SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR

Department of Production Engineering

LECTURE PLAN & LAB/TUTORIAL PLAN

Course Code :	2142503	Year/Semester :	BE II Year/ 4th Semester
Course Name :	METROLOGY AND MEASUREMENT	Academic Year :	2018-19/ EVEN
L - T - P :	3 - 0 - 2	Credit :	5
Course Detail :	Theory and Practical	Term Start Date :	17/12/2018
Course Coordinator :	Prof. N. P. Nirmal	Term End Date :	16/04/2019
Team of Instructors :		Class Test 1 :	-
Faculty Name:	Prof. N. P. Nirmal (Th.+ Lab)	Class Test 2 :	-
	Prof. P H Solanki (Th. + Lab)		`

SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
Department of Production Engineering

Lesson Plan

Academic Year : 2018-19			**Sem. : 4th Semester**			
Name of Teacher : Prof. N.P. Nirmal, Prof. P.H.Solanki			**Name of Department: Production Engineering**			
Subject : Metrology and Measurement			**Hrs./Week: 3Hrs/ Week**			
Theory/Tutorial : Theory			**Total 47 Hours to Teach**			
Sr. No.	**Name of Unit/Topics**	**Hrs. Allotted**	**Planned Date**	**Actual Date**	**Teaching AidCode**	**Remarks**
1	**Unit 1:Mechanical measurement**	**3**				
A	Need of mechanical measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments,	1	22.01.19		1	Prof.NPN
B	Threshold, Drift, Zero stability, loading effect and system response	1	28.01.19		1	Prof.NPN
C	Measurement methods, Generalized Measurement system, Static performance characteristics, Errors and their classification.	1	29.01.19		1	Prof.NPN
2	**Unit 2: Measurement of force, torque and strain**	**6**				
A	Force measurement: load cells, cantilever beams, Proving rings, differential transformers	1	04.02.19		1	Prof.NPN
B	Measurement of torque: Torsion bar dynamometer, servo controlled.	1	05.02.19		1	Prof.NPN
C	Dynamometer, absorption dynamometers. Power Measurements	1	11.02.19		1	Prof.NPN
D	Measurement of strain: Mechanical strain gauges, electrical strain gauges	1	12.02.19		1	Prof.NPN
E	Strain gauge materials, gauge factors	1	18.02.19		1	Prof.NPN
F	Theory of strain gauges and method of measurement, bridge arrangement, temperature compensation.	1	25.02.19		1	Prof.NPN
3	**Unit 3 : Displacement, velocity/speed and acceleration measurement**	**4**				
A	Working principal of Resistive Potentiometer, Linear variable differential transducers	1	26.02.19		1	Prof.NPN
B	Electro Magnetic Transducers: Mechanical	1	05.03.19		1	Prof.NPN
C	Transducers Electrical, Photoelectric Tachometers	1	11.03.19		1	Prof.NPN
D	Piezoelectric Accelerometer, Seismic Accelerometer	1	12.03.19		1	Prof.NPN
4	**Unit 4:Temperature measurement**	**4**				
A	Temperature Measuring Devices: Thermocouples, Resistance Temperature Detectors,	1	18.03.19		1	Prof.NPN
B	Thermistor, Liquid in glass Thermometers, Pressure Thermometers,	1	19.03.19		1	Prof.NPN
C	Pyrometer, Bimetallic strip	1	25.03.19		1	Prof.NPN
D	Calibration of temperature measuring devices, Numerical Examples on Flow Measurement.1	1	01.04.19		1	Prof.NPN
5	**Unit 5: Metrology**	**2**				

A	Basics of Metrology, Need for Inspection, Accuracy and Precision,	1	17.12.18		1	Prof.NPN
B	Objectives, Standards of measurements.	1	18.12.18		1	Prof.NPN
6	**Unit 6: Linear and angular measurements:**	**7**				
A	Working principle , constriction , Measurement prouder, error and elimination, limitations and calibration of Vernier Calliper	1	24.12.18		1, 3	Prof.NPN
B	" of Micrometer	1	31.12.18		1, 3	Prof.NPN
C	Miscellaneous linear measuring instruments	1	01.01.19		1, 3	Prof.NPN
D	Dial gauge indicator	1	07.08.19		1, 3	Prof.NPN
E	Working principle , constriction , Measurement prouder, error and elimination, limitations and calibration angular measuring instrument Sine Bar	1	08.01.19		1, 3	Prof.NPN
F	Bevel Protector	1	15.01.19		1, 3	Prof.NPN
G	Miscellaneous angular measuring instruments	1	21.01.19		1, 3	Prof.NPN
7	**Unit 7: Metrology of Gears and screw threads**	**6**				
A	Gear tooth terminology, Sources of errors in manufacturing of gears, Measurement of tooth thickness: Gear tooth vernier	1	30.01.19		1, 3	Prof.PHS
B	Constant chord method, Addendum comparator method and Base tangent method	1	06.02.19		1, 3	Prof.PHS
C	Measurement of tooth profile: Tool maker's microscope or projector, Involute tester	1	13.02.19		1, 3	Prof.PHS
D	Measurement of concentricity, Alignment of gears.	1	20.02.19		1, 3	Prof.PHS
E	Screw Thread Measurement: Errors in threads, screw thread gauges, measurement of element of the external,	1	27.02.19		1, 3	Prof.PHS
F	Measurement of element of the internal threads, thread caliper gauges Alignment testing	1	06.03.19		1, 3	Prof.PHS
8	**Unit 8: Metrology of Surface finish**	**6**				
A	Surface Metrology Concepts and terminology, Analysis of surface traces, ,	1	19.12.18		1	Prof.PHS
B	Specification of surface Texture characteristics	1	26.12.18		1	Prof.PHS
C	Method of measuring surface finish: Stylus system of measurement	1	02.01.19		1	Prof.PHS
D	Specification of surface Texture characteristics, and Method of measuring surface finish:	1	09.01.19		1	Prof.PHS
E	Stylus system of measurement other methods for measuring surface roughness:	1	16.01.19		1	Prof.PHS
F	Pneumatic method, Light Interference microscopes, Mecrin Instruments.	1	23.01.19		1	Prof.PHS
9	**Unit 9: Comparators**	**3**				
A	Functional Requirements, Classification, Mechanical Comparators	1	13.03.19		1	Prof.PHS

B	Mechanical Optical Comparators	1	27.03.19		1	Prof.PHS
C	Electrical Comparators, Pneumatic Comparators	1	03.04.19		1	Prof.PHS
10	**Unit 10: Miscellaneous Metrology**	**6**				
A	Precision instrumentation based on laser principles, coordinate measuring machines	1	02.04.19		1	Prof.NPN
B	Structure, modes of operation, probe operation and applications	1	08.04.19		1	Prof.NPN
C	Optical measuring techniques, tool makers microscope, profile projector	1	09.04.19		1	Prof.NPN
D	Optical square, basic of optical interference and interferometry, optoelectronic measurements	1	15.04.19		1	Prof.NPN
E	Pressure measurement, bourdon tube, diaphragm, bellow pressure gauge	1	10.04.19		1	Prof.PHS
F	Dead weight tester, ionization gauges	1	10.04.19		1	Prof.PHS

Teaching Aid Code:	
1	O.H.P √
2	L.C.D PROJECTER √
3	MODEL √
4	CHART √
5	OTHER (VIDEO) √

Sign of Teacher : Prof. N.P. Nirmal Prof. P. H. Solanki

Sign of H.O.D : _____

**** Remark column should cover any slippages and remedial action planned***

Reference Books:

1. Engineering Metrology and Measurement, N V Raghavendra and Krishnamurthy, Oxford University Press,
2. Engineering Metrology and Measurements, Bentley, Pearson Education
3. Theory and Design for Mechanical Measurements, 3rd Edition, Richard S Figliola, Donald E Beasley, Wiley India
4. Metrology and Measurement, AnandBewoor&VinayKulkarni McGraw-Hill
5. Doebelin's Measurement Systems Ernest Doebelin, DhaneshManik McGraw-Hill
6. Instrumentation, Measurement and Analysis, B.C. Nakra, K.K. Chaudhry McGraw-Hill
7. A Text book of Engineering Metrology, I C Gupta, DhanpatRai Publications
8. A course in Mechanical Measurements and Instrumentation, A K Sawhney, DhanpatRai Publications
9. Mechanical Measurements and Instrumentations, Er. R K Rajput, KatariaPublication(KATSON)
10. Mechanical Measurement and Metrology by R K Jain, KhannaPublisherMechanical Measurement & Control by D.S. Kumar.
11. Industrial Instrumentation & Control by S K Singh, McGrawHill
12. Mechanical Measurements by Beckwith & Buck, Narosa publishing House
13. A textbook of Metrology by M. Mahajan, Dhanpatrai& Co.
14. Mechanical measurement and metrology by J.P. Hadiy, H.G. Katariya, Books India Publicationis.

SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
Department of Production Engineering

Lesson Plan

Academic Year : 2018-19 Second Term	**Sem. : 4th Semester**
Name of Teacher : A1- Prof. NPN & A2, A3- Prof. PHS	**Name of Department : Production Engineering**
Subject : Metrology & Measurement	**Hrs./Week : 2 Hrs/Week**
Theory/Tutorial/Practical : Practical	

Sr. No.	Name of Unit/Topics	Hrs. Allotted	Batch	Planned Date	Actual Date	Teaching Aid Code	Remarks
1.	Basic understanding of measurements and metrology: concepts, application, advantage and future aspects.	2	A1	18.12.18		**1**	Prof. NPN
			A2	18.12.18			Prof. PHS
			A3	20.12.18			Prof. PHS
2.	Linear measurement checks different characteristics of linear measurements.	2	A1	01.01.19		**1, 3**	Prof. NPN
			A2	01.01.19			Prof. PHS
			A3	27.12.18			Prof. PHS
3.	Linear measurement check different characteristics of linear measurements.	2	A1	08.01.19		**1, 3**	Prof. NPN
			A2	08.01.19			Prof. PHS
			A3	03.01.19			Prof. PHS
4.	Angular measurement check different characteristics of angular measurements.	2	A1	22.01.19		**1, 3**	Prof. NPN
			A2	22.01.19			Prof. PHS
			A3	10.01.19			Prof. PHS
5.	Angular measurement check different characteristics of angular measurements.	2	A1	29.01.19		**1, 3**	Prof. NPN
			A2	29.01.19			Prof. PHS
			A3	17.01.19			Prof. PHS
6.	Measurement of force, torque and strain	2	A1	05.02.19		**1**	Prof. NPN
			A2	05.02.19			Prof. PHS
			A3	24.01.19			Prof. PHS
7.	Measurement of speed, velocity and acceleration	2	A1	12.02.19		**1**	Prof. NPN
			A2	12.02.19			Prof. PHS
			A3	31.01.19			Prof. PHS
8.	Measurement of Surface Roughness	2	A1	26.02.19		**1**	Prof. NPN
			A2	26.02.19			Prof. PHS
			A3	07.02.19			Prof. PHS
9.	Measurement of gear	2	A1	02.04.19		**1, 3**	Prof. NPN
			A2	02.04.19			Prof. PHS
			A3	14.02.19			Prof. PHS
10.	Measurement of screw thread	2	A1	09.04.19		**1, 3**	Prof. NPN
			A2	09.04.19			Prof. PHS
			A3	21.02.19			Prof. PHS
11.	Measurement of screw thread	2	A1	16.04.19		**1**	Prof. NPN
			A2	16.04.19			Prof. PHS
			A3	28.02.19			Prof. PHS

Teaching Aid Code:	
1	O.H.P √
2	L.C.D PROJECTER √
3	MODEL, INSTRUMENT √
4	CHART √
5	OTHER (VIDEO) √

Sign of Teacher : Prof. N.P. Nirmal Prof. P.H. Solanki

Sign of H.O.D : _____

**** Remark column should cover any slippages and remedial action planned***

Shantilal Shah Engineering College, Bhavnagar
Department of Production Engineering
4th Production Engineering
Metrology & Measurement
List of Experiments

1) Basic understanding of measurements and metrology: concepts, application, advantage and future aspects
2) Performance on linear and angular measurements and check different characteristics of measurements
3) Performance on Temperature measurements and check different characteristics of measurements and also do calibration
4) Performance on Stress, strain and force measurements and check different characteristics of measurements and also do calibration
5) Performance on Speed/Velocity, acceleration measurements.
6) Performance on surface measurements
7) Performance on measurements of gears and screw threads

Prof. N.P. Nirmal **Head of Production Engineering**

Prof. P.H. Solanki