AE837

Advanced Mechanics of Damage Tolerance

Dr. Nicholas Smith
Wichita State University, Department of Aerospace Engineering November 5, 2019

upcoming schedule

- Nov 5 - Exam 2 Review
- Nov 7 - FE Demo?, Homework 7 Due
- Nov 12 - Exam 2
- Nov 14 - Exam Return

outline

- exam
- strain energy release rate
- mixed-mode fracture
- crack tip plasticity
- elastic-plastic fracture

exam

exam format

- Similar to last time
- Four questions
- Some calculation, some short answer
- Same equation sheet

strain energy release rate

energy release rate

- strain energy and stress intensity
- j-integral
- finite elements
    - VCCT
    - Direct Method

possible problems

- Calculate J-integral
- Calculate K from G or J
- Find K or G using finite elements (or describe how to do so)

mixed-mode fracture

mixed-mode fracture

- Elliptical model
- Maximum tensile stress
- Minimum strain energy density
- Maximum strain energy release rate

possible problems

- Calculate crack growth direction
- Explain theory behind models

crack tip plasticity

crack tip plasticity

- Irwin's model
- Dugdale's model
- plastic zone shape

possible problems

- Calculate plastic zone size
- Theoretical effects of crack tip plasticity

elastic-plastic fracture

elastic-plastic fracture

- Adjusted stress intensity
- Resistance curve
- J-integral
- Crack tip opening displacement
- Crack tip opening angle

possible problems

- find K_C using Irwin's method
- find K_C using the resistance curve
- describe the K_R curve
- discuss advantages and weaknesses of models