Fracture and Fatigue of Engineering Materials

Course Overview

The Many failures of engineering structures result from fracture and fatigue problems. It is estimated that in The USA more than 100 billion dollars are lost every year to fracture and fatigue problems. This number is likely multiplied many times over on a worldwide scale. Since the development of quantitative approaches to fracture and fatigue in the mid 1900's, an estimated 50 percent of these failures could have been prevented by the proper application of technology. Many industries fail to use these proven approaches due to lack of knowledge or inadequate funding to implement the latest technology. Use of these technologies can improve the design life of structures by an implementation of fail-safe, safe-life or fracture-proof designs. It is important that engineers involved with structural design, material selection and failure prevention and analysis have a working knowledge of fracture and fatigue fundamentals and methods of failure prevention. This knowledge could come from a better understanding of fracture mechanics and fatigue concepts and a knowledge of methods for applying these to engineering structures. Since the development of fracture and fatigue concepts in the middle 1900's, many test standards have been developed and many methods for application of these techniques are available.

This proposed mini-course would present the basic concepts of engineering fracture mechanics and fatigue. In addition test methods used for determining properties used in a fracture and fatigue and fatigue analysis would be presented. Finally methods of applying the technology to the prevention of fracture and fatigue failures will be presented. Some case studies showing how this technology has been used in the past used would also be presented. The course would start with the traditional linear-elastic approach to fracture mechanics. After the linear-elastic concepts are fully covered, the newer nonlinear approaches to fracture mechanics would be covered.

The course is designed for students who have little or no knowledge of fracture and fatigue concepts. However, the student should have a good background in basic stress analysis, engineering mathematics and a working knowledge of engineering materials. The course would be suitable for advanced undergraduate students, graduate students and engineers from industry. The course would involve some student participation with workshop sessions for solving practical problems in fracture and fatigue. The course will also provide an opportunity for students to bring to class problems for discussion.

Dates	**November 7-18, 2016. Maximum Number of participants: 60.**
You Can Attend if	Anybody with an interest in the course topic and adequate basic background in engineering, science, or technology. Adequate background in calculus, at least at the higher-secondary level, but better at the Bachelors level is expected. Some experience with computation and programming will be helpful. Selection on the first-come-first-served basis after ensuring reasonable background (total capacity: 60; some seats reserved for students from the SP Pune University campus departments). Resume/CV with a brief statement of interest/purpose is required for selection and registration.
Fees	**One-Time GIAN Registration:** Visit http://www.gian.iitkgp.ac.in/GREGN/ **Course Fees:** People affiliated to SP Pune University or affiliated colleges: No fee, but registration is must. People affiliated to academic institutions, research institutes, NGOs, etc.: ₹1000. People from industry: ₹5000. Fees include tea with light snacks, any instructional material provided by the expert faculty, computer access during any tutorial sessions for the course, internet access via the SP Pune University campus network during the course. Out-station candidates need to arrange for transport and accommodation on their own. Full attendance necessary to be eligible for certificate of participation/attendance. Appearing for evaluations/examinations during the course is necessary for certificate of grades in the course.

Prof. John D. Landes is a professor emeritus from the University of Tennessee in Knoxville, TN USA. He received his PhD training at Lehigh University where he studied with fracture mechanics pioneers like Dr. George Irwin, the father of fracture mechanics, Dr. Paul Paris, a developer of fracture mechanics approaches to fatigue crack growth, Dr. Robert Wei, know for basic work in environmental influences in fracture and fatigue. Dr. Landes spent more than 15 years working in a fracture and fatigue group at Westinghouse research center in Pittsburgh, PA USA working on fracture and fatigue applications for structural problems in the power generation industry. After he left Westinghouse, he joined the faculty of the University of Tennessee as a Professor in the Engineering Mechanics Department. This later became the Department of Mechanical, Aerospace and Biomedical Engineering. There he continued fracture and fatigue research as well as a teaching career.

Dr. Landes is one of the pioneers in the development of non-linear fracture mechanics including elastic-plastic fracture mechanics and high temperature creep cracking. He suggested a statistical approach to correlating scatter and size effects for brittle fracture of steels in the transition regime. He has been instrumental in developing new testing approaches and in working with groups involved in the writing of ASTM and ISO test standards. He has developed new methods for the application of fracture mechanics approaches to the analysis of integrity and safety in large structural components.

Dr. Landes has spent more than 30 years teaching engineering subjects including fracture and fatigue courses at the University of Tennessee, short courses in fracture mechanics for industry students and short courses throughout the Westinghouse Corporation. He is on the editorial board of two technical journals involving fracture and fatigue publications and a frequent reviewer for journal papers and book chapters. He has received several awards and honors including the first ASTM George R. Irwin Medal for outstanding contributions in fracture mechanics research and the Fracture Mechanics Medal Award from ASTM E 08 for significant contributions to the field of non-linear fracture mechanics. At the University of Tennessee, he received awards for his research as well as for teaching excellence. After retirement he continued teaching engineering subjects at a local community college as well as teaching short courses in fracture and fatigue to industrial students.

Course Coordinators

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