Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1C3/ DTP2C3 **Advanced Machine Design**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objectives: The objective of the subject is to deal with failure analysis and advanced areas of design of machine elements based on reliability, fatigue, creep. Also deals with the fracture mechanics approach to design.

Prerequisite(s): Pre requisites are Material science, Machine Design I and Machine Design II.

COURSE OF CONTENTS

Unit-I

Introduction to Advanced Mechanical Engineering Design:

Review of materials and processes for machine elements. Case studies of mechanical engineering design failures. Review of static strength failure analysis – theories of failure.

Unit-II

Reliability and Optimum based Design :

Introduction to optimum design, analysis of simple machine members based on optimum design. Fundamentals of reliability ,System concepts in Reliability engineering. Failure distributions, Statistical analysis of failure data, Weibull analysis, dimensioning.

Unit-III

Design for Dynamic Loading:

High cycle and low cycle fatigue, Fatigue strength. Design of Mechanical Equipment Elements. Exercises of fatigue design of shafting and gears. Exercises of surface fatigue design of rolling contact bearings including linear bearings.

Unit-IV

Design for Creep:

Introduction to Design for creep. Combined creep and fatigue failure prevention. Design for low temperature (Brittle failure). Design for corrosion, wear, hydrogen embrittlement, fretting fatigue and other combined modes of mechanical failure.

Unit-V

Fracture mechanics:

Introduction: Fracture mechanics approach to design, the energy criterion, the stress intensity approach, effect of material properties on fracture, dimensional analysis in fracture mechanics.

Fundamental concepts: Stress concentration effect of flaws, the Grifith energy balance, the energy release rate, instability and the R curve, stress analysis of cracks, K as a failure criterion. Fracture toughness testing of metals

Note: Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.

Text Books:

[1] Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003

[2] Dieter G.E., *Engineering Design*, McGraw-Hill 2000.

[3] Mubeen., Machin*e Design*, , Khanna Publications(P) Ltd.,2004

Reference Books:

[1] Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2006

[2] Shariff A.,*Design of Machine Elements*,Dhanpat Rai Publications(P) Ltd.,3e,1995