUESTIONS:

Q.1 Explain the Sine bar in brief.

Q2 Explain the measuring angle of Sine bar.

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q.1 Explain the limitation & Error of Sine bar.

Q.2 Explain the use of Sine bar in brief.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

Student ask about the maximum or minimum limit of Sine bar, which we can measure by Sine angle gauge.

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Measurement & Metrology by R.K. Jain

Sin bar

Sin bar are always used along with Slip gauge as a device for the measurement of angle very precisely.

They are used to

1) Measure angle very accurately.

2) Locate the w/p to a given angle with a very high precision.

Generally sine bar are made from high carbon, high chromium, & corrosion resistant steel.

These materials are highly hard, ground & stabilized

In sine bar two cylinder of equal dia. are attached at lie ends with its axes are mutually parallel to each other. They are also at equal distance from the upper surface of

Sine bar Mostly the distance b/w the axes of two cylinder is 100 mm, 200 mm & 300 mm. The working surface of the roller are finished to 2 um R value.

formula:

$$Sin\theta = \frac{h}{L}$$

$$\therefore \theta = Sin^{-1}\frac{h}{L}$$

use.

1. To set at a given angle θ, first 'h' of slip gauge is calculated by $Sin\theta = \frac{h}{L}$

2. After that height 'h' is made by using suitable Slip gauge.

Limitation.

1. Sine bar are fairly reliable for angles than 15°.

2. It is Physically difficult to hold in position

3. slight error in sine bar cause larger angular error.

4. The rise of part to be inspected by sine bar is limited.

Source of error.

1. Error in distance b/w roller centers
2. Error in slip gauge combination
3. Error in checking of Parallelism
4. Error in flatness of the upper surface of sine bars.
5. Error in Parallelism of roller axel with each other.

Assignment Sheet NO:- 2

Campus: PCE   Course: B.Tech.   Class/Section: 3/A   Date: 19/04/2022

Name of Faculty: Kalpit Jain   Name of Subject: Measurement   Code: 6ME3-01
& Metrology

Date of Preparation:………. Scheduled Date of Submission.........................Max Marks:50

Question No.	Questions	COs	POs	BL
Q.1	List the various linear measurements?	1	1	1
Q.2	What is comparator?	1	1	1
Q.3	How are all mechanical comparator effected?	1	1	1
Q.4	Define least count and mention the least count of a mechanical comparator.	1	1	1
Q.5	Explain with the help of neat sketches, the principle and construction of an auto-collimator	1	1	1
Q.6	State and explain the "Taylor's principle of gauge design'.	3	2	3
Q.7	Explain the working principle of pneumatic comparator with a neat sketch.	3	2	3
Q.8	Explain with the help of neat sketches, the principle and construction of an Angle dekkor.	2	2	2
Q.9	Explain the working principle of Electrical comparator with a neat sketch.	2	2	2
Q.10	Explain the precautionary measures one shall follow at various stages of using slip gauges. Explain the process of 'Wringing' in slip gauges. Explain why sine bars are not suitable for measuring angles above 45 degrees.	4	2	3

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Department of Mechanical Engineering

Batch			2019-2023		Name of Activity			Assignment-2		
Name of Course			Measurement & Metrology		Name of Faculty			Kalpit Jain		
Course Code			6ME3-01		Semester / Section			VI		

S. No.	Roll No.	Name of Students	Q. No.	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.9	Q.10
			Max. Marks:	5	5	5	5	5	5	5	5	5	5
			University Roll No	CO1	CO1	CO1	CO1	CO1	CO3	CO3	CO2	CO2	CO4
1	19EPCME001	ABHINAV SINGH .	19EPCME001	5	5	4	3	5	4	5	4	3	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	4	3	4	4	4	3	3	3	4	3
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	5	3	2	2	4	1	4	3	5	1
4	19EPCME005	ADITYA KASHYAP	19EPCME005	3	5	4	5	3	3	5	3	4	5
5	19EPCME006	AFROZ ALAM	19EPCME006	5	5	5	5	5	5	5	5	5	5
6	19EPCME007	AHIN JOHNY	19EPCME007	4	5	4	3	3	3	4	3	3	3
7	19EPCME008	AKASH KUMAR	19EPCME008	4	4	4	4	1	4	3	5	5	1
8	19EPCME009	AKSHIT SINGH .	19EPCME009	4	5	5	3	4	5	5	5	5	4
9	19EPCME011	ANIKET VERMA	19EPCME011	3	4	5	3	3	5	2	4	5	1
10	19EPCME012	ANMOL PANWAR	19EPCME012	4	5	4	5	4	4	5	4	5	5
11	19EPCME013	ANMOL SHARMA	19EPCME013	5	5	4	5	4	4	3	4	3	3
12	19EPCME016	DEEPAK SISODIA	19EPCME016	4	3	4	3	4	3	3	5	3	3
13	19EPCME017	DHRUV SINGH RATHOUR .	19EPCME017	4	5	4	5	4	5	4	5	5	4
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24	19EPCME029	KUNAL .	19EPCME029	3	3	3	3	2	2	3	3	5	3
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26	19EPCME031	MANVENDRA PRATAP SINGH CHAUHAN	19EPCME031	5	5	4	4	5	4	4	4	5	5
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28	19EPCME034	NIKHIL SIWASIA .	19EPCME034	4	4	5	4	4	5	3	3	4	4
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31	19EPCME037	PANKAJ YADAV .	19EPCME037	4	4	4	4	4	5	4	3	4	4
32	19EPCME038	PARTH VERMA .	19EPCME038	3	2	2	3	3	3	4	3	3	4
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	5	5	4	5	5	3	5	4	4	5
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	5	4	5	4	5	5	4	4	5	4
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	4	3	4	2	4	3	2	3	2	3
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38	19EPCME045	RAVI SHARMA	19EPCME045	4	5	5	5	5	4	5	4	4	4
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46	19EPCME056	UMESH YADAV	19EPCME056	4	4	5	5	4	4	4	5	5	4
47	19EPCME057	USAMA BAKHED	19EPCME057	3	4	5	4	5	5	5	5	5	4
48	19EPCME058	UTKARSH KUMAR SHARMA .	19EPCME058	3	3	5	4	5	4	3	3	3	2
49	19EPCME059	VENKTESH KUMAR KALBI	19EPCME059	4	3	3	5	2	3	4	4	4	3
50	19EPCME060	VIKASH TIWARI	19EPCME060	3	3	2	4	2	3	3	3	3	4
51	19EPCME064	YASH DAHIYA	19EPCME064	4	2	3	3	4	3	2	3	3	3
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA										
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	5	4	5	5	4	4	4	4	5	5
54	DIPLOMA	HARSHA RAJ SHISODIYA	DIPLOMA	4	4	2	3	3	3	2	4	2	3
55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	4	3	4	5	4	4	4	4	4	4
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	5	5	4	5	4	5	4	5	4	4
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	4	4	4	4	4	4	5	3	4	4
58	DIPLOMA	VIKRAM .	DIPLOMA	4	5	5	4	4	5	4	4	5	5
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	5	5	5	5	5	5	5	5	5	5

Department of Mechanical Engineering

NBA Process Implementation

Batch		2019-2023		Name of Activity		Assignment-1I
Name of Course		Measurement & Metrology		Name of Faculty		Kalpit Jain
Course Code		6ME3-01		Semester / Section		VI

S. No.	Roll No.	Name of Students	Q. No. / University Roll No	Total Marks	PRE. CO1 level	CUR. CO1 level	OVER CO1 Avg. Level	PRE. CO2 Level	CUR. CO2 level	OVER CO2 Avg. Level	PRE. CO3 Level	CUR. CO3 level	OVER CO3 Avg. Level	PRE. CO4 Level	CUR. CO4 level	OVER CO4 Avg. Level	PRE. OVER ALL CO Level	CUR. OVER ALL CO level	OVER CO Avg. Level	PRE. PO1 Level	CUR. PO1 level	OVER PO1 Avg. Level	PRE. PO2 Level	CUR. PO2 level	OVER PO2 Avg. Level	PRE. PSO1 Level	CUR. PSO1 level	OVER PSO1 Avg. Level	PRE. PSO2 Level	CUR. PSO2 level	OVER PSO2 Avg. Level
1	19EPCME001	ABHINAV SINGH .	19EPCME001	40	3	3	3	3	3	3	2	3	3	2	2	2	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	35	3	3	3	2	3	3	2	2	2	3	2	3	2	3	3	3	3	3	1	2	2	1	3	2	1	2	2
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	30	2	2	2	2	3	3	2	2	2	3	1	2	2	2	2	2	2	2	2	1	2	1	2	2	2	1	2
4	19EPCME005	ADITYA KASHYAP	19EPCME005	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2	2
5	19EPCME006	AFROZ ALAM	19EPCME006	50	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
6	19EPCME007	AHIN JOHNY	19EPCME007	35	3	3	3	2	2	2	3	3	3	2	2	2	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
7	19EPCME008	AKASH KUMAR	19EPCME008	35	3	3	3	3	3	3	2	3	3	1	2	3	2	3	3	3	3	3	2	2	2	1	3	2	2	2	2
8	19EPCME009	AKSHIT SINGH .	19EPCME009	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
9	19EPCME011	ANIKET VERMA	19EPCME011	35	3	3	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3	3	2	2	2	1	2	2	2	2	2
10	19EPCME012	ANMOL PANWAR	19EPCME012	45	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
11	19EPCME013	ANMOL SHARMA	19EPCME013	40	3	3	3	3	3	3	3	3	3	2	2	3	2	3	3	3	3	3	2	2	2	2	3	3	2	2	2
12	19EPCME016	DEEPAK SISODIA	19EPCME016	35	3	3	3	2	3	3	3	2	3	2	2	2	2	3	3	3	3	3	2	2	2	1	3	2	2	2	2
13	19EPCME017	DHRUV SINGH RATHOU	19EPCME017	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
14	19EPCME018	GARIMA SINGH	19EPCME018	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
15	19EPCME019	GAURAV SAINI	19EPCME019	45	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3	2	2	2	2	3	3	2	2	2
16	19EPCME020	HARSH SHARMA	19EPCME020	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
17	19EPCME021	JATIN ARORA	19EPCME021	30	3	3	3	2	1	2	2	2	2	3	3	2	2	2	3	3	3	1	1	1	1	2	2	1	1	1	1
18	19EPCME022	JATINDER SINGH .	19EPCME022	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
19	19EPCME023	JIGNESH SAINI	19EPCME023	35	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3	2	2	2	2	3	2	2	2	2
20	19EPCME024	JITENDRA KUMAR BAIK	19EPCME024	30	2	2	2	3	3	3	2	2	2	3	2	3	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2
21	19EPCME025	KAPIL SHARMA	19EPCME025	31	3	3	3	2	3	3	2	2	2	3	1	2	2	2	2	3	3	3	2	1	2	2	2	2	2	1	2
22	19EPCME026	KARTIK CHIMNANI	19EPCME026	40	3	3	3	3	2	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
23	19EPCME027	KRASHISH JAIN	19EPCME027	35	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
24	19EPCME029	KUNAL .	19EPCME029	30	2	2	2	3	3	3	2	2	2	3	2	3	2	3	3	2	2	2	2	2	2	1	2	2	2	2	2
25	19EPCME030	MANISH TONGARIA	19EPCME030	35	3	3	3	2	3	3	2	3	3	3	2	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
26	19EPCME031	MANVENDRA PRATAP S	19EPCME031	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
27	19EPCME032	NARESH KUMAR .	19EPCME032	30	3	2	3	2	2	2	2	2	2	2	2	2	2	2	3	3	2	3	1	1	1	1	2	2	1	1	1
28	19EPCME034	NIKHIL SIWASIA .	19EPCME034	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
29	19EPCME035	NIMAI JOSHI	19EPCME035	35	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
30	19EPCME036	OMENDRA SINGH .	19EPCME036	40	3	3	3	2	3	3	2	2	2	3	3	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
31	19EPCME037	PANKAJ YADAV .	19EPCME037	40	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
32	19EPCME038	PARTH VERMA .	19EPCME038	30	2	2	2	2	3	3	2	3	3	2	2	2	2	3	3	2	2	2	2	2	2	1	3	2	2	2	2
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	30	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2	1	1	1
36	19EPCME043	RACHIT JAIN	19EPCME043	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
37	19EPCME044	RAJEEV SHARMA .	19EPCME044	30	3	2	3	3	2	3	3	3	3	3	2	3	3	2	3	3	2	3	2	1	2	2	2	2	2	1	2
38	19EPCME045	RAVI SHARMA	19EPCME045	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
39	19EPCME047	SANDEEP SHARMA	19EPCME047	30	3	2	3	3	2	3	3	2	3	3	2	3	3	2	3	3	2	3	2	1	2	2	2	2	2		1
40	19EPCME049	SHISHUPAL JADOUN	19EPCME049	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2		2	2
41	19EPCME050	SHIVAM BHAT	19EPCME050	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2						
42	19EPCME052	SUDERSEN SEN .	19EPCME052	30	3	2	3	3	3	3	3	2	3	2	2	2	3	2	3	3	2	3	2	2	2	1	2	2		2	2
43	19EPCME053	SUMIT SHUKLA	19EPCME053	35	3	3	3	2	3	3	3	2	3	3	2	3	3	3	3	3	3	2	2	2	2						2

