國立清華大學
National Tsing Hua University

PME 235001 Mechanics of Materials
材料力學

Spring 2015

Instructor:	Prof. Jen-Yuan (James) Chang 張禎元 教授	Credits:	3 credits.
Class meetings:	**T3T4R3**	Office hours:	Tuesdays 17:00-18:00

Course description: This course is a foundation to many advanced techniques that allow engineers to design structures, predict failures and understand the physical properties of materials. Mechanics of Materials gives students basic tools for stress, strain and strength analyses. The course is designed to introduce basic principles of statics for rigid and deformable bodies. The main objective of this course is to help the students develop engineering intuition for equilibrium, properly constrained systems, and deformation under external loadings. Methods for determining the stresses, strains and deflections produced by applied loads are learned through analyzing and designing structural members subjected to tension, compression, torsion and bending using fundamental concepts of stress, strain, and elastic behavior. It is also anticipated that theory and design approaches for the mechanics of deformable bodies will help prepare students for complex systems that will be encountered in advanced design courses such as mechanical designs, manufacturing, and micro-electro-mechanical systems (MEMS).

Textbook: R. C. Hibbeler, Mechanics of Materials, 8th Edition, Taiwan Adapted Version, Pearson/Prentice Hall, Taiwan, 2010.

References: J.M. Gere, "Mechanics of Materials", 7th ed., Brooks/Cole-Thomson Learning, Belmont, CA, USA, 2009.
F. P. Beer, E. R. Johnston, Jr., J. T. DeWolf, and D. F. Mazurek, Mechanics of Materials, 6th Global Edition in SI units, McGraw-Hill, New York, NY, USA, 2012.

Teaching Method: Classroom lectures will be offered in English with teaching materials posted in Moodle. In addition to lectures, in-class exercise sessions will be arranged and carried by teaching assistants.

Assessments:

Class Work	20%
Term project	10%
Two Midterm Exams	40% (2 @ 20%)
Final Exam	30%

A curve will NOT be used to establish grades in this course. The portion of the grade for class work will be established from short in-class quizzes and from homework problems collected occasionally for grades. Missed daily quizzes CANNOT be made up. Please note on your assignment sheet when hour quizzes are scheduled. Missed hour quizzes can be made up only under excepted circumstances or if arrangements are made in advance. Reasonably neat work is expected on all material submitted for grading. Always bring your textbook, calculator, paper and pencil to class.

Tentative Course Schedule & HW Assignments

Week	Articles	Topics	Problems
1		Introduction	----------
	1.1-1.3	Equilibrium & Stress	1, 3, 9, 18, 25, 27
	1.4-1.5	Normal & Shear Stresses	32, 39, 47, 50, 61
2	1.6-1.7	Allowable Stress	75, 81, 88, 91
	2.1	Deformation	3, 6, 9, 14
	2.2	Strain	16, 27, 29
3	3.1-	Stress-Strain Diagram	2, 5, 9
	3.5	Hooke's Law	17, 19, 22
	3.6-3.7	Poisson's Ratio	25, 30, 34

Week	Articles	Topics	Problems
4	4.1-4.2	Saint-Venant's Principle	2, 6, 15, 21, 22, 29
	4.3-4.4	Statically Indeterminate	33, 35, 39
	4.5	Force Method	54, 61, 63
5	4.6	Thermal Stress	68, 75, 79, 82
	4.7	Stress Concentrations	89, 91, 94
	5.1-5.2	Torsion Formula	2, 6, 9, 13, 24
	Midterm I		
6	5.3	Power Transmission	31, 34, 38, 42
	5.4	Angle of Twist	48, 49, 58, 75
	5.5	Statically Indeterminate	79, 82,
7	6.1	Shear & Moment Diagram	3, 6, 11, 16, 22, 29
	6.2-6.3	Graphical Method	38, 41, 43, 46
8	6.4	The Flexure Formula	47, 53, 69, 73, 81, 90
	6.6	Composite Beams	127, 131, 137
	7.1-	Shear in Straight Beams	1, 7, 10, 15
9	7.3	The Shear Formula	18, 23, 26
	8.1	Pressure Vessels	2, 5, 9, 11
	8.2	Combined Loadings	21, 23, 35, 55
10	9.1-9.2	Stress Transformation	2, 7, 11
	9.3	Principal Stresses	15, 19, 26, 33, 47
	9.4	Mohr's Circle	54, 60, 66, 70, 74
11	9.5	Absolute Max Shear Stress	84, 86, 90, 93
	10.1-10.2	Strain Transformation	2, 5, 8, 10
	Midterm II		
12	10.3 -	Mohr's Circle	14, 16, 20
	10.4	Absolute Max Shear Strain	22, 23, 24
	10.5	Strain Rosettes	25, 27, 28
13	10.6	Material Properties	33, 38, 44, 50
	12.1-12.2	Deflection by Integration	3, 7, 21, 27
	12.3	Discontinuity Functions	35, 47, 48, 54
14	12.4	Moment Area Method	55, 58, 61
			62, 68, 73
	12.5	Method of Superposition	87, 97, 98
15	12.6-	Statically Indeterminate	104, 108, 115, 118
	12.9	Beams	122, 127, 129, 131
	13.1-13.2	Ideal Columns	3, 7, 12
16	13.3	End Conditions	18, 22, 27
	14.1-14.2	Strain Energy	4, 5, 11, 18
	14.3-14.4	Impact Loading	28, 30, 35, 42, 46, 55
17	14.8-14.10	Castigliano's Theorem	135, 137, 141, 143
18	Final Exam; Term Project Final Competition		

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