ME 541
FATIGUE OF MATERIALS
Winter 2006
http://courses.washington.edu/mengr541/ramulu/541/


Schedule: Tuesday, Thursday
8:30-9:50 AM
TA: S. Gururaja, EGA 152
OH: MW 1:30-2:30PM
gsuhasini@gmail.com

Grading:
Homework and short projects 60%
Midterm Exam 40%

Calendar: This indicates topics and associated reading.

Final Exam: There is no Final Exam

Instructor: Professor M. Ramulu
MEB-320
Office Hours: T, TH: 11:30-12:30 AM.
Phone: 206-543-5349
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ramulum@u.washington.edu

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University of Washington
Seattle, WA 98195-2600

EDGE Website:
http://www.engr.washington.edu/edge/me541

<table>
<thead>
<tr>
<th></th>
<th>Tuesday</th>
<th>Thursday</th>
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</thead>
<tbody>
<tr>
<td>J A N U A R Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Course Introduction</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Stress-Life approach Chap 1</td>
<td>12</td>
</tr>
<tr>
<td>17</td>
<td>Strain-Life Analysis Chap 2</td>
<td>19</td>
</tr>
<tr>
<td>24</td>
<td>Fracture Mechanics Analysis</td>
<td>26</td>
</tr>
<tr>
<td>31/1</td>
<td>Notch effects Chap 4</td>
<td>2</td>
</tr>
<tr>
<td>F E B R U A R Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Variable Amplitude Loading Chap 5</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>Variable Amplitude Loading Chap 5</td>
<td>16</td>
</tr>
<tr>
<td>21</td>
<td>Applications and Comparison of Methods Chap 6</td>
<td>23</td>
</tr>
<tr>
<td>M A R C H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Topics of Interest Notes</td>
<td>9</td>
</tr>
<tr>
<td>28/2</td>
<td>Environmental effects Note</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Midterm Examination</td>
<td></td>
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Notes
ME541 : OVERVIEW

General Description: Fatigue of Materials (3 Credits)

Macro and micro aspects of fatigue (time dependent failure) of materials and related fatigue mechanisms. Analytical methods for fatigue and life assessment in advanced materials. Each week: Two 1.5-hr lectures

Course Goals: To give students an applied understanding of the three basic methods of fatigue analysis (stress-life, strain-life, fracture mechanics) for all classes of materials. Emphasis is placed on the engineering experience practice using practical homework problems and short projects.

Course Outline:

Introduction and brief review
Historical Overview

Macro and Micro Aspects of Fatigue
-Fracture surfaces
-Fatigue Mechanism
  Crack nucleation
  Crack growth
  Fatigue failure

Stress-Life Analysis
- S-N Curves
- Mean Stress Effects (Goodman, Soderburg, Gerber)
- Modifying Factors (Marin)

Strain-Life Analysis
- Fundamental Material Behaviour
- Plasticity Relations
- Elastic and Plastic Strain Components
- Strain-Reversal Curves
Fracture Mechanics (Fatigue Crack Propagation) Analysis
- LEFM
- Fatigue Crack Growth Curves
- Relationships (Paris Power Law, Forman)
- Closure Effects, Short Cracks, Stress Raisers

Effects of Notches, Variable Loading, Multi-Axial Loading and Other Conditions
- Blunt vs Sharp Notches in Brittle and Ductile Materials
- Damage Parameters and Combined Loading (Palmgren-Miner, Rainflow)

19. Equivalent Stress and Strain

Corrosion & Fretting Fatigue
Fatigue and Failure of Joints and Structure
Methods to enhance fatigue resistance
Fatigue of Materials

Professor

M. Ramulu

Reference Books:


Suggested Additional Reading:

- Annual Book or ASTM Standards, American Society for Testing and Materials
- Deformation and Fracture Mechanics of Engineering Materials, Richard Hertzberg
- Elementary Engineering Fracture Mechanics, David Broek
- Engineering Materials and Their Applications, Richard Flinn and Paul Trojan
- Engineering Materials 1 and 2, Michael Ashby and David Jones
- Mechanical Behavior of Materials, Thomas Courtney
- Mechanical Engineering Design, Joseph Shigley and Larry Mitchell
- Mechanical Metallurgy, George Dieter
- Mechanics of Materials, Russel Hibbeler
- Mechanics of Materials, David Roylance
- Stress, Strain, and Strength, Robert Juvinall

Highlighted books are the major references
# TECHNICAL JOURNALS IN FRACTURE MECHANICS

<table>
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<tr>
<th>Primary Interest</th>
<th>Secondary Interest</th>
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<tbody>
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<td>Journal of Pressure Vessel Technology</td>
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<td>International Journal of Pressure Vessels and Piping</td>
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<td>International Journal of Mechanical Sciences</td>
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