Circular

Ref. No. AJU/AD/ENGG/239/2024-25 **Date: 12.05.2025**

It is to inform the students and faculty members of ARKA JAIN University that the Department of Mechanical Engineering & Electrical Engineering of School of engineering and IT, ARKA JAIN University is going to organize "Value Added Course –**"Numerical Analysis of Fatigue Failure in Mechanical Components"** in association with Design and simulation club from 14.05.2025 to 02.06.2025. The course is open for all the Engineering students of ARKA JAIN University Jamshedpur. The details are mentioned in annexure. For any query kindly contact with Course Co-ordinator Mr.Basant Kumar Das

Link for registration: https://forms.gle/A74ZKKFGqSe5EBgT8

Mode of learning: Hybrid.

Registration fee: Nil
Last Date for Registration: 14.05.2025
Convener: Dr. Ashwini Kumar

Coordinators:
Mr.Basant Kumar Das (basant.d@arkajainuniversity.ac.in), 7004188155
Dr. Jonaki Mukherjee (dr.jonaki@arkajainuniversity.ac.in), 8902464892

Dr. Ashwini Kumar
Assistant Dean
School of Engineering & IT
Arka Jain University, Jharkhand

Copy for information & necessary action please: -

1. PS to The Vice-Chancellor
2. PS to The Director
3. PS to DSW/Director Campus
4. Controller of Examination for information
5. PS to The Registrar
6. In charge Web services for Website
7. Notice Board
8. Guard File

Value Added Course –Numerical Analysis of Fatigue Failure in Mechanical Components" in association with Design and simulation club

Course Content:

This course is designed to build participants' background from basics to the advanced level of fatigue fracture analysis. It will cover practical-analytical aspects of fatigue failure and fracture mechanics for engineering components and structures subjected to various cyclic loading conditions. Typical fatigue problems are analysed and methods of solution are discussed.
Topics covered include: fundamental concepts of fracture mechanics and fatigue damage in materials, fatigue fracture analysis of cyclically loaded components, practical application, the stress intensity factor, fatigue and fracture data analysis, fatigue crack initiation and growth of engineering components subjected to the uniaxial and multi axial fatigue loading conditions, fatigue damage theories, and cyclic plasticity and ratcheting response of materials.

Module 1 Basics of Fatigue Failure Mechanism

- Overview of stress and strain states, and materials properties
- Cyclic stress/ strain- fatigue life
- The elements of elastic and plastic behaviour of materials
- Linear Elastic Fracture Mechanics (LEFM)

Module 2 Fatigue Failure Analysis

- Crack tip plasticity, R curves, and Fracture toughness
- Fatigue damage and cycle counting analyses
- Stress concentration factor, stress raiser effect on fatigue life
- Crack growth rate and fatigue life prediction

Module 3 Cause and Effects of Fatigue damage

- The effect of mean stress on fatigue life of engineering components
- Fracture surface analysis
- Fatigue damage theories and approaches
- Cyclic plasticity and ratcheting theories

Module 4: Understand the mechanisms of fatigue

- Know the circumstances where fatigue is exacerbated
- Actions that can be taken to minimise the problem
- Different techniques for reducing the impact of fatigue
- Identify some fatigue failures
- Life time assessment of fatigue failure in metallic components

Module 5: Industry 4.0 – Methods for assessing fatigue life

- What does fatigue failure look like?
- Methods for assessing fatigue life
- How to minimize the problem

About the course:

Course Convener: Dr. Ashwini Kumar

Course Developer: - Mr. Basant Kumar Das, Dr. Jonaki Mukherjee

Contact No- 7004188155

Email-dr.jonaki@arkajainuniversity.ac.in,basant.d@arkajainuniversity.ac.in.

Course Duration: - 35 Hours, Commencement Date: - 14th May 2025

Course Location: - Arka Jain University Jharkhand and Hybrid Mode (Google Meet)

Mode of Learning: -Both class room and online

Who can Enroll: - All Engineering Students

Registration Fee: - Nil

Course Objective

- Understand why fatigue occurs
- Understand the mechanisms of fatigue
- Know the circumstances where fatigue is exacerbated
- Have an understanding of actions that can be taken to minimize the problem
- Knowledge of different techniques for reducing the impact of fatigue
- Identify some fatigue failures
- Have some knowledge of carrying out life time assessment of fatigue failure in metallic components

Process of Enrollment and Certification

- Fill out the registration form using the Google form link given below. After the successful enrollment, participants will attend a 35 hour session in which 80% attendance is required. At the end of the each module, the participants have to submit an assignment. To be eligible for the certificate, the participants must complete at least three out of five assignments and score at least 60% in the quiz. The participant will receive a certificate from Arka Jain University Jharkhand after successful completion of the assignment and quiz.

Program Specific outcome

- Theoretical concepts that are foundational to fracture mechanics
- Key information needed to perform a risk assessment with fracture mechanics
- Tools for the analysis of data coming from qualification tests and CT scans
- Computational tools that are available to support probabilistic fracture mechanics

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