#	Roll No	Name	Code	Marks																											
44	19EPCME054	TUSHAR JANGID	19EPCME054	35	2	3	3	3	3	3	3	3	3	3	2	3	3	3	3	2	3	3	2	2	2	1	3	2	2	2	2
45	19EPCME055	UMESH KUMAR	19EPCME055	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
46	19EPCME056	UMESH YADAV	19EPCME056	44	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
47	19EPCME057	USAMA BAKHED	19EPCME057	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
48	19EPCME058	UTKARSH KUMAR SHA	19EPCME058	35	3	3	3	2	2	2	2	3	3	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2	2	2	2
49	19EPCME059	VENKTESH KUMAR KA	19EPCME059	35	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2
50	19EPCME060	VIKASH TIWARI	19EPCME060	30	2	2	2	3	2	3	3	2	3	3	3	3	3	2	3	2	2	2	2	2	2	1	2	2	2	2	2
51	19EPCME064	YASH DAHIYA	19EPCME064	30	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	1	1	1	1	2	2	1	1	1
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA																												
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
54	DIPLOMA	HARSHA RAJ SHISODIY	DIPLOMA	30	3	2	3	2	2	2	3	2	3	1	2	2	2	2	2	3	2	3	1	1	1	1	2	2	1	1	1
55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
58	DIPLOMA	VIKRAM .	DIPLOMA	45	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	50	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3

Overall CO Attainments for		CO					PO			
		CO1	CO2	CO3	CO4	CO	PO1	PO2	PSO1	PSO2
Targets		3.00	2.00	2.00	2.00	2.50	3.00	2.00	3.00	2.00
prev Act Attainments		2.90	1.78	1.83	1.78	2.36	2.90	1.28	1.52	1.29
Attainments curr ActI		2.81	1.85	1.76	1.68	2.27	2.81	1.24	2.74	1.25
Attainments Cumulative		2.85	1.82	1.79	1.73	2.31	2.85	1.26	2.13	1.27
Gap		0.15	0.18	0.21	0.27	0.19	0.15	0.74	0.87	0.73

Student Attainment Level 3 Count	49
Student Attainment Level 3 %	60
Student Attainment Level 2 Count	12
Student Attainment Level 2%	15
Student Attainment Level 1 Count	21
Student Attainment Level 1 %	23
Course Attainment (%Students getting level 3)	60.00%

Gaps Identified:	1	One student not attempt the questions in assignment properly
	2	One students not attempt the question related to angle dekkor and electrical
	3	Four students not attempt the question related to the measurement by the slip
Action To be taken:	1	Provide the notes of the topic to better understanding of topic

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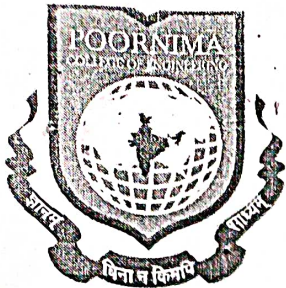
POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Campus: ...P.C.E...... Course: ....B.Tech..... Class/Section: ....3rd yr.............. Date: 21/4/22

Name of Faculty: ....Kalpit Jain.... Name of Subject: ......M&M......... Code: ..6ME3-01

Date (Prep.): ..02/02/22........... Date (Del.): ..21/4/22......Unit No./Topic:....04...............Lect. No: 20

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction

Definition of form measurement

introduction to Screw thread

Screw thread terminology

IMPORTANT & RELEVANT QUESTIONS:

Q1 Explain the form measurement.

Q2 Give the brief on Screw thread measurement in detail.

Q3 Define the pitch diameter.

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q1 Explain the nomenclature & terminology of screw thread.

Q2 Explain the types of screw thread.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

Student ask about the screw thread & its nomenclature along with the addendum & dedendum

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Engineering Metrology - R.K. Jain - Khanna Publication

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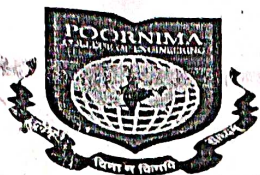
Definition of form Measurement:-

A form Measurement is conducted to determine the overall shape of an object under test which may refer to its flatness, straightness, roundness or cylindericity.

Introduction to screw thread:

- screw thread are used to transmit power & motion and also used to fasten two component with the help of nuts, bolts, and studs.

- There is a large variety of screw thread varying in their form, by included angle, head angle, helix angle, etc.

- The screw threads are mainly classified into
  1) External screw thread.
  2) Internal screw thread.

Page No.:

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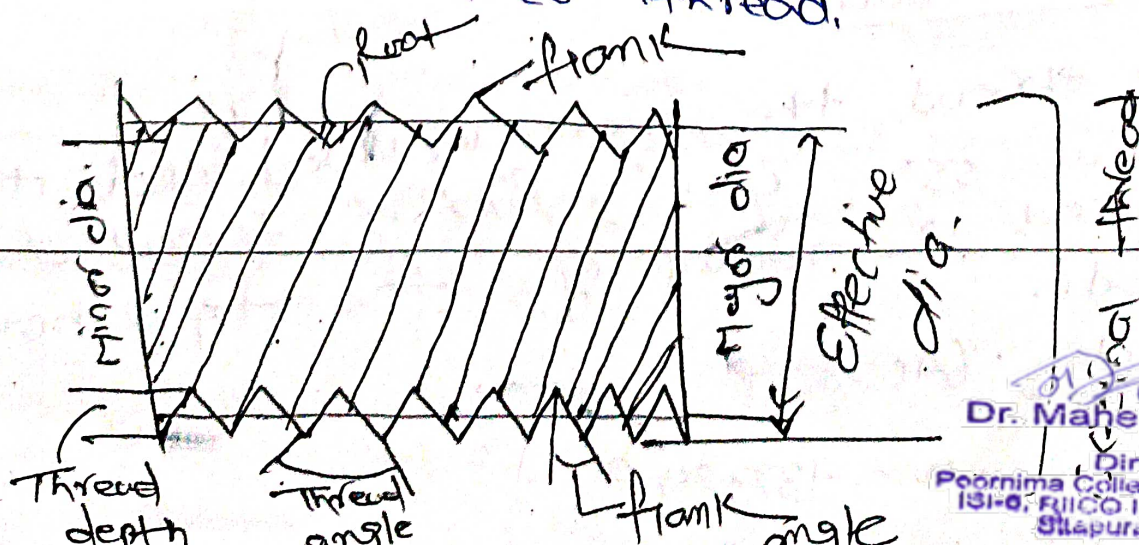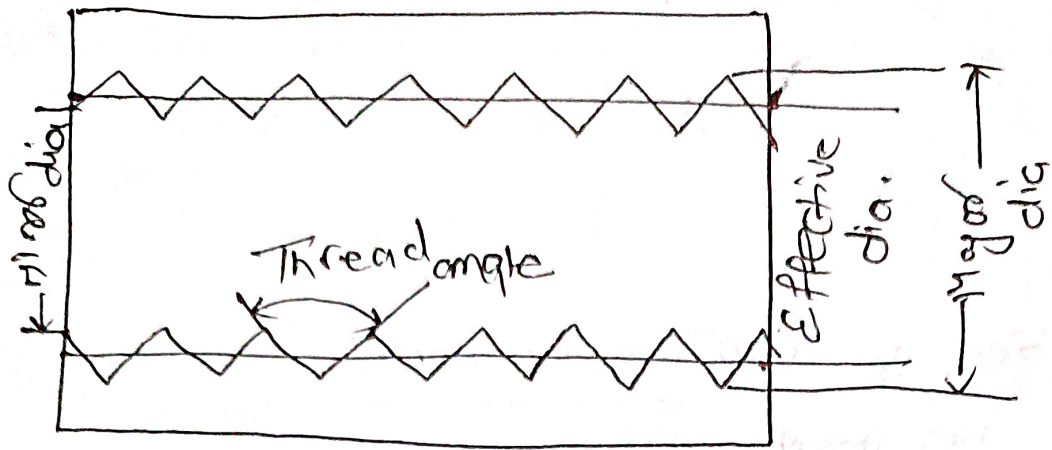
Internal thread.

