

FRACTURE MECHANICS

EM 508 – Fall 2008

Instructor: Prof. George N. Frantziskonis
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Office Hours: TBA

Outline

Introduction: history of fracture mechanics; fundamentals of the theory of elasticity and index notation.

Linear Elastic Fracture Mechanics: stress concentration at crack tip; stress intensity factors; fracture toughness; different modes of fracture; crack propagation

Griffith Energy Criterion: basic energy balance; energy release rate; experimental issues; crack resistance

Plasticity Effects: size and shape of plastic zone; plasticity correction factors in plane strain and plane stress; Dugdale model; crack tip opening; J-integral

Various Topics: dynamic crack propagation; 3-D effects at crack front; penny and elliptical shape cracks; similitude in fracture problems; practical problems

Numerical Stress Analysis: boundary collocation; finite element; J-integral; special finite elements; global-local finite element method; boundary integral method

Other Topics: determination of stress intensity factor; damage mechanics; failure of fiber bundles, yarns, etc.; statistical models of fracture

Grading

Midterm Test	20%
Final	30%
Homework	20%
Project	30%

Absence Policy: The following is the University policy on absence:

Students are expected to be regular and punctual in class attendance. The University believes that students themselves are primarily responsible for attendance. Instructors will provide students with written statements of their policies with respect to absences. An excessive or extended absence from class is sufficient reason for the instructor to recommend that the student be administratively dropped from the course. For those courses in which enrollment is limited, missing the first class session may be interpreted as excessive absence. If this action is filed in the Registrar's Office by the end of the fourth week of classes, it will result in cancellation of registration in the course. If the student is administratively dropped after the end of the fourth week of classes, it will result in a failing grade being awarded in that course.

Policy of this class:

- If you need to be absent from the class for justifiable reasons (sickness, family obligations, etc.), you must inform the instructor in advance.
- It is strongly recommended that you do not remain absent from the class for a total of more than 10% of the class. The instructor would report to the Registrar's Office if the total absence exceeds this limit, which may result in administrative drop from the class.
- Auditors are expected to attend about 90% of the classes.