

**The University of Texas at Arlington**  
**Materials Science and Engineering Department and**  
**Mechanical and Aerospace Engineering**

**MSE 5312/ MAE 4336**

**Sp. 2011**

**Mechanical Behavior of Materials/ Advanced Mechanical Behavior of  
Materials**

**Course Mechanics**

- Instructor:** Professor Pranesh B. Aswath  
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Office Hours: W: 1:00 – 3:00 pm or by appointment
- Teaching Asst:** TBA (Will have office hours that will be announced in class)
- Lecture Meetings:** T, Th 2:00 - 3:20 pm
- Course Content:**
- 1) Mechanics of Materials
  - 2) Dislocation Theory
  - 3) Single Crystal Deformation
  - 4) Strengthening Mechanisms
  - 5) Fracture Mechanics
  - 6) Fatigue of Materials
  - 7) Creep of Materials

**Student Learning Outcomes:**

- 1) Basic Principles of Strength of Materials, Constitutive Equations, Plasticity
- 2) Origin of Defects and the characterization and mechanics of defects.
- 3) Basic Principles of Deformation of Single Crystals.
- 4) Mechanism of Strengthening of Metallic materials.
- 5) Basic Understanding of Fracture Mechanics and its application to failure mechanisms.
- 6) Fatigue of engineering materials.
- 7) Fractography and failure analysis..
- 8) Mechanism of Creep and Creep Deformation.

**Text Book** " Mechanical Metallurgy", 3rd Edition by George E. Dieter

**Additional Reading** "The Plastic Deformation of Metals", R.W.K. Honeycombe,  
Edward Arnold & American Society of Metals.

"Introduction to Dislocations", 3rd Edition, D. Hull and D.J. Bacon,  
Pergamon Press.

"Deformation and Fracture of Engineering Materials", R. W. Hertzberg, 3rd Edition

**All text books are on 1 day reserve in the Science and Engineering Library.**

**Two copies of the additional reading materials will be placed in the MSE office (Rm. 325 WH) and can be checked out for 24 hours at a time from Ms. Libia Cuauhtli**

**Notes**

**Some** class notes will be posted on Blackboard:

[www.uta.edu/blackboard](http://www.uta.edu/blackboard)

**Homework**

Periodic homework will be assigned. Homework will be posted on Blackboard and you will have to complete your homework, scan it and upload it on Blackboard in pdf format.

**Examinations**

Mini Exam	Jan . 21 <sup>st</sup>	2011
Exam I	Feb. 17 <sup>th</sup> ,	2011,
Exam II	March 10 <sup>th</sup> ,	2011
Exam III	April 26 <sup>th</sup> ,	2011
Final	As Scheduled by University	

**Mini Exam:**

Material that you should already know from your undergraduate study. This will include material from Chapters 7,8,9 in Introduction to Materials Science and Engineering – An Integrated Approach. 2<sup>nd</sup> Edition by William Callister.

**Grading**

Homework	10%
Mini Exam	5%
Exam I	20%
Exam II	20%
Exam III	20%
Final	25%

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100%  
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**Grading:**

<b>&gt; 85</b>	<b>A Grade</b>
<b>75-84</b>	<b>B Grade</b>
<b>65-74</b>	<b>C Grade</b>
<b>55-64</b>	<b>D Grade</b>
<b>&lt; 55</b>	<b>F</b>

**Note:** Students enrolled in MAE 4336 will get an additional credit of 10 points.

## **American With Disabilities Act**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 - The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide “***reasonable accommodation***” to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with **informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels**. If you require an accommodation based on disability, I would like to meet with you in the privacy of my office during the first week of the semester to make sure that you are properly accommodated.

## **Academic Dishonesty**

It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

**“Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)**

**My Approach to Academic Dishonesty:** Academic dishonesty is completely unacceptable in the class room and I have zero tolerance for it. However, that said, the important thing in a class is the learning experience and I encourage discussion outside class hours on material that was covered in class. However, what I find unacceptable is copying other’s homework and acquiring homework from past years.

All exams will be closed book and closed notes. I will provide any equations that I believe are necessary for assisting you in working problems in the exam. You will not be allowed to bring in any external material into the exam, you will be allowed a simple calculator into the exam but not any of the programmable ones where data, equations and definitions can be stored. The calculators are meant to assist in calculation and not provide any additional advantage in an exam.

## **SYLLABUS**

<b>MATERIAL COVERED</b>	<b>SECTION</b>
<b>Stress-Strain Relationships for Elastic Behavior</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 2
<b>Theory of Plasticity</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 3
<b>Dislocations</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 5
The Plastic Deformation of Metals - Honeycombe	Chapter 3
Introduction to Dislocations-Hull & Bacon	Chapters 1,2,3, 5, 6 & 7.
<b>Deformation of Single Crystals</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 4
The Plastic Deformation of Metals - Honeycombe	Chapter 4 & 5
<b>Solid Solution Strengthening</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 6
<b>Precipitation Hardening</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 7
<b>Miscellaneous Strengthening</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 9
<b>Fracture Mechanics</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 11
Deformation and Fracture of Engineering Materials-Hertzberg.	Chapter 8
<b>Fracture</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 7 &14
Deformation and Fracture of Engineering Materials-Hertzberg.	Chapter 7 & 10
The Plastic Deformation of Metals - Honeycombe	Chapter 15
<b>Fatigue</b>	
Mechanical Metallurgy - George E. Dieter	Chapter 12
Deformation and Fracture of Engineering Materials-	

Hertzberg.

Chapter 12 & 13

**Creep**

Mechanical Metallurgy - George E. Dieter

Chapter 13

The Plastic Deformation of Metals - Honeycombe

Chapter 13

Deformation and Fracture of Engineering Materials-

Hertzberg.

Chapter 5