Threads can be classified as:

British Association Thread.

In this thread, the angle included inside the thread is 47.5°. if P = Pitch of thread,

d = depth of thread

r = radius of top & bottom of threads

d = .6P

r = 8P/11

Whitworth thread:

In this thread, the angle included inside the thread is 55°, if P = Pitch of thread, d = depth of thread, r = radius of the top & bottom of threads.

d = .640327 P

r = .137329 P
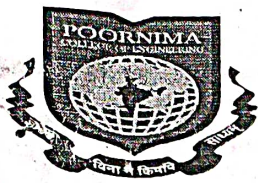
Metric Thread:-

In this thread, the angle included inside the thread is 60°.

$$if \ P = d = .54127P.$$

Screw thread terminologies:-

Pitch

Pitch line

flank

Crest

flank angle

Thread angle

Addendum

Dedendum

Axial thickness

Major dia.   Pitch dia.   Minor dia.   Root
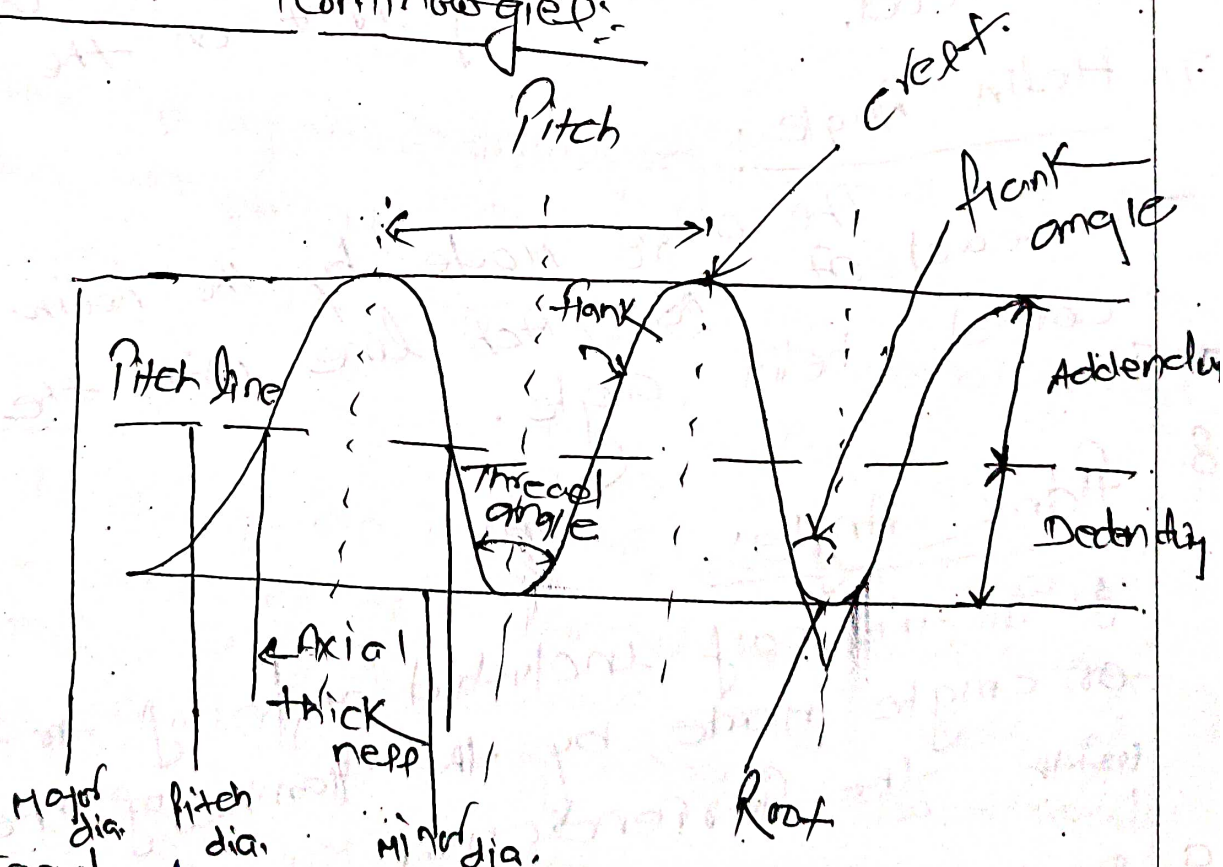
Screw thread

It is a continuous helical grooves of specified cross section produced on the external or internal surface.

2. **Crest:** It is the top surface joining two sides of threads.

3. **Flank:** It is the surface b/w crest & root.

4. **Root:** The bottom of the groove b/w the two flank of thread.

5. **Lead:** The distance a screw thread advances in one turn.

6. **Pitch:** The distance from a point on a screw thread to a corresponding point on the next thread.

7. **Helix Angle:** The angle made by the helix of the thread at the pitch line with the axis is called helix angle.

3. **Flank Angle:** It is the half included angle of the thread. or angle made by the flank of the thread with the perpendicular to the thread axis.

7 **Depth of thread:** It is the distance b/w Crest & Root.

0. **Angle of thread:** It is the angle include by the flank of a thread measurement in Plane.

11. Major dia :-

This is the dia. of an imaginary cylinder, co-axial with the screw, which just touches the crest of an external thread. or root of an internal threads.

12. Minor dia :-

This is the dia. of an imaginary cylinder, co-axial with the screw which just touches the root of an external thread or crest of an internal thread.

13. Pitch dia :-

It is the dia. of an imaginary cylinder co-axial with the axis of the thread and intersects the flank of thread such that width of threads and width of spaces b/w threads.

14. Addendum: It is the distance b/w the crest and root Pitch line measured perpendicular to axis of screw.

15. Dedendum: It is the distance b/w Pitch line and root measured perpendicular to the screw.

III B.TECH. (VI Sem.)

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Roll No. _____

FIRST MID TERM EXAMINATION 2021-22
Code: 6ME3-01 Category: PCC Subject Name–Measurement & Metrology
(BRANCH – Mechanical ENGINEERING)

Course Credit: 02
Max. Marks: 40

Max. Time: 2 hrs.

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):
At the end of the course the student should be able to:
CO1: Describe the measuring concept and working principle of metrological instruments.
CO2: Identify the appropriate measuring device and method as per their application.
CO3: Apply metrological concept for measuring engineering parameters.
CO4: Evaluate various parameters of measurement in Instrumentation and Metrological Engineering.

	PART - A: (All questions are compulsory) Max. Marks (5)	Marks	CO	BL	PO
Q.1	Give the basic concept of Range of measurement.	1	1	1	1
Q.2	What is the advantages of comparator?	1	1	1	1
Q.3	Define the term 'Precision and Accuracy'.	1	1	1	1
Q.4	Define least count and mention the least count of a Vernier Caliper and Micrometer.	1	1	1	1
Q.5	List the various angular measurement.	1	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What is the 'best wire size'? Describe the two-wire method of finding the effective diameter of screw threads.	5	1	1	1
Q.7	How to measure the pitch of the screw thread by using the tool maker's microscope in an organization?	5	2	2	2
Q.8	Differentiate between the terms Interchangeability, precision, reproducibility and sensitivity as applied to the method of measurements, with examples?	5	3	3	2
Q.9	How to analysis the parameters of surface finish. Give the focus on the method of surface finish and also give their formulas.	5	4	3	2
Q.10	In an organization mechanical comparator is using for the process. Why they are using the mechanical comparator as compare to the others.	5	2	2	2
Q.11	Define various terminologies related with screw thread. How are the major and minor diameters of thread measured?	5	1	1	1
	PART - C: (Attempt 2 questions out of 3) Max. Marks (15)				
Q.12	Explain with the help of neat sketches, the working principle of sine bar. How to use the sine bar? Also explain the limitation of sine bar.	7.5	1	1	1
Q.13	Describe the different types of errors in measurements and the causes. Distinguish between Systematic and random errors.	7.5	2	2	1
Q.14	How to use the three wire method? Derive the formula for measuring the different parameter for measuring effective diameter of thread by using 3-wire method.	7.5	4	3	2

Page 1 of 2

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EVALUATION SHEET

I MID TERM THEORY EXAM, 2021-22

Subject Code :	6ME3-01	Subject Name : MEASUREMENT & METROLOGY
Date of Exam :	4/5/2022	Name of Examiner : KALPIT JAIN
Branch	MECHANICAL ENGINEERING	B. TECH. III YEAR (VI SEM.)

SUBJECTS WISE MARKS

S.No.	Year	Batch	Roll No.	Name of Students	CO No. / BL No. / PO No.	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.9	Q.10	Q.11	Q.12	Q.13	Q.14	Q.15	Total
				Max. Marks:	1/1/1	1	1	1	1	1	5	5	5	5	5	5	7.5	7.5	7.5	7.5	
1	3ME	3ME1	19/ME/01	ABHINAV SINGH .	PCE19ME001	1	1	1	1	1	5	5	5	5	5	5	7.5	7.5	7.5		31
2	3ME	3ME1	19/ME/02	ABHISHEK MISHRA	PCE19ME002	1	1	1	1	1	2	1	1	4	4	4	5	5	5		22
3	3ME	3ME1	19/ME/03	ABHISHEK SHAKYA	PCE19ME003	0		0.5	0.5	0.5											21
4	3ME	3ME1	19/ME/04	ADITYA KASHYAP	PCE19ME005	1	1	1	0	1	4		4	3		4	4	5	5		17
5	3ME	3ME1	19/ME/05	AFROZ ALAM	PCE19ME006	1	0	0			2	3					6	5			25
6	3ME	3ME1	19/ME/06	AHIN JOHNY	PCE19ME007	1	1	1	1		2		2	4	2	1	4	6			16
7	3ME	3ME1	19/ME/07	AKASH KUMAR	PCE19ME008	1	1	1	1	1	4		4	4	3	6	5				23
8	3ME	3ME1	19/ME/08	AKSHIT SINGH .	PCE19ME009	1	1	1	1	1	5		4	3	5	5	6	6			31
9	3ME	3ME1	19/ME/09	AMAN DESHWALI	PCE19ME010	A															34
10	3ME	3ME1	19/ME/10	ANIKET VERMA	PCE19ME011	A															A
11	3ME	3ME1	19/ME/11	ANMOL PANWAR	PCE19ME012	1		1		1	3		4		4	3	6		7		32
12	3ME	3ME1	19/ME/12	ANMOL SHARMA	PCE19ME013	A															A
43	3ME	3ME1	19/ME/43	ANSHU JANGID	PCE19ME014	A															A
44	3ME	3ME1	19/ME/44	BABAR AGWAN	PCE19ME015	A															A
15	3ME	3ME1	19/ME/15	DEEPAK SISODIA	PCE19ME016	1	1	1	1	1	4	4	4	4	4	5	5	6			34
16	3ME	3ME1	19/ME/16	DHRUV SINGH RATHOUR .	PCE19ME017	1	1	1	1	3	4	4	4	4	3	6	6				26
17	3ME	3ME1	19/ME/17	GARIMA SINGH	PCE19ME018	1	1	1	1	4	3	4	3	4	4	6	6				17
18	3ME	3ME1	19/ME/18	GAURAV SAINI	PCE19ME019	1	1	1	1	1	5	2	2	5	4	6	5	5			32
19	3ME	3ME1	19/ME/19	HARSH SHARMA	PCE19ME020									3							31
20	3ME	3ME1	19/ME/20	JATIN ARORA	PCE19ME021	1	1	1	1	2	3	3	5	3	5	6					32
21	3ME	3ME1	19/ME/21	JATINDER SINGH .	PCE19ME512	1	1	1	1	4	3	4	3	4	3	5	6	5			13
22	3ME	3ME2	19/ME/22	JIGNESH SAINI	PCE19ME022	1	1	1	1	4	3	3	3	4	3	6	6				25
23	3ME	3ME2	19/ME/23	JITENDRA KUMAR BAIRWA .	PCE19ME023	1	1	1	0.5	3	1	1	1	1	1	1	6.5				31
24	3ME	3ME2	19/ME/24	KAPIL SHARMA	PCE19ME024	1	1	1	1		1	2	2	3	3	5	4				30
25	3ME	3ME2	19/ME/25	KARTIK CHIMNANI	PCE19ME025	1	1	1	1		2	4	3	3	3	6	6				22
26	3ME	3ME2	19/ME/26	KRASHISH JAIN	PCE19ME026	1	1	1	1	1		1	1	1	3	3	3				29
27	3ME	3ME2	19/ME/27	KUNAL .	PCE19ME027	A															16
28	3ME	3ME2	19/ME/28	MANISH TONGARIA	PCE19ME028	0	0	0	0	1	2				1						A
29	3ME	3ME2	19/ME/29	MAHENDRA PRATAP SINGH CHAUHAN	PCE19ME029	1	1	1	1	1	3			4	4	4	7		7		34

#	Class	Sec	Enrollment	Name	Code
30	3ME		19/ME/30	MS. PAYAL KANWAR.	PCE19ME030
31	3ME	3ME2	19/ME/31	NARESH KUMAR.	PCE19ME031
32	3ME	3ME2	19/ME/32	NIKHIL SIWASIA.	PCE19ME032
33	3ME	3ME2	19/ME/33	NIRMAL JOSHI	PCE19ME033
34	3ME	3ME2	19/ME/34	OMENDRA SINGH.	PCE19ME034
35	3ME	3ME2	19/ME/35	PANKAJ YADAV.	PCE19ME035
36	3ME	3ME2	19/ME/36	PARTH VERMA.	PCE19ME036
37	3ME	3ME2	19/ME/37	PRANAV KUMAR SINGH	PCE19ME037
38	3ME	3ME2	19/ME/38	PRITAM PRAJAPAT.	PCE19ME038
39	3ME	3ME2	19/ME/39	PRIYANSH SHARMA	PCE19ME039
40	3ME	3ME2	19/ME/40	RACHIT JAIN	PCE19ME040
41	3ME	3ME2	19/ME/41	RAJEEV SHARMA.	PCE19ME041
42	3ME	3ME2	19/ME/42	RAVI SHARMA	PCE19ME042
43	3ME	3ME2	19/ME/43	RONAK SHARMA	PCE19ME043
44	3ME	3ME3	19/ME/44	SANDEEP SHARMA	PCE19ME044
45	3ME	3ME3	19/ME/45	SHISHUPAL JADOUN	PCE19ME045
46	3ME	3ME3	19/ME/46	SHIVAM BHAT	PCE19ME511
47	3ME	3ME3	19/ME/47	SUDERSEN SEN.	PCE19ME049
48	3ME	3ME3	19/ME/48	SUMIT SHUKLA	PCE19ME050
49	3ME	3ME3	19/ME/49	TUSHAR JANGID	PCE19ME051
50	3ME	3ME3	19/ME/50	UMESH KUMAR	PCE19ME052
51	3ME	3ME3	19/ME/51	UMESH YADAV	PCE19ME053
52	3ME	3ME3	19/ME/52	USAMA BAKHED	PCE19ME054
53	3ME	3ME3	19/ME/53	UTKARSH KUMAR SHARMA.	PCE19ME055
54	3ME	3ME3	19/ME/54	VENKTESH KUMAR KALBI	PCE19ME056
55	3ME	3ME3	19/ME/55	VIKASH TIWARI	PCE19ME058
56	3ME	3ME3	19/ME/56	VIKRAM SINGH	PCE19ME057
57	3ME	3ME3	19/ME/57	VISHNU KUMAR REGAR	PCE19ME059
58	3ME	3ME3	19/ME/58	YAMAN KUMAR NARANIYA	PCE19ME060
59	3ME		19/ME/59	YASH DAHIYA	PCE19ME061
60	3ME		19/ME/60	ABHISHEK LAXKAR	PCE20ME800
61	3ME		19/ME/61	AMARJEET KUMAR	PCE20ME801
62	3ME		19/ME/62	HARSHA RAJ SHISODIYA	PCE20ME802
63	3ME		19/ME/63	MOHAMMED FAIZAN	PCE20ME803
64	3ME		19/ME/64	RAJ SHEKHAR	PCE20ME804
65	3ME		19/ME/65	SHASHI RANJAN SINGH	PCE20ME805
66	3ME		19/ME/66	VIKRAM.	PCE20ME806
67	3ME	3ME3	19/ME/67	YASH KUMAR JARWAL	PCE20ME807
68	3ME	3ME3	19/ME/68	YOGESH KUMAR SAHU	PCE20ME808

% OF CLASS AVERAGE

A	Total Marks of Present Students	1178
B	Total No. of Present Students	47
C	Average Marks of students = A / B	25.06
D	Marks award out of (each student)	40
E	% Average marks per student (C/D*100)	62.66
F	Total No. of PASS Students	44
G	Total No. of FAIL Students	3
H	Total No. of ABSENT Students	21

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Batch	2019-2023	Name of Activity	Mid-I
Name of Course	Measurement & Metrology	Name of Faculty	Kalpit Jain
Course Code	6ME3-01	Semester / Section	VI

S. No.	Roll No.	Name of Students	University Roll No	Total Marks (40)	PRE.CO1	CUR.CO1	OVER CO1	PRE.CO2	CUR.CO2	OVER CO2	PRE.CO3	CUR.CO3	OVER CO3	PRE.CO4	CUR.CO4	OVER CO4	PRE.OVER ALL CO	CUR.OVER ALL CO	OVER CO	PRE.PO1	CUR.PO1	OVER PO1	PRE.PO2	CUR.PO2	OVER PO2	PRE.PSO1	CUR.PSO1	OVER PSO1	PRE.PSO2	CUR.PSO2	OVER PSO2
1	19EPCME001	ABHINAV SINGH .	19EPCME001	22	3	3	3	3	2	3	3	1	2	2		2	3	2	3	3	3	3	3	2	1	2	3	2	3	2	1	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	21	3	3	3	3	2	3	2	2	2	3	1	2	3	2	3	3	3	3	3	2	1	2	2	2	2	2	1	2
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	17	2	2	2	3		3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2
4	19EPCME005	ADITYA KASHYAP	19EPCME005	25	3	3	3	3	2	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
5	19EPCME006	AFROZ ALAM	19EPCME006	16	3	2	3	3	3	3	3		3	3		3	3	2	3	3	3	2	3	3	2	3	3	2	3	3	1	2
6	19EPCME007	AHIN JOHNY	19EPCME007	23	3	2	3	2	2	2	3	2	3	2	1	2	3	2	3	3	2	3	2	1	2	2	2	2	2	1	2
7	19EPCME008	AKASH KUMAR	19EPCME008	31	3	3	3	3	3	3	3	3	3	2		2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
8	19EPCME009	AKSHIT SINGH .	19EPCME009	34	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
9	19EPCME011	ANIKET VERMA	19EPCME011		3		3	3		3	3		3	2		2	3		3	3		3	2		2	2		2	2		2
10	19EPCME012	ANMOL PANWAR	19EPCME012	32	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
11	19EPCME013	ANMOL SHARMA	19EPCME013		3		3	3		3	3		3	2		2	3		3	3		3	2		2	3		3	2		2
12	19EPCME016	DEEPAK SISODIA	19EPCME016	26	3	3	3	3	3	3	3	3	3	2		2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
13	19EPCME017	DHRUV SINGH RATHOUR .	19EPCME017	32	3	3	3	3	3	3	3	3	3	3	1	2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
14	19EPCME018	GARIMA SINGH	19EPCME018	31	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
15	19EPCME019	GAURAV SAINI	19EPCME019	32	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
16	19EPCME020	HARSH SHARMA	19EPCME020	13	3	3	3	3	3	3	3		3	3	1	2	3	2	3	3	3	3	2	2	2	3	2	3	2	2	2
17	19EPCME021	JATIN ARORA	19EPCME021	25	3	2	3	2	3	2	3	2	2	2	2	2	3	2	2	2	3	2	1	1	1	2	2	2	1	1	1
18	19EPCME022	JATINDER SINGH .	19EPCME022	31	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
19	19EPCME023	JIGNESH SAINI	19EPCME023	30	3	3	3	3	3	3	3	2	3	2	1	2	3	3	3	3	3	3	2	1	2	2	2	2	2	2	2
20	19EPCME024	JITENDRA KUMAR BAIRWA .	19EPCME024	17	2	2	2	3	1	2	2		2	3	2	3	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2
21	19EPCME025	KAPIL SHARMA	19EPCME025	22	3	3	3	3	2	3	2	2	2	2	1	2	2	2	2	3	3	3	2	1	2	2	2	2	2	1	2
22	19EPCME026	KARTIK CHIMNANI	19EPCME026	29	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
23	19EPCME027	KRASHISH JAIN	19EPCME027	16	3	2	3	3	1	2	3	2	3	3	1	2	3	2	3	3	3	3	2	1	2	3	2	3	2	1	2
24	19EPCME029	KUNAL .	19EPCME029		2		2	3		3	2		2	3		3	3		3	2		2	2		2	2		2	2		2
25	19EPCME030	MANISH TONGARIA	19EPCME030	4	3	1	2	3	1	2	3		3	3		3	3	1	2	3	1	2	2	1	2	2	1	2	2	1	2
26	19EPCME031	NVENDRA PRATAP SINGH CHAU	19EPCME031	34	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
27	19EPCME032	NARESH KUMAR .	19EPCME032	18	3	2	3	2	2	2	2		2	2		2	2	2	2	3	2	3	2	1	2	2	2	2	1	2	2
28	19EPCME034	NIKHIL SIWASIA .	19EPCME034	28	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	1	2	3	2	3	2	2	2
29	19EPCME035	NIMAI JOSHI	19EPCME035	24	3	2	3	3	2	3	3	2	3	3		3	3	2	3	3	2	2	2	2	2	2	2	2	2	2	2
30	19EPCME036	OMENDRA SINGH .	19EPCME036	11	3	3	3	3	3	3	2		2	3	1	2	3	2	3	3	3	3	2	1	2	2	2	2	2	2	2
31	19EPCME037	PANKAJ YADAV .	19EPCME037	31	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
32	19EPCME038	PARTH VERMA .	19EPCME038		2		2	3		3	3		3	3		3	3		3	2		2	2		2	2		2	2		2
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	28	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	31	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	30	3	3	3	2	2	2	2	3	3	3	2	1	2	2	2	2	3	3	1	1	1	2	2	2	1	2	2
36	19EPCME043	RACHIT JAIN	19EPCME043	26	3	2	3	3	2	3	3	3	3	3		3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
37	19EPCME044	RAJEEV SHARMA .	19EPCME044	19	3	2	3	3	2	3	3	1	2	3	1	2	3	1	2	3	2	3	2	1	2	2	1	2	2	1	2
38	19EPCME045	RAVI SHARMA	19EPCME045	34	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
39	19EPCME047	SANDEEP SHARMA	19EPCME047	27	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	2	1	2	2	2	2	2	2	2	2	2
40	19EPCME049	SHISHUPAL JADOUN	19EPCME049	20	3	2	3	3	2	3	3	2	3	3		3	3	2	3	3	2	3	2	1	2	3	2	3	2	1	2
41	19EPCME050	SHIVAM BHAT	19EPCME050	32	3	3	3	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3	2	1	2	3	2	3	2	2	2
42	19EPCME052	SUDERSEN SEN .	19EPCME052	16	3	2	3	3	2	3	3		3	3	2	1	2	3	1	2	3	2	3	2	1	2	2	1	2	2	1	2
43	19EPCME053	SUMIT SHUKLA	19EPCME053	26	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
44	19EPCME054	TUSHAR JANGID	19EPCME054		3		3	3		3	3		3	3		3	3		3	3		3	2		2	2		2	2		2
45	19EPCME055	UMESH KUMAR	19EPCME055		3		3	3		3	3		3	3		3	3		3	3		3	2		2	3		3	2		2
46	19EPCME056	UMESH YADAV	19EPCME056	28	3	3	3	3	2	3	3	3	3	3		3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
47	19EPCME057	USAMA BAKHED	19EPCME057		3		3	3		3	3		3	3		3	3		3	3		3	2		2	3		3	2		2

