

COURSE CODE	COURSE TITLE	L	T	P	C
1153AE107	FATIGUE AND FRACTURE MECHANICS	3	0	0	3

Course Category:

Allied Elective

a. Preamble :

This course provides knowledge on basic characteristics of fatigue and fracture mechanics of aircraft structures.

b. Prerequisite Courses:

Strength of Materials

c. Related Courses:

NA

d. Course Educational Objectives :

- To understand the fatigue load, low and high cycle fatigue.
- To understand crack initiation and crack growth of the structure.
- To understand safe life and fail safe design.

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understanding fatigue load and become familiar with definitions	K3
CO2	Analyze for cumulative damage	K4
CO3	Analyze for crack initiation and crack growth	K4
CO4	Analyze for strength of cracked bodies	K4
CO5	Analyze damage tolerance structures	K4

f. Correlation of COs with POs :

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	M	L							
CO2	H	H	M	M	L							
CO3	H	H	M	M	L							
CO4	H	H	M	M	L							
CO5	H	H	M	M	L							

H- High; M-Medium; L-Low

Course contents

- 1. FATIGUE OF STRUCTURES** **9**
S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.
- 2. STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR** **9**
Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life - cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques - Cumulative damage - Miner's theory.
- 3. PHYSICAL ASPECTS OF FATIGUE** **9**
Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations - fatigue fracture surfaces.
- 4. FRACTURE MECHANICS** **9**
Strength of cracked bodies - Potential energy and surface energy - Griffith's theory - Irwin - Orwin extension of Griffith's theory to ductile materials - stress analysis of cracked bodies - stress intensity factors for typical geometries.
- 5. FATIGUE DESIGN AND TESTING** **9**
Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

TOTAL : 45

TEXT BOOKS

Prasanth Kumar – “Elements of fracture mechanics” – Wheeler publication, 1999.
S. Suresh, “Fatigue of Materials” Second Edition, Cambridge University Press

REFERENCES

1. Sin, C.G., “Mechanics of fracture” Vol. I, Sijthoff and Noordhoff International Publishing Co., Netherlands, 1989.
2. Knott, J.F., “Fundamentals of Fracture Mechanics”, Butterworth & Co., Ltd., London
3. Barrois W, Ripely, E.L., “Fatigue of aircraft structure”, Pergamon Press. Oxford, 1983.