COURSE TITLE	**ADVANCED MACHINE DESIGN LAB**
COURSE CODE	**01CA1104**
COURSE CREDITS	**2**

Objective:

1 The course is intended to strengthen fundamentals of applied mechanics of solids and build understanding of design and analysis of machine components under dynamic loading. The course introduces loading design and analysis of machine components at elevated temperature. The course also includes fundamentals and application of fracture mechanics and surface failures in machine component design.

Course Outcomes: After completion of this course, student will be able to:

1 Design mechanical components subjected to static loading using principles of applied mechanics of solids.

2 Design and analyze mechanical components subjected to dynamic loading conditions.

3 Design and analyze mechanical components considering the effects of crack propagation and creep at elevated temperatures.

4 Analyze mechanical components subjected to fracture and evaluate their failure behavior.

5 Analyze the influence of surface failure mechanisms on the performance of mechanical components.

Pre-requisite of course: Machine Design, Strength of Materials

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	4	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**To analyze stress concentration effect on a specimen using software.** To analyze stress concentration effect on a specimen using software.	4

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
2	**To perform stress concentration test of a specimen using Universal Testing Machine.** To perform stress concentration test of a specimen using Universal Testing Machine.	4
3	**To analyze fatigue failure of a specimen using software.** To analyze fatigue failure of a specimen using software.	4
4	**To perform fatigue failure test of a specimen using fatigue testing machine.** To perform fatigue failure test of a specimen using fatigue testing machine.	4
5	**To analyze creep failure of a specimen using software.** To analyze creep failure of a specimen using software.	4
6	**To investigate creep failure of a specimen using microscope.** To investigate creep failure of a specimen using microscope.	4
7	**To investigate friction on different types surfaces.** To investigate friction on different types surfaces.	4
8	**Prepare a case study related to design of mechanical components.** Prepare a case study related to design of mechanical components.	4
9	**Prepare a case study related to failure of mechanical components.** Prepare a case study related to failure of mechanical components.	4
10	**Design exercise of shaft used in machine tool gear box.** Design exercise of shaft used in machine tool gear box.	4
11	**Design exercise of connecting rod used in Automobile I.C. Engine.** Design exercise of connecting rod used in Automobile I.C. Engine.	4
12	**Design exercise of cylinder used in Automobile I.C. Engine.** Design exercise of cylinder used in Automobile I.C. Engine.	4
Total Hours		**48**

Textbook :

1 ANSYS Workbench Tutorial Structural & Thermal Analysis Using the ANSYS Workbench Release 12.1 Environment, Kent L. Lawrence, Schroff Development Corporation, 2010

2 Elements of Fracture Mechanics, Prashant Kumar, Tata McGraw-Hill Publishing Company Limited, 2009

3 Machine Design An Integrated Approach, Robert L. Norton , Pearson, 2019

4 Engineering Design, George E. Dieter, Linda C. Schmidt , McGraw-Hill Higher Education, 2009

References:

1 Fundamentals of Machine Component Design, Fundamentals of Machine Component Design, Robert C. Juvinall, Kurt M. Marshek, Wiley, 2020

2 Mechanical Design of Machine Elements and Machines : A Failure Prevention Perspective, Mechanical Design of Machine Elements and Machines : A Failure Prevention Perspective, Jack A. Collins, Henry R. Busby, George H. Staab, Wiley, 2010

3 Materials Science and Engineering Problems with Solutions, Materials Science and Engineering Problems with Solutions, M. N. Shetty , Prentice Hall India Pvt., Limited, 2015

4 Metal Fatigue in Engineering, Metal Fatigue in Engineering, Henry O. Fuchs, Ralph I. Stephens ·, Wiley, 1980

5 Mechanical Design of Machine Components, Mechanical Design of Machine Components, Ansel Ugural, CRC Press, 2015

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	10.00	20.00	15.00	25.00	20.00

Instructional Method:

1 Demonstration

Supplementary Resources:

1 https://nptel.ac.in/courses/112/106/112106137/