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48	19EPCME058	UTKARSH KUMAR SHARMA .	19EPCME058		3		3	2		2	3		3	2		2	2		2	3		3	1		1	2		2	2		2
49	19EPCME059	VENKTESH KUMAR KALBI	19EPCME059		3		3	3		3	3		3	3		3	3		3	3		3	2		2	2		2	2		2
50	19EPCME060	VIKASH TIWARI	19EPCME060	16	2	3	3	3	2	3	3	3	3	3	3	3	3	3	2	3	3	2	2	2	2	3	3	2	2	2
51	19EPCME064	YASH DAHIYA	19EPCME064		3		3	2		2	2		2	2		2	2		2	3		3	1		1	2		2	1		1
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA																													
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	36	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
54	DIPLOMA	HARSHA RAJ SHISODIYA	DIPLOMA		3		3	2		2	3		3	2		2	2		2	3		3	1		1	2		2	1		1
55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	18	3	2	3	3	2	3	3	1	2	3	3	3	1	2	3	2	3	2	1	2	3	1	2	2	1	2
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	32	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	25	3	3	3	3	3	3	3		3	3	1	2	3	2	3	3	3	2	1	2	3	2	3	2	1	2
58	DIPLOMA	VIKRAM .	DIPLOMA	32	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	27	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2	3

Overall CO Attainments for PO	CO					PO			
	CO1	CO2	CO3	CO4	CO	PO1	PO2	PSO1	PSO2
Targets	3	2	2	2	2.5	3	2	3	2
prev Act Attainments	2.85	1.82	1.79	1.73	2.31	2.85	1.26	2.13	1.27
Attainments curr Actl	2.68	1.67	1.58	0.91	2	2.68	1.05	2.4	1.12
Attainments Cumulative	2.77	1.74	1.69	1.32	2.16	2.77	1.15	2.27	1.2
Gap	0.23	0.26	0.31	0.68	0.34	0.23	0.85	0.73	0.8

Student Attainment Level 3 Count	39
Student Attainment Level 3 %	67
Student Attainment Level 2 Count	19
Student Attainment Level 2%	33
Student Attainment Level 1 Count	0
Student Attainment Level 1 %	0
Course Attainment (%Students getting level 3)	0.67

Gaps Identified:	1	13 student not attempt the basic question of metrology related to the sine bar, comparator and their accuracy
	2	16 students not attempt the question related to screw thread and their errors
	3	24 students not attempt the question related to the parametrs of metrology.
	4	53 students not attempt the question related to the efective diameter of wire
Action To be taken:	1	Provide the notes of the topic to better understanding of topic
	2	Provide NPTEL vedio lecture for the understanding of the concept

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ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Campus: B.Tech Course: PCE Class/Section: 3rd A Date: 14/5/22

Name of Faculty: Kalpit Jain Name of Subject: MSM Code: 6ME3-01

Date (Prep.): 13/3/22 Date (Del.): 14/5/22 Unit No.: 05 Lect. No: 27

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction to CMM, Application of CMM.
features of CMM
Errors in CMM.
Types of CMM,

IMPORTANT & RELEVANT QUESTIONS:

Q1 Explain the types of CMM.

Q2 What are the diff. b/w Computer controlled CMM & coordinate Measuring M/c.

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q1 What are the principle of CMM along with the features of CMM.

Q2 What are the Error of CMM.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

student ask about the accuracy & stylus (Diamond) of the CMM.

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

A text book of Eng. Metrology - R.K.Jain.

overview

- CMM are extremely powerful metrological instrument.
- It is a measuring device for measuring the physical geometrical characteristic of an object.
- The M/C may be manually controlled by an operator or it may be computer controlled.
- Measuring are defined by a probe attached to the third moving axis of M/C.
- The probe touch the part of interest and allows collecting discrete points on the object surface

CMM : It is a three dimensional measurement for various components. These M/C have precise movement is x, y, z co-ordinates, which can be easily controlled and measured.

- it is used for measurement of length over the outer surface of a length bar or any other long member.
- The member may be either round, flat and tapered.
- It is used for.
  - Length bar measuring M/C
  - universal measuring M/C
  - Co-ordinate ---"-------"

- Newall Measuring M/C
- Computer Controlled Measuring M/C.

Component of CMM.

1.) M/C itself
2) Probing system.
3) Controller & software.

Types of CMM.

1. Cantilever

It is very easy to load & unload, but mechanical error can take place because of deflection in y-axis.

2. Bridge type:

It is more difficult to load but less sensitive to mechanical error.

3. Horizontal boring mill

This is best suited for large heavy work piece.

4. Vertical boring mill

It is highly accurate but slower operation.

Causes of Error in CMM.

1. The table & probe are in imperfect alignment.
2. Dimensional error of a CMM ep
   - Probe lenght
   - Environment
   - Error due to digitigation
   - Scale division & adjustment
   - Probe system Callibration.
3. Variation in temp of CMM.
4. Translation Error
5. Translatory Error

Application of CMM.

- CMM finds application in automobile, m/c tool, electronics, Space & any other large companies.
- These m/c are best suited for the test & inspection of test, equipment, gauges and tools.

- for aircrafts & space vehicle, 100% inspection is carried out by using CMM.
- It is used for determining dimensional accuracy.
- It is also used for sorting task to achieve optimum pairing of component within tolerance limit.

Advantage of CMM

- Inspection rate is increased
- Accuracy is more.
- Operators error can be minimized.
- Skill requirement of operator is reduced.
- Reduce inspection cost.
- Reduction in set-up time.
- Reduction in off line analysis time.

Disadvantage of CMM.

- The probe may have lean out.
- There may be error is digital system.
- The table & probe may not be perfect alignment.
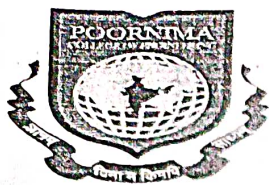
- Probe while moving in x & y direction may not be square to each other.

Features of CMM.

- Measurement of dia., length & center distance.
- Measurement of plane & spatial curves.
- Minimum CNC program.
- Data Communication
- Digital input & o/p command.
- Interface to CAD software.

POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Campus: P.C.E.   Course: B.Tech.   Class/Section: 3rd yr   Date: 25.5.12

Name of Faculty: Kalpit Jain   Name of Subject: MSM   Code: 6M6.3-01

Date (Prep.): 3/4/22   Date (Del.): 25/5/22   Unit No.: 6   Lect. No.: 34

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

Introduction
- Thermocouple
- thermistor
- pyrometer

Temp. Measurement
Bimetallic strip
Calibration of temp.
measuring device.

IMPORTANT & RELEVANT QUESTIONS:

Q.1 Explain the working of thermocouple.

Q.2 Explain the principle and working of thermistor.

Q.3 What is the pyrometer?

FEED BACK QUESTIONS (AFTER 20 MINUTES):

Q.1 Write down the Advantage & Disad
vantage of the thermocouple, &
thermistor.

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

Student able about the concept related
to the temperature temperature
Measuring instrument.

REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Engg. Metrology by R.K. Jain

Introduction

Thermocouple

- It consist of two wire legs made from different metals.

- The wire legs are welded together at one end, creating an junction.

- This junction is where the temp. is measured.

- When the junction change in temp; a voltage is created.

- The voltage can be interpreted using thermocouple

- There are many types of thermocouple.

- Type J, K &T are metal,

- E is base thermocouple, which is most common type of thermocouple.

- Type R & S are noble thermocouple metal, which are used in high temp. application

Thermocouple feature:

Adv. 1. Capable to measure the

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- High Resolution
- Rugged & Reliable

Disadvantage.

Non linear Complex operation.
Calibration required when in use.

Thermistor.

— It is sensitive resistor whose prime function is to exhibit a large, predictable & precise change in electrical resistance.

