Department of Mechanical Engineering   *R19*

B.Tech IV Year I Semester
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
<u>**19AME76e – GEOMETRIC DIMENSIONING AND TOLERANCING**</u>
(Professional Elective-IV)

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Course Objectives: The objectives of the course are to make the students learn about
- Teach the basics of the geometric dimensioning and tolerances.
- Familiar with the form and orientation tolerances.
- Introduce tolerances of profiles of lines and surfaces with or without datums.
- Expose the students to various surface roughness parameters and their measurements in two dimensions.
- Understand the concepts of dimensional chains and inspection techniques.

UNIT – 1: Basic Concepts   **12 Hrs**
General terms and definitions of geometrical features - General principle of sizes - System of limits and fits - Principles of dimensioning - Introduction to geometric dimensioning and tolerancing (GD&T) - Inspection of dimensional and geometrical deviations - Datums and datum systems, Rule #1 and Rule #2- Boundary principle.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the general terms and definitions of geometrical features   **L2**
- List the various boundary principle rules   **L1**
- Identify the types of datums and datum systems   **L3**

UNIT – II: Form and Orientation Tolerances   **10Hrs**
Form tolerances: types, specifications and interpretations - measurement and evaluation of straightness, flatness and roundness - Orientation tolerances: types, specifications and interpretations, and verification of orientation tolerances. Exercises on each group.

Learning Outcomes:
At the end of this unit, the student will be able to
- Describe orientation tolerances   **L2**
- List types of form tolerances and its specifications   **L1**
- Explain the measurement and evaluation of straightness and flatness   **L2**
- Explain the measurement and evaluation of roundness   **L2**

UNIT – III: Location, Runout and Profile Tolerances   **10Hrs**
Tolerances of location: types, specifications and interpretations - verification techniques - Tolerances of profiles of lines and surfaces with or without datums - Tolerances of runout - Tolerancing of angles and cones. Exercises on each group.

Learning Outcomes:
At the end of this unit, the student will be able to
- List the types of tolerances of locations   **L3**
- Explain the concept of tolerances of run out   **L2**
- Explain tolerancing of angles and cones   **L2**

UNIT – IV: Surface Roughness   **8 Hrs**
Various parameters and their measurements in two dimensions - filtering and filtering techniques - areal parameters.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the concept of surface parameters in two dimensions — L2
- Explain the filtering techniques — L2

UNIT – V: Related Topics 9Hrs

Vectorial dimensioning and tolerancing - Statistical tolerancing of mechanical assemblies - Dimensional chains - Measurement uncertainty - Computer-aided tolerancing and verification. Inspection techniques- conventional and CMM.

Learning Outcomes:
At the end of this unit, the student will be able to
- Compare various statistical tolerancing of mechanical assemblies. — L3
- Identify the various computer aided tolerancing techniques. — L3

Text Books:
1. Drake, P. J., Dimensioning and Tolerance Handbook, McGraw-Hill, Inc., New York.
2. Meadows, J. D., Geometric Dimensioning and Tolerancing: Applications and Techniques for use in Design, Manufacturing and Inspection, Marcel Dekker, Inc., New York.
3. Gill, P. S., Geometric Dimensioning and Tolerancing, S. K. Kataria & Sons, New Delhi.

Reference Books:
1. Gupta, I. C., A Textbook of Engineering Metrology, Dhanpat Rai Publications, New Delhi.
2. Galyer, J. F. W. and C. R. Shotbolt, Metrology for Engineers, Cassell Publishers, London.
3. Henzold, G., Handbook of Geometrical Tolerancing: Design, Manufacturing and Inspection, John Wiley & Sons, Chichester.
4. Muralikrishnan, B. and J. Raja, Computational Surface and Roundness Metrology, Springer, USA.

Course Outcomes:
At the end of this Course the student will be able to
- Introduce the essentials of the language of geometric dimensioning and tolerancing (GD&T) based on ASME and ISO standards, as well as the essentials of surface roughness measurements in both 2D and 3D including filtering techniques. — L2
- Relate concepts of Vectorial dimensioning and tolerancing, dimensional chains, measurement uncertainty, etc. — L2

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