

CVEG 563V – Fundamentals of Fracture and Fatigue in Structures
Course Syllabus, Spring 2014

Classroom: 2291, Bell Engineering Center
Mtg. Times: M,W,F: 2:00 – 2:50pm
Website: www.ssr1-uark.com/teaching/

Instructor: Gary S. Prinz, PhD, PE
Office: Bell 4156
Office Hours: *TBD*
Email: prinz@uark.edu

Required Text:

T.L. Anderson, *Fracture Mechanics: Fundamentals and Applications*, 3rd Edition, CRC Press LLC, 2004. ISBN: 978-0-84-931656-2.

Supplemental Texts & Materials:

D. Broek, *Elementary Engineering Fracture Mechanics*, 4th Edition, Kluwer Academic Publishers, 1986. ISBN: 90-247-2656-5

MIL-HDBK-5H, *Military Handbook: Metallic Materials and Elements for Aerospace Vehicle Structures*, US DOD, 1998. (*PDF link on course website*)

Prerequisites:

Graduate student status

Course Objectives:

The aim of this course is to give a basis in fracture mechanics and fatigue to be applied in structural design and analysis. After completion of the course you should be able to:

1. Understand the fundamental principles of linear-elastic fracture mechanics;
2. Identify different modes of fracture;
3. Determine the stress-strain and load-displacement fields around a crack tip for linear elastic cases;
4. Formulate the stress intensity factor (K) for typical crack configurations and apply it in design-type problems;
5. Formulate the strain energy release rate (G) and use it in the analysis of structural systems;
6. Define fracture toughness of materials using K_{Ic} and G_{Ic} ;
7. Understand general concepts of elastic-plastic fracture mechanics (application of J -contour integral, etc.);
8. Understand the standard and non-standard fracture mechanics tests to determine the fracture toughness of materials;
9. Identify the influencing factors in fatigue and understand how they relate to damage;
10. Understand S-N curves and how they are used in fatigue analysis;
11. Predict the fatigue life of structures subjected to constant-amplitude and variable-amplitude repeated loads.

Grades: Grades are based on homework and exam performance. The final grade distribution is as follows:

Homework	30%
Midterm Exam	30%
Final Exam	40%

Homework:

Homework assignments and corresponding due dates are listed in the attached course schedule. Please note that homework assignments will be collected at the BEGINNING of class on the day they are due. Late homework will not be accepted.

Beware of over-dependence on other people for help with homework. Proper use (full participation) of study groups is highly encouraged; however, improper use of study groups is a form of academic misconduct and will be dealt with seriously (see section on Academic Integrity below).

Standards for Presentation:

Similar to what is expected in engineering practice, complete, professional, and correct presentations are expected on homework and exams. The presentations will be subject to critical review. It is possible to have correct solutions on homework and exam problems but receive less than full credit due to lack of clarity or unprofessional presentation. The work leading to the solutions must be presented appropriately and clearly.

Note: A sample of proper work presentation is provided in this packet.

Attendance:

All students enrolled in this course are required to attend all lectures. Unavoidable absences should be discussed with the instructor in advance.

Academic Integrity:

In keeping with the University of Arkansas' academic integrity policy, academic misconduct in all forms is unacceptable and may result in a failing grade and further action by the Office of Academic Integrity and Student Conduct (OAISC). Academic misconduct includes, but is not limited to, plagiarism, fabrication or falsification, and cheating (including taking credit for work completed by others).

Five Keys to Success:

1. Read the assigned material before each class
2. Bring thoughtful questions to class or prepare for class as if you will be explaining the concepts to others
3. Take notes during class discussions and during reading assignments
4. Synthesize and summarize what you learn each week in a course journal
5. Begin your assignments the day they are assigned (rather than the day they are due) and turn in your work on time