材料力學 MECHANICS OF MATERIALS

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Textbook:	B.J. Goodno, J.M. Gere, Mechanics of Materials, 9th ed, Cengage Learning, ISBN: 9781337093354	
Reference	R.C. Hibbeler, Mechanics of Materials, 9th ed, Pearson, ISBN: 9780133254426	

COURSE MATERIAL

Reading assignments and additional course material will be posted in CEIBA. The documents will be posted in electronic version. The contents will be updated frequently, so you should check periodically for new materials.

The course videos taught by Dr. Yin-Nan Huang (Dept. of Civil Engineering at NTU) can be accessed via http://ocw.aca.ntu.edu.tw/ntu-ocw/index.php/ocw/cou/103S111/1

COURSE DESCRIPTION

Mechanics of materials is a basic engineering subject that, along with applied mechanics, must be familiarized by civil engineering students. The objective of this course is to introduce theories and methods for analyzing the force, deformation, stress and strain of linearly elastic structural elements (i.e., bar, beam and column) subjected to different loading conditions. Materials exhibiting plastic deformation will not be covered in this course.

This class will first introduce the general state of stress and strain and their relationships based on Hooke's law. Transformation equations and Mohr's circle will be discussed to determine the stress and stain at any plane of interest. Statically determinate and indeterminate structures are defined. Afterward, student will learn how to conduct structural analysis to analyze bar members subjected to axial load and torsion, familiar with how to plot shear and moment diagrams of beams, to analyze stresses within beams, to calculate the deflection of beams using differential equation of deflection curve and method of superposition, and to evaluate the buckling and stability of columns.

Successful learning of this course involves an appropriate blend of understanding of course materials, and development of a correct engineering mechanics sense and structured solution process through active practice.

HOMEWORK ASSIGNMENTS

Homework problems will be assigned on a regular basis. Assignments will be distributed on class and can be downloaded from CEIBA. Completed assignments are due at the beginning of class on the date specified; late submission of assignments will be subtracted 2 points off for each day.

Homework is intended principally as a means of helping you to learn and understand the course material, rather than as a means of assigning points which directly determine your final grade. The assignments also are aimed at developing your engineering skills and judgments. Students may consult with each other about homework assignments. However, each student is responsible for preparing their own homework and displaying their understanding of the principles behind the homework solution.

Prