C.U.SHAH UNIVERSITY – Wadhwan City

FACULTY OF: - Technology and Engineering (Diploma Engineering)
DEPARTMENT OF: - Mechanical Engineering
SEMESTER: - IV **CODE**: - 2TE04MMT1
NAME OF SUBJECT: - Mechanical Measurement

Teaching & Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
		Th	Tu	Pr	Total		Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
2TE04MMT1	Mechanical Measurement	03	00	02	05	4	30	1.5	70	03	30	20	----	150

Objective: - After completion of this course, the students will be able to,

- Measure linear & angular parameters
- Measurement of geometrical tolerances & surface roughness.
- Gear measurement
- Thread measurement.
- Limit gauges.

Course outline:-

Sr. No.	Course Contents	Teaching Hours
1	**Linear and angular measurement** Inspection, quality and quality control-definitions and differences ,Define accuracy, precision and error, Principle of Vernier scale and least count, Surface plates-types, important features, standards/important sizes, applications and precautions in use. Types, constructional sketch, major parts and their functions, least count , measuring methods and measurement illustration (for e.g. 12.48mm)of: (Vernier caliper, Micrometer, Telescopic gauge ,Height gauge, Depth gauge.),Slip gauge-types, applications, and wringing method ,Sketch, major parts and their functions, least count , measuring methods and measurement illustration of: (Bevel Protector, Sine bar, Angle gauges, Angle Dekkor, Spirit level, Clinometers, Auto collimator.)	09
2	**Measurement of geometrical tolerances** Dial indicators/gauge-types, constructional sketch and applications, Definition, symbol and measuring methods of: Straightness, Flatness, Squareness, Parallism, Perpendicularity, Roundness, Concentricity, Cylindricity, Run out and ovality.	05
3	**Measurement of surface roughness** Terminology used in connection with surface finish, Comparison methods to inspect surface finish-concept and applications, Direct instrument measurement methods-types and concepts, Construction, working and applications of Talysurf surface roughness tester and Tomlinson tester, Centre line average and Root Mean Square systems of surface texture evaluation-terminology used, concept, equations and numerical examples,Indication of various surface roughness characteristics with surface roughness symbols-interpretation	05
4	**Gear measurement** Types of gears, Forms of gear teeth-types and concept, Gear tooth Terminology, Sketch, major	05

	parts and their functions, least count, measuring methods and measurement illustration of gear tooth Vernier,Derivation and numerical example to measure gear tooth thickness using: . Gear tooth Vernier, Constant chord method, Base tangent method, Gear tooth profile measurement.	
5	**Thread measurement** Threads-classification, elements, specifications and forms, Measurement of major and minor diameters,Three and two wire method of measuring effective diameter of external thread-concept, terminology used, best wire size, derivation of equation and numerical example,Thread micrometer-sketch, method to use and determination of dimension, Pitch measurement methods.	**06**
6	**Limit gauges** Limit gauges-classification, sketch and applications	**02**
7	**Non destructive testing** Non destructive testing (NDT) -concept, need and advantages, NDT- important methods, working with sketch and applications.	**04**
8	**Transducers and sensors** Instrumentation-introduction, performance characteristics,Static characteristics of instruments,Transducers-concept, classifications, physical quantities which can be measured, advantages and disadvantages,Electrical transducers-types, working principles and applications,Linear Variable Differential Transformer (LVDT) type pressure gauge, Resistance type, Capacitance type, Inductance type (LVDT), Piezo-electric, Sensors- classification and applications.	**04**
9	Temperature Measurement Introduction, Classification, working principle, construction, working, advantages, limitations and applications of temperature measuring devices: Mercury in glass, thermometer, Bimetallic thermometer, Resistance thermometer, Thermister, Thermocouple, Radiation pyrometers, Optical pyrometers.	**02**

List of Experiments:-

- Preparatory Activity:
  S.I. basic, supplementary and derived units and their conversions. Convert given length, area and volume from one unit to another. (From mm to cm and m, from mm to inch, from m to yard and foot, from mm2 to inch2 and vice-versa, mm3 to inch3 and vice-versa ,etc.), Convert given degree to radian and vice-versa, Various drafting, surface finish and geometrical symbols, Define axis, axes, centre, angles, plane, solid angle.
- Measurement of Linear And Angular Dimensions.
- Measurement of Straightness.
- Measurement of Flatness.
- Measurement of Squareness, Perpendicularity and Parallity.
- Measurement of Roundness, Cylindricity, Concentricity, Run Out and Ovality.
- Measurement of Surface Roughness.
- Measurement of Gear Measurement.
- Measurement of Thread Measurement.
- Measurement of Limit Gauges**.**

Learning Outcomes:-

- Measure the given mechanical elements and assemblies using linear and angular analog /digital measuring instruments.
- Check geometrical accuracy of given application.
- Explain surface roughness checking instruments.
- Measure and derive important dimensions of various thread forms and gears.
- Select and use non destructive testing methods.
- Use gauges to check the dimension.
- Select and measure variables using appropriate sensors and transducers

Books Recommended:-

- Mechanical measurements and instrumentation, R.K.Rajput , KATSON Publication.
- Metrology and Instrumentation, Tahir .
- Mechanical Measurement , R.S.Sirohi.
- Engineering Metrology , R.K.Jain, Khanna Publications .