ADVANCED MECHANICAL COMPONENT DESIGN

Subject Code: 13ME2210

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Pre requisites: Material science and Mechanics of solids

Course Educational Objectives:

To make the student learn

1. design of mechanical components against creep and fracture
2. design of mechanical components process equipments
3. concepts of computer aided design and analysis of mechanical components

Course Outcomes:

The student will be able to

1. explain various theories of ductile and brittle materials
2. analyze mechanical components against creep and fracture
3. analyze and design various components pressure vessels
4. analyze the gearbox
5. explain the concepts of computer aided design and analysis of mechanical components

UNIT-I

Creep: Material behavior**,** stages of creep, creep strength, relaxation, mathematical modeling of creep behavior-Maxwell model, Voigt-Kelvin Model.

UNIT-II

Fracture: Introduction, **c**rack modes**, s**tress intensity factor, fracture toughness, plastic zone correction, *J*-Integral**.**

UNIT-III

Design of cylindrical and spherical vessels : Thin and thick walled cylinder analysis, design of end closers, design of standard and non-standard flanges, design of vessels, design of supports for process vessels.

UNIT-IV

Design of thick walled high pressure vessels: Design by various theories of failure, construction of these vessels with high strength steel and other special methods.

UNIT-V

Design of gearbox: Component of speed reducers, multi speed gear box, speed changing, speed diagrams, kinematic arrangement, design of gear box.

TEXT BOOKS:

1. P. Gope, "*Machine design*" ,1e, PHI, 2012.

2. M.V. Joshi and V V Mahajani, "*Process Equipment Design*" , 2e, Mc-Millan India Ltd.,3e,2008.

3. T V Sundrarajamurthy and Shanmugam, "*Machine Design*" , 8e, Anuradha Publications, 2007.

REFERENCES:

1. John, V. Harvey, "*Pressure Vessel Design: Nuclear and Chemical Applications*", Affiliated East West Press Pvt. Ltd., 1969.

2. Prasanth Kumar, "*Elements of Fracture Mechanics*", Wheeler Publishing, New Delhi-1999.