

# EGM 6570 – Principles of Fracture Mechanics Spring 2016 Syllabus

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## Lecture

Monday / Wednesday / Friday, Period 5, 11:45 am – 12:35 pm, NEB 102

## Office Hours

Monday / Wednesday / Friday, 12:35 – 1:30 pm, NEB 133 (or by appointment)

## Course Description

Introduction to the mechanics of fracture of brittle and ductile materials. Linear elastic fracture mechanics; elastic-plastic fracture; fracture testing; numerical methods; composite materials; creep and fatigue fracture.

## Textbook

Fracture Mechanics: Fundamentals and Applications, Third Edition, Anderson, 2005.

<https://www.crcpress.com/Fracture-Mechanics-Fundamentals-and-Applications-Third-Edition/Anderson-Anderson/9780849316562>

## Homework

Homework will be assigned at least one week prior to its due date. Assignments will be collected at the beginning of class on the due date via in-class collection or upload to Canvas.

**No late homework assignments will be accepted without prior approval.** To receive full credit on each homework problem, solution must include all pertinent sketches or diagrams, equations, solutions and final answers with correct units. Homework must be legible and professional (neat, orderly, final solutions circled or boxed). Illegible homework solutions will be marked as incorrect. Homework solutions will be posted on Canvas.

## Exams

Three exams will be given during the semester. Exam dates/time/format are to be determined.

Exams will consist primarily of numerical problems but may also include short answer problems as appropriate for the course material.

## Grading

Homework/Projects (assignments to be determined): 30%

Exams (3 equally weighted): 70%

**Course grades will be “curved” if necessary – this decision will not be made until the end of the semester once all exams and homework assignments are graded.**

## Student Complaint Process

The process of filing a complaint about this course can be found at the following links:

Residential Course: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

Online Course: <http://www.distance.ufl.edu/student-complaint-process>.

## EGM 6570 – Principles of Fracture Mechanics Spring 2016 Course Schedule\*

| <u>Week</u> | <u>Dates (M,W,F)</u>         | <u>Sections</u> | <u>Topic(s)</u>                                                    |
|-------------|------------------------------|-----------------|--------------------------------------------------------------------|
| Week #1     | 1/6, 1/8                     | 1.1 – 1.4       | Syllabus and history<br>Review of basic fracture mechanics         |
| Week #2     | 1/11, 1/13, 1/15             | 2.1 – 2.3       | Atomic view of fracture<br>Griffith energy criterion               |
| Week #3     | <del>1/18</del> , 1/20, 1/22 | 2.4 – 2.5       | Energy release rate<br>R and driving force curves                  |
| Week #4     | 1/25, 1/27, 1/29             | 2.6 – 2.9       | Stress analysis<br>Crack tip plasticity                            |
| Week #5     | 2/1, 2/3, 2/5                | 2.10 – 2.11     | Mixed mode fracture                                                |
|             |                              | 3.1             | Crack tip opening displacement                                     |
| Week #6     | 2/8, 2/10, 2/12              | 3.2 – 3.3       | J Integral<br>J – CTOD relationships                               |
| Week #7     | <del>2/15, 2/17</del> , 2/19 | 3.4             | <b>EXAM 1 (Chapters 1,2)</b><br>Crack growth resistance curves     |
| Week #8     | 2/22, 2/24, 2/26             | 3.5, 4.1        | J controlled fracture<br>Dynamic fracture                          |
| Week #9     | <del>2/29, 3/2, 3/4</del>    |                 | <b>NO CLASS</b><br><b>SPRING BREAK</b>                             |
| Week #10    | 3/7, 3/9, 3/11               | 4.1 – 4.2       | Rapid crack propagation/arrest<br>Creep crack growth               |
| Week #11    | 3/14, 3/16, 3/18             | 5.1 – 5.4       | Ductile/brittle failure<br>Intergranular fracture                  |
| Week #12    | 3/21, 3/23, 3/25             | 6.1 – 6.2       | Failure in polymers<br>Fracture in ceramics                        |
| Week #13    | <del>3/28, 3/30</del> , 4/1  | 7.1 – 7.3       | <b>EXAM 2 (Chapters 3,4)</b><br>Fracture testing methods           |
| Week #14    | 4/4, 4/6, 4/8                | 7.4 – 7.6       | Elastic-plastic testing methods<br>Dynamic testing                 |
| Week #15    | <del>4/11</del> , 4/13, 4/15 | 8.1 – 8.3       | Fracture testing of polymers<br>Testing of composites and ceramics |
| Week #16    | 4/18, 4/20                   | 11.1 – 11.4     | Stress corrosion cracking<br>Hydrogen embrittlement                |
| Finals Week | TBD                          |                 | <b>EXAM 3 (Topics from Ch. 4,5,6,7,8,11)</b>                       |

– Strikethrough dates are either university holidays or Prof. Spearot is out of town at a professional meeting; class will be either prerecorded or cancelled.

\* Course schedule may change over the course of the semester; changes will be communicated in class and/or electronically.