— There are semiconductor made from a specific mixture of pure oxide of nickel, magnese, copper, cobalt, iron, magnelium

— Thermistor differ from resistance temp. detectors in the materials.

Advantage.

— It offer better accuracy
— highly sensitive
— Smaller in size
— reliable & easy to use.

Disadvantage:

- Highly non linear
- Limited temp. range.

Pyrometer.

- It is a non contacting device that intercepts and measure thermal radiation, a process known as Pyrometry.

  The device can be used to determine the temp. of an object surface.

Types:

- Optical Pyrometer
- Radiation Pyrometer
- Digital Pyrometer
- Infrared Pyrometer.

Adv.

1. Able to measure the high temp.
2. No need for contact.

3. High o/p
4. Moderate Cost.

Disadv.

1. Non linear
2. Error due to interleaving Media
3. Emissivity of target Affect Measurement.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Roll No. _____

SECOND MID TERM EXAMINATION 2021-22
Code: 6ME3-01 Category: PCC Subject Name–Measurement & Metrology
(BRANCH – Mechanical ENGINEERING)

Course Credit: 02
Max. Marks: 40

Max. Time: 2 hrs.

NOTE:-   Read the guidelines given with each part carefully.

Course Outcomes (CO):
At the end of the course the student should be able to:

CO1: Describe the measuring concept and working principle of metrological instruments.
CO2: Identify the appropriate measuring device and method as per their application.
CO3: Apply metrological concept for measuring engineering parameters.
CO4: Evaluate various parameters of measurement in Instrumentation and Metrological Engineering.

	PART - A: (All questions are compulsory) Max. Marks (5)	Marks	CO	BL	PO
Q.1	Define the thermo electric effect?	1	1	1	1
Q.2	What is the thermistors and pyrometers?	1	1	1	1
Q.3	What is comparators? Write its types?	1	1	1	1
Q.4	What are the differences between direct and indirect methods?	1	1	1	1
Q.5	What is accelerometer and bourdon tube?	1	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What is the load cell? Explain the working of the load cell.	5	1	1	1
Q.7	Define the thermocouple. Explain the types of thermocouple junction.	5	1	1	1
Q.8	Explain the Rota meter along with the working principle. Also explain the advantages and disadvantages of Rota meter.	5	2	2	2
Q.9	Justify the thermoelectric effect. Compare the working principle of thermocouples and thermistors.	5	3	3	2
Q.10	Compare the hydraulic load cell and pneumatic load cell along with their diagram. Also indicate the importance of load cells.	5	2	2	2
Q.11	How to measure the power by using the prony brake dynamometer in an organization? Discuss in detail.	5	4	3	2
	PART - C: (Attempt 2 questions out of 3) Max. Marks (15)				
Q.12	Give the brief idea about the computer aided inspection using robots for the measurement of an object. How integration of CAD/CAM with inspection system in an organization is possible.	7.5	1	1	1
Q.13	How are CMMs classified with respect to constructional parameters in an organization? Discuss in detail about the calibration of three coordinate measuring machine.	7.5	4	3	2
Q.14	How to explain the orifice flow meter and venture meter with their advantages and disadvantages.	7.5	3	3	2

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II MID TERM THEORY EXAM, 2021-22		EVALUATION SHEET		B. TECH. III YEAR (VI SEM.)
Subject Code : 6ME3-01		**Subject Name :**	MEASUREMENT & METROLOGY	
Date of Exam : 20/06/2022		**Name of Examiner :**	KALPIT JAIN	
Branch MECHANICAL ENGINEERING		SUBJECTS WISE MARKS		3ME1

S. No.	Year	Batch	Roll No.	Name of Students		Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.9	Q.10	Q.11	Q.12	Q.13	Q.14	Q.15	Total
				LO No.		1	1	1	1	1	1	1	2	3	2	4	1	4	3		
				BL No.		1	1	1	1	1	1	1	2	3	2	3	1	3	3		40
				PO No.		1	1	1	1	1	1	1	2	2	2	3	1	2	2		
				Max. Marks:		1	1	1	1	1	5	5	5	5	5	5	7.5	7.5	7.5		
1	3ME	3ME1	19/ME/01	ABHINAV SINGH .	PCE19ME001		1	1	1	1	3	2			4	4	3	4			24
2	3ME	3ME1	19/ME/02	ABHISHEK MISHRA	PCE19ME002	1	1	1	1	1	4	4	4		3		3		6		29
3	3ME	3ME1	19/ME/03	ABHISHEK SHAKYA	PCE19ME003	1	1	1	1	1	4	3			4		6				22
4	3ME	3ME1	19/ME/04	ADITYA KASHYAP	PCE19ME005	1	1	1	1		4	4					4	7	6		29
5	3ME	3ME1	19/ME/05	AFROZ ALAM	PCE19ME006	1	1		1	1		2	2		3	3	5	7			26
6	3ME	3ME1	19/ME/06	AHIN JOHNY	PCE19ME007	0	1	1	1	1	3	3	4	3			6		7		30
7	3ME	3ME1	19/ME/07	AKASH KUMAR	PCE19ME008	1	1	1	1	1	4		4		3	3	6	7			32
8	3ME	3ME1	19/ME/08	AKSHIT SINGH .	PCE19ME009	1	1	1	1	1		4	4		4	4	7	7			35
9	3ME	3ME1	19/ME/09	AMAN DESHWALI	PCE19ME010																0
10	3ME	3ME1	19/ME/10	ANIKET VERMA	PCE19ME011	1	1	1	1	1	3	3	4		4		5		7		31
11	3ME	3ME1	19/ME/11	ANMOL PANWAR	PCE19ME012	1	1	1	1	0	4		3	4	4		7	7			33
12	3ME	3ME1	19/ME/12	ANMOL SHARMA	PCE19ME013	1	1	1	1	1	2						4	3			14
13	3ME	3ME1	19/ME/13	ANSHU JANGID	PCE19ME014																0
14	3ME	3ME1	19/ME/14	BABAR AGWAN	PCE19ME015																0
15	3ME	3ME1	19/ME/15	DEEPAK SISODIA	PCE19ME016	0	0	0	0	0		2	3	2		2	3		4		16
16	3ME	3ME1	19/ME/16	DHRUV SINGH RATHOUR .	PCE19ME017	1	0	1	1	1	4	3	4		4		7	7			33
17	3ME	3ME1	19/ME/17	GARIMA SINGH	PCE19ME018	1	1	1	1	1	3	4			4	4	4		7		31
18	3ME	3ME1	19/ME/18	GAURAV SAINI	PCE19ME019	1	1	1	1	1	3		3		3	3	5	6			28
19	3ME	3ME1	19/ME/19	HARSH SHARMA	PCE19ME020			1	1		2	3			4		4	5			20
20	3ME	3ME1	19/ME/20	JATIN ARORA	PCE19ME021	1	1	1	1	1		2	3	3	3		5	5			26
21	3ME	3ME1	19/ME/21	JATINDER SINGH .	PCE19ME512	1	1	1	1	1	4		4	4	4			7	7		35
22	3ME	3ME2	19/ME/22	JIGNESH SAINI	PCE19ME022	1	1	1	1	1	4	4	3	3			6	7			32
23	3ME	3ME2	19/ME/23	JITENDRA KUMAR BAIRWA .	PCE19ME023	0	0	1	1	1	4	3	3			3	2		5		23
24	3ME	3ME2	19/ME/24	KAPIL SHARMA	PCE19ME024	1	1	0	1	1	3	3	4	2			5	4			25
25	3ME	3ME2	19/ME/25	KARTIK CHIMNANI	PCE19ME025	1	1	1	1	1	4	2	3		4			7	7		32
26	3ME	3ME2	19/ME/26	KRASHISH JAIN	PCE19ME026	1		1	1	1	3		1		2	2	5	5			22
27	3ME	3ME2	19/ME/27	KUNAL .	PCE19ME027	1	1	1		1	3	3		3		3	5		5		26
28	3ME	3ME2	19/ME/28	MANISH TONGARIA	PCE19ME028	1	1	0	0	0	2		2	2	2		3	3			16
29	3ME	3ME2	19/ME/29	MANVENDRA PRATAP SINGH CHAUHAN	PCE19ME029		1	1	1	1	4	4	4	4			6				26
30	3ME	3ME2	19/ME/30	MS. PAYAL KANWAR .	PCE19ME030																0

