

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

**Professor Aswath MSE 5312/ MAE 4336**

**Sp. 2008**

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

**Course Mechanics**

**Instructor:** Professor Pranesh B. Aswath  
Office: 325G Woolf Hall  
Telephone: (817) 272-7108  
E-Mail: [aswath@uta.edu](mailto:aswath@uta.edu)  
Office Hours: W: 1:00 – 3:00 pm or by appointment

**Teaching Asst:** Punnapob Punnakitikashem (Rm 100 WH)

**Lecture Meetings:** T, Th 3:30 - 5:00 pm, Rm 208

**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) Fractography and failure analysis..
- 7) 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 Cuauhlti**

**Notes**                      **Some** class notes will be posted on the Web.  
Website: <http://www-woolf.uta.edu>  
User Name: **mae-mse**  
Password: **mebehave217**

**Homework**                      Periodic homework will be assigned.

<b>Examinations</b>	Mini Exam	Jan . 22 <sup>nd</sup>	2008
	Exam I	Feb. 14 <sup>th</sup> ,	2008,
	Exam II	March 13 <sup>th</sup> ,	2008
	Exam III	April 15 <sup>th</sup> ,	2008
	Final	As Scheduled by University	

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

<b>Grading</b>	Homework	10%
	Mini Exam	5%
	Exam I	20%
	Exam II	20%
	Exam III	20%
	Final	25%
		-----
		100%

<b>Grading:</b>	<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)**

## **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