The University of Texas at Arlington

Materials Science and Engineering Department and
Mechanical and Aerospace Engineering

MSE 5312/ MAE 4336 **Sp. 2015**

Mechanical Behavior of Materials/
Advanced Mechanical Behavior of Materials

Instructor: Professor Choong-Un Kim
Office: 302 ELB
Telephone: (817) 272-5497
E-Mail: *choongun@uta.edu*
Office Hours: Tu and Th 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 (SH 205)

Course Content:
1) Mechanics of Materials (stress-strain and stress tensor)
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, the characterization, and mechanics of defects.
3) Basic Principles of Deformation of Solid Crystals.
4) Mechanism of Creep and Creep Deformation.
5) Mechanism of Strengthening of Metallic materials.
6) Basic Understanding of Fracture Mechanics and its application to failure mechanisms.
7) Fatigue of engineering materials.
8) Fractography and failure analysis.

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

Notes	**Some** class notes will be emailed to each student		
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	**3 tests**		
	Exam 1	late March	2015
	Exam 2	Mid April	2015
	Final	TBD	
Grading	Homework	20%	
	Exam I	20%	
	Exam II	20%	
	Final	30%	

		100%	

Grading:	**> 85**	**A Grade**	
	75-84	**B Grade**	
	65-74	**C Grade**	
	55-64	**D Grade**	
	< 55	**F**	

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

SYLLABUS

MATERIAL COVERED	SECTION
Stress-Strain Relationships for Elastic Behavior	
Mechanical Metallurgy - George E. Dieter	Chapter 2
Theory of Plasticity	
Mechanical Metallurgy - George E. Dieter	Chapter 3
Dislocations	
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.
Deformation of Single Crystals	
Mechanical Metallurgy - George E. Dieter	Chapter 4
The Plastic Deformation of Metals - Honeycombe	Chapter 4 & 5
Solid Solution Strengthening	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 6
Precipitation Hardening	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 7
Miscellaneous Strengthening	
Mechanical Metallurgy - George E. Dieter	Chapter 6
The Plastic Deformation of Metals - Honeycombe	Chapter 9
Fracture Mechanics	
Mechanical Metallurgy - George E. Dieter	Chapter 11
Deformation and Fracture of Engineering Materials-Hertzberg.	Chapter 8
Fracture	
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
Fatigue	
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

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.

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)