Name of Examiner:_____

Signature of Exam

#		Sec	Roll	Name	Code																Total
31	3ME	3ME2	19/ME/31	NARESH KUMAR .	PCE19ME031	1	1		1	1		2	4	3	3			6		**22**
32	3ME	3ME2	19/ME/32	NIKHIL SIWASIA .	PCE19ME033	1	1	1	1		4			4	4		6	6		**28**
33	3ME	3ME2	19/ME/33	NIMAI JOSHI	PCE19ME034	1	1	1	1	1	3		4		4	3	5	0		**24**
34	3ME	3ME2	19/ME/34	OMENDRA SINGH .	PCE19ME035					1		4		4	3	4		3	7	**26**
35	3ME	3ME2	19/ME/35	PANKAJ YADAV .	PCE19ME036	1	1	1	1	1	4	3		3	4		6		6	**31**
36	3ME	3ME2	19/ME/36	PARTH VERMA .	PCE19ME037	1	1	1	1	0		4	4	4			5		6	**27**
37	3ME	3ME2	19/ME/37	PRANAV KUMAR SINGH	PCE19ME038	1	1	1	1	1	3	3	4			4		5	6	**30**
38	3ME	3ME2	19/ME/38	PRITAM PRAJAPAT .	PCE19ME039	1	1	1	1		4	4	4	3			6	7		**32**
39	3ME	3ME2	19/ME/39	PRIYANSH SHARMA	PCE19ME040	1	1	1	1	1		4	4	3		3	5	5		**29**
40	3ME	3ME2	19/ME/40	RACHIT JAIN	PCE19ME041	1	1	1	1	1	3	3	3	3			5	6		**28**
41	3ME	3ME2	19/ME/41	RAJEEV SHARMA .	PCE19ME042	1	1	0	1	1	2	3					3	2		**14**
42	3ME	3ME2	19/ME/42	RAVI SHARMA	PCE19ME043	1	1	1	1	1	4	4	4			4	6		6	**33**
43	3ME	3ME3	19/ME/43	RONAK SHARMA	PCE19ME044	A														**A**
44	3ME	3ME3	19/ME/44	SANDEEP SHARMA	PCE19ME045	1	1	1	1	1	0	3	3	3			4		6	**24**
45	3ME	3ME3	19/ME/45	SHISHUPAL JADOUN	PCE19ME047	1	1	1	1	1	3	3	3	3			4		4	**25**
46	3ME	3ME3	19/ME/46	SHIVAM BHAT	PCE19ME511	1	1	1	1	1	4	4	4		4		6	6		**33**
47	3ME	3ME3	19/ME/47	SUDERSEN SEN .	PCE19ME049	1	1	1	1	1	3	3			4	3	5		6	**29**
48	3ME	3ME3	19/ME/48	SUMIT SHUKLA	PCE19ME050	1	1	1	1	1	4	3	4			4		3	3	**26**
49	3ME	3ME3	19/ME/49	TUSHAR JANGID	PCE19ME051	1	1	1	1	1	3	2	2		3		2			**17**
50	3ME	3ME3	19/ME/50	UMESH KUMAR	PCE19ME052	1	1	1	1	1	2	3	2	2			3	3		**20**
51	3ME	3ME3	19/ME/51	UMESH YADAV	PCE19ME053	1	1	1	1	1	3		3		4	2	5		6	**28**
52	3ME	3ME3	19/ME/52	USAMA BAKHED	PCE19ME054	1	1	1	1	1	3	3		3		4	4	0		**22**
53	3ME	3ME3	19/ME/53	UTKARSH KUMAR SHARMA .	PCE19ME055	A														**A**
54	3ME	3ME3	19/ME/54	VENKTESH KUMAR KALBI	PCE19ME056	1	1			1		2		3	2	2		5	5	**22**
55	3ME	3ME3	19/ME/55	VIKASH TIWARI	PCE19ME058	1	1	1	1	1	3		3	2					3	**16**
56	3ME	~~3ME3~~	~~19/ME/56~~	~~VIKRAM SINGH~~	~~PCE19ME057~~															**0**
57	3ME	~~3ME3~~	~~19/ME/57~~	~~VISHNU KUMAR REGAR~~	~~PCE19ME059~~															**0**
58	3ME	~~3ME3~~	~~19/ME/58~~	~~YAMAN KUMAR NARANIYA~~	~~PCE19ME060~~															**0**
59	3ME	3ME3	19/ME/59	YASH DAHIYA	PCE19ME061		1	1	1			2		3	3		3	2		**16**
60	3ME	3ME3	19/ME/60	ABHISHEK LAXKAR	PCE20ME800	A														**A**
61	3ME	3ME3	19/ME/61	AMARJEET KUMAR	PCE20ME801	1	1	1	1	1	4	4		4		4	6		6	**33**
62	3ME	3ME3	19/ME/62	HARSHA RAJ SHISODIYA	PCE20ME802						3	1	1		3			4	6	**18**
63	3ME	3ME3	19/ME/63	MOHAMMED FAIZAN	PCE20ME803	1	1	1	1	1	2	3	3	3				6	4	**26**
64	3ME	3ME3	19/ME/64	RAJ SHEKHAR	PCE20ME804	1	1	1	1		3	3	2	3			5		5	**25**
65	3ME	3ME3	19/ME/65	SHASHI RANJAN SINGH	PCE20ME805	1	1	1	1	1	3		3	4	3		5	6		**29**
66	3ME	3ME3	19/ME/66	VIKRAM .	PCE20ME806	1	1	1	1	1	3	3	4	3			3	6		**27**
67	3ME	~~3ME3~~	~~19/ME/67~~	~~YASH KUMAR JARWAL~~	~~PCE20ME807~~															**0**
68	3ME	3ME3	19/ME/68	YOGESH KUMAR SAHU	PCE20ME808	1	1	1	1	1	2		4	4			7	7		**29**

% OF CLASS AVERAGE

A	Total Marks of Present Students	1485
B	Total No. of Present Students	57
C	Average Marks of students = A / B	26.05
D	Marks award out of (each student)	40
E	% Average marks per student (C/D*100)	65.13
F	Total No. of PASS Students	55
G	Total No. of FAIL Students	10
H	Total No. of ABSENT Students	3

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Name of Examiner:_____

Signature of Exam

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Department of Mechanical Engineering

CO-PO Attainment Sheet Session 2020-2021

Batch	2019-2023	Name of Activity: Mid-II
Name of Course	Measurement & Metrology	Name of Faculty: Kalpit Jain
Course Code	6ME3-01	Semester / Section: VI

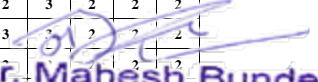| S. No.	Roll No.	Name of Students	Q. No. / University Roll No	Total Marks	PRE. CO1	CUR. CO1	OVER CO1	PRE. CO2	CUR. CO2	OVER CO2	PRE. CO3	CUR. CO3	OVER CO3	PRE. CO4	CUR. CO4	OVER CO4	PRE. OVER ALL CO	CUR. OVER ALL CO	OVER CO	PRE. PO1	CUR. PO1	OVER PO1	PRE. PO2	CUR. PO2	OVER PO2	PRE. PSO1	CUR. PSO1	OVER PSO1	PRE. PSO2	CUR. PSO2	OVER PSO2
1	19EPCME001	ABHINAV SINGH .	19EPCME001	24	3	2	3	3	3	3	2		2	2	2	2	3	3	3	3	2	3	2	2	2	3	3	3	2	2	2
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	29	3	3	3	3	3	3	2	3	3	2		2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	22	2	3	3	3	3	3	2		2	2	2	2	3	3	2	3	2	3	2	2	2	3	3	3	2	2	2
4	19EPCME005	ADITYA KASHYAP	19EPCME005	29	3	3	3	3		3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
5	19EPCME006	AFROZ ALAM	19EPCME006	26	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2	2
6	19EPCME007	AHIN JOHNY	19EPCME007	30	3	3	3	2	3	3	3	3	3	2		2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
7	19EPCME008	AKASH KUMAR	19EPCME008	32	3	3	3	3	3	3	3		3	2	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
8	19EPCME009	AKSHIT SINGH .	19EPCME009	35	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
9	19EPCME011	ANIKET VERMA	19EPCME011	31	3	3	3	3	3	3	3	3	2		2	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
10	19EPCME012	ANMOL PANWAR	19EPCME012	33	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
11	19EPCME013	ANMOL SHARMA	19EPCME013	14	3	2	3	3		3	3		3	2	1	2	3	2	3	2	3	2	3	2	1	2	3	2	1	2	2
12	19EPCME016	DEEPAK SISODIA	19EPCME016	16	3	1	2	3	2	3	2		3	2	1	2	3	1	2	3	1	2	2	1	2	3	1	2	2	1	2
13	19EPCME017	DHRUV SINGH RATHOUR .	19EPCME017	33	3	3	3	3	3	3	3		3	2	2	2	3	3	3	3	3	2	2	2	3	3	3	2	2	2
14	19EPCME018	GARIMA SINGH	19EPCME018	31	3	3	3	3	3	3	3	3	3	1	2	3	3	2	3	3	3	2	2	2	3	3	3	2	2	2
15	19EPCME019	GAURAV SAINI	19EPCME019	28	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
16	19EPCME020	HARSH SHARMA	19EPCME020	20	3	2	3	3	3	3	3		2	2	2	3	2	3	3	2	3	2	2	2	3	2	3	2	1	2
17	19EPCME021	JATIN ARORA	19EPCME021	26	3	3	3	3	2	3	2	2	2	3	2	3	2	2	2	3	3	1	1	1	2	2	2	1	1	1
18	19EPCME022	JATINDER SINGH .	19EPCME022	35	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
19	19EPCME023	JIGNESH SAINI	19EPCME023	32	3	3	3	2	3	3	2	3	2	2	2	3	3	3	3	3	2	1	2	2	3	3	3	2	2	2
20	19EPCME024	JITENDRA KUMAR BAIRWA .	19EPCME024	23	2	2	2	2	2	2	3	3	3	1	2	2	2	2	2	2	2	1	2	2	2	2	1	2
21	19EPCME025	KAPIL SHARMA	19EPCME025	25	3	3	3	3	3	3	2	2	2	1	2	2	2	3	3	3	2	1	2	2	2	2	1	2
22	19EPCME026	KARTIK CHIMNANI	19EPCME026	32	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
23	19EPCME027	KRASHISH JAIN	19EPCME027	22	3	3	3	2	1	2	3		3	2	2	2	3	2	3	3	3	2	1	2	2	2	1	2	2
24	19EPCME029	KUNAL .	19EPCME029	26	2	3	3	3		3	2	2	2	3	1	2	3	2	3	2	3	3	2	1	2	2	2	2	1	2
25	19EPCME030	MANISH TONGARIA	19EPCME030	16	2	2	2	2	2	2	3	3	1	2	2	1	2	2	2	2	1	2	2	1	2	2	1	2
26	19EPCME031	MANVENDRA PRATAP SINGH CHAUHAN	19EPCME031	26	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	2	2	3	3	3	2	2	2
27	19EPCME032	NARESH KUMAR .	19EPCME032	22	3	3	3	2	3	3	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2
28	19EPCME034	NIKHIL SIWASIA .	19EPCME034	28	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
29	19EPCME035	NIMAI JOSHI	19EPCME035	24	3	3	3	3	3	3	3		3	3	1	2	3	2	3	3	3	2	1	2	2	2	2	2	2
30	19EPCME036	OMENDRA SINGH .	19EPCME036	26	3	2	3	3		3	2	2	2	3	2	3	3	3	2	2	2	2	3	3	2	2	2
31	19EPCME037	PANKAJ YADAV .	19EPCME037	31	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
32	19EPCME038	PARTH VERMA .	19EPCME038	27	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	30	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	32	3	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	29	3	3	3	2	3	3	2	3	2	2	2	3	3	3	3	1	2	2	3	3	3	2	2	2
36	19EPCME043	RACHIT JAIN	19EPCME043	28	3	3	3	3	2	3	3	2	3	2	3	3	2	3	3	3	2	1	2	3	3	2	2	2
37	19EPCME044	RAJEEV SHARMA .	19EPCME044	14	3	2	3	3		3	2		2	2	1	2	2	1	2	3	2	3	2	1	2	2	1	2	2	1	2
38	19EPCME045	RAVI SHARMA	19EPCME045	33	3	3	3	3	3	3	3	3	3	1	2	3	3	3	3	2	2	2	3	3	3	2	2	2
39	19EPCME047	SANDEEP SHARMA	19EPCME047	24	3	2	3	3	3	2	3	3	3		3	3	3	3	3	2	2	2	2	2	2	2	2	2
40	19EPCME049	SHISHUPAL JADOUN	19EPCME049	25	3	3	3	3	3	3	3	3	2		3	3	3	3	3	2	1	2	3	3	3	2	2	2
41	19EPCME050	SHIVAM BHAT	19EPCME050	33	3	3	3	3	3	3	3	3	3		3	2	2	3	3	3	3	3	3	3	2	2	2
42	19EPCME052	SUDERSEN SEN .	19EPCME052	29	3	3	3	3	3	3	3	3	3	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2
43	19EPCME053	SUMIT SHUKLA	19EPCME053	26	3	3	3	3	3	3	3	2	3	3	3	3	2	3	3	2	1	2	3	3	2	3	2	2
44	19EPCME054	TUSHAR JANGID	19EPCME054	17	3	2	3	3	2	3	3		3	3		3	3	2	3	3	2	3	2	1	2	2	2	2	2

