**IV B.TECH - I SEMESTER**
**ADVANCED MACHINE DESIGN**

**Course Code: ME7T5A** **Credits: 3**
**Lecture: 3 periods/week** **Internal assessment: 30 marks**
**Tutorial: 1 period/week** **Semester end examination: 70 marks**

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**COURSE OBJECTIVES:**

1. Introduce Knowledge about the advance failure theories
2. Acquire the Knowledge to design IC engine components
3. Design the gear box and valve mechanism for engines.
4. Introduce concept of optimization in machine design

**COURSE OUTCOMES**

At the end of the course the students will be able to

1. Predict the mode of failure for ductile and brittle materials under fatigue loading
2. Identify the surface failure due to contact of components
3. Design and Analyze the IC Engine Components
4. Design gear box and valve mechanism for engines
5. Implement the optimization techniques for design

**Pre Requisites:** Design of Machine Members, Dynamics of Machinery

**UNIT I**
**ADVANCE FAILURE THEORIES**
Failure of ductile materials under static loading, failure of brittle materials under static loading, mechanism of fatigue failure, fatigue failure models, estimating fatigue failure criteria, residual stresses

**UNIT II**
**SURFACE FAILURE**
adhesive wear, abrasive wear, corrosion wear, surface fatigue, spherical contact, cylindrical contact, general contact, surface fatigue failure modes, dynamic contact, surface fatigue strength

**UNIT III**
**I. C. ENGINE COMPONENTS:**
Cylinder and cylinder liner, Design of trunk type piston, Design of connecting rod and Design of overhung Crank shaft, Center crankshaft

**UNIT IV**
**GEAR BOX DESIGN:**
Function of Gear Box, Components of Gear Box, Progression Ratio, Speed Diagram, Kinematic Arrangement, Design Procedure
Valve gear mechanism, Design of Valves, Design of Valve Spring, Design of Push rod

**UNIT V**
**DESIGN OPTIMISATION**

Optimization function of single variable and multi variables, optimization techniques, Interval halving and Golden section methods, optimum design of tension bar for minimum deflection, cost and weight, Torsion member for minimum deflection, cost and weight.

## Learning Resources

**Text books:**


1. Design of Machine Elements by V. B. Bhandari, Third Edition, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, ($5^{th}$ Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.
3. Engineering Optimization - Theory and Practice by Singeresu S. Rao, Revised Third Edition, New Age International Publishers, New Delhi, 2008.


**Reference books:**


1. Mechanical Engineering Design, ($8^{th}$ Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
2. Design of Machine Elements, by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
3. A Textbook of Machine Design by R S Khurmi, J K Guptha, ($25^{th}$ Edition), S Chand & Company Ltd., New Delhi, 2005.
4. A Text book of Machine design (in SI units) by S Md. Jalaluddin, (Third Enlarged Edition), Anuradha Publications, Chennai, 2006.


**DATA BOOKS TO BE ALLOWED IN EXAMINATION:**


1. Design data hand book by K Mahadevan & K Balaveera Reddy, ($4^{th}$ Edition), CBS Publishers, 2013.
2. Design Data Hand Book, First Edition, S. Md. Jalaluddin, Anuradha Publications, Chennai, 2009