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#	ID	Name	Code	Marks																										
45	19EPCME055	UMESH KUMAR	19EPCME055	20	3	2	3	3	2	3	3	2	3	3	1	2	3	2	3	3	2	3	2	1	2	3	2	3	2	1	2
46	19EPCME056	UMESH YADAV	19EPCME056	28	3	3	3	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3	2	1	2	3	2	3	2	2	2
47	19EPCME057	USAMA BAKHED	19EPCME057	22	3	3	3	3		3	3	2	3	3	1	2	3	2	3	3	3	3	2	1	2	3	2	3	2	1	2
48	19EPCME058	UTKARSH KUMAR SHARMA .	19EPCME058		3		3	2		2	3		3	2		2	2		2	3		3	1		1	2		2	2		2
49	19EPCME059	VENKTESH KUMAR KALBI	19EPCME059	22	3	2	3	3	2	3	3	2	3	3	2	3	3	2	3	3	2	3	2	1	2	2	2	2	2	1	2
50	19EPCME060	VIKASH TIWARI	19EPCME060	16	3	3	3	3	2	3	3	2	3	3		3	3	2	3	3	3	3	2	1	2	3	2	3	2	2	2
51	19EPCME064	YASH DAHIYA	19EPCME064	16	3	2	3	2	2	2	2	2	2	2	1	2	2	2	2	3	2	3	1	1	1	2	2	2	1	1	1
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA																												
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	33	3	3	3	3		3	3	3	3	3	1	2	3	3	3	3	3	3	2	1	2	3	3	3	2	2	2
54	DIPLOMA	HARSHA RAJ SHISODIYA	DIPLOMA	18	3	2	3	2	2	2	3	3	3	2	1	2	2	2	2	3	2	3	1	1	1	2	2	2	1	1	1
55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	26	3	3	3	3	2	3	2	2	3	3	2	3	2	2	3	3	3	3	2	1	2	2	2	2	2	1	2
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	25	3	3	3	3	2	3	3	2	3	3		3	3	2	3	3	3	3	2	1	2	3	2	3	2	1	2
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	29	3	3	3	3	2	3	3	3	3	2	2	2	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
58	DIPLOMA	VIKRAM .	DIPLOMA	27	3	3	3	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3	2	1	2	3	2	3	2	2	2
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	29	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2	3

Overall CO Attainments for PO	CO					PO			
	CO1	CO2	CO3	CO4	CO	PO1	PO2	PSO1	PSO2
Targets	3	2	2	2	2.5	3	2	3	2
prev Act Attainments	2.76715	1.74	1.69	1.321	2.158	2.77	1.154	2.267	1.195
Attainments curr ActI	2.73684	1.73	1.7	1.152	2.047	2.74	1.029	2.456	1.123
Attainments Cumulative	2.752	1.73	1.69	1.236	2.103	2.75	1.092	2.361	1.159
Gap	0.25	0.27	0.31	0.76	0.40	0.25	0.908	0.639	0.841

Student Attainment Level 3 Count	34
Student Attainment Level 3 %	59
Student Attainment Level 2 Count	24
Student Attainment Level 2%	41
Student Attainment Level 1 Count	0
Student Attainment Level 1 %	0
Course Attainment (%Students getting level 3)	59.00%

Gaps Identified:	1	3 student not attempt the basic question of metrology related to use of CAD/CAM in an
	2	9 students not attempt the question related to thermocouple measuring device
	3	17 students not attempt the question related to stuidy of flow measuring devices in an organization.
	4	32 students not attempt the question related to CMM nad their construction.
Action To be taken:	1	Provide the notes of the topic to better understanding of topic
	2	Provide NPTEL vedio lecture for the understanding of the concept

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POORNIMA COLLEGE OF ENGINEERING,JAIPUR
Department of Mechanical Engineering
NBA Process Implementation

| **Batch 2019-2023** | | | | | **RTU Examination** | | | | | | |

| Name of Course | Measurement & Metrology | | Name of Faculty | Kalpit Jain | | | | | | | |
| Course Code | 6ME3-01 | | Semester / Section | VI | | | | | | | |

S. No.	Roll No.	Name of Students	University Roll No.	Marks Obtained	RTU Overall CO Level	PO1 Level	PO2 Level	Overall CO of PO	PSO1 Level	PSO2 Level	Overall CO of PSO
1	19EPCME001	ABHINAV SINGH .	19EPCME001	55	**3**	**2**	**2**	**2**	**2**	**2**	**2**
2	19EPCME002	ABHISHEK MISHRA	19EPCME002	63	**3**	**3**	**2**	**2**	**3**	**2**	**2**
3	19EPCME003	ABHISHEK SHAKYA	19EPCME003	47	**2**	**2**	**2**	**2**	**2**	**2**	**2**
4	19EPCME005	ADITYA KASHYAP	19EPCME005	75	**3**	**3**	**2**	**3**	**3**	**2**	**3**
5	19EPCME006	AFROZ ALAM	19EPCME006	59	**3**	**2**	**2**	**2**	**2**	**2**	**2**
6	19EPCME007	AHIN JOHNY	19EPCME007	70	**3**	**3**	**2**	**2**	**3**	**2**	**2**
30	19EPCME036	OMENDRA SINGH .	19EPCME036	64	**3**	**3**	**2**	**2**	**3**	**2**	**2**
31	19EPCME037	PANKAJ YADAV .	19EPCME037	78	**3**	**3**	**2**	**3**	**3**	**2**	**3**
32	19EPCME038	PARTH VERMA .	19EPCME038	61	**3**	**3**	**2**	**2**	**3**	**2**	**2**
33	19EPCME040	PRANAV KUMAR SINGH	19EPCME040	73	**3**	**3**	**2**	**3**	**3**	**2**	**3**
34	19EPCME041	PRITAM PRAJAPAT .	19EPCME041	77	**3**	**3**	**2**	**3**	**3**	**2**	**3**
35	19EPCME042	PRIYANSH SHARMA	19EPCME042	84	**3**	**3**	**2**	**3**	**3**	**2**	**3**
36	19EPCME043	RACHIT JAIN	19EPCME043	72	**3**	**3**	**2**	**3**	**3**	**2**	**3**
37	19EPCME044	RAJEEV SHARMA .	19EPCME044	63	**3**	**3**	**2**	**2**	**3**	**2**	**2**
38	19EPCME045	RAVI SHARMA	19EPCME045	85	**3**	**3**	**2**	**3**	**3**	**2**	**3**
39	19EPCME047	SANDEEP SHARMA	19EPCME047	61	**3**	**3**	**2**	**2**	**3**	**2**	**2**
40	19EPCME049	SHISHUPAL JADOUN	19EPCME049	57	**3**	**2**	**2**	**2**	**2**	**2**	**2**
41	19EPCME050	SHIVAM BHAT	19EPCME050	93	**3**	**3**	**3**	**3**	**3**	**3**	**3**
42	19EPCME052	SUDERSEN SEN .	19EPCME052	73	**3**	**3**	**2**	**3**	**3**	**2**	**3**
43	19EPCME053	SUMIT SHUKLA	19EPCME053	73	**3**	**3**	**2**	**3**	**3**	**2**	**3**
44	19EPCME054	TUSHAR JANGID	19EPCME054	48	**2**	**2**	**2**	**2**	**2**	**2**	**2**
45	19EPCME055	UMESH KUMAR	19EPCME055	72	**3**	**3**	**2**	**3**	**3**	**2**	**3**
46	19EPCME056	UMESH YADAV	19EPCME056	89	**3**	**3**	**2**	**3**	**3**	**2**	**3**
47	19EPCME057	USAMA BAKHED	19EPCME057	68	**3**	**3**	**2**	**2**	**3**	**2**	**2**
48	19EPCME058	UTKARSH KUMAR SHARMA .	19EPCME058	76	**3**	**3**	**2**	**3**	**3**	**2**	**3**
49	19EPCME059	VENKTESH KUMAR KALBI	19EPCME059	54	**3**	**2**	**2**	**2**	**2**	**2**	**2**
50	19EPCME060	VIKASH TIWARI	19EPCME060	41	**2**	**2**	**1**	**2**	**2**	**1**	**2**
51	19EPCME064	YASH DAHIYA	19EPCME064	37	**2**	**2**	**1**	**2**	**2**	**1**	**2**
52	DIPLOMA	ABHISHEK LAXKAR	DIPLOMA	0							
53	DIPLOMA	AMARJEET KUMAR	DIPLOMA	92	**3**	**3**	**3**	**3**	**3**	**3**	**3**
54	DIPLOMA	HARSHA RAJ SHISODIYA	DIPLOMA	17	**1**	**1**	**1**	**1**	**1**	**1**	

55	DIPLOMA	MOHAMMED FAIZAN	DIPLOMA	77	**3**	**3**	**2**	**3**	**3**	**2**	**3**
56	DIPLOMA	RAJ SHEKHAR	DIPLOMA	92	**3**	**3**	**3**	**3**	**3**	**3**	**3**
57	DIPLOMA	SHASHI RANJAN SINGH	DIPLOMA	81	**3**	**3**	**2**	**3**	**3**	**2**	**3**
58	DIPLOMA	VIKRAM .	DIPLOMA	76	**3**	**3**	**2**	**3**	**3**	**2**	**3**
59	DIPLOMA	YOGESH KUMAR SAHU	DIPLOMA	79	**3**	**3**	**2**	**3**	**3**	**2**	**3**

CO Attainments	Overall CO	PO1	PO2	Overall for PO	PSO1	PSO2	Overall for
Target	**3.00**	**3.00**	**2.00**	**2.25**	**3.00**	**2.00**	**2.50**
RTU Component Attainments	**2.88**	**2.71**	**1.36**	**1.89**	**2.71**	**1.36**	**2.10**
Gap	**0.12**	**0.29**	**0.64**	**0.36**	**0.29**	**0.64**	**0.40**

Student Attainment Level 3 Count	**52**
Student Attainment Level 3 %	**90**
Student Attainment Level 2 Count	**5**
Student Attainment Level 2%	**9**
Student Attainment Level 1 Count	**1**
Student Attainment Level 1 %	**2**
Course Attainment (%Students getting level 3)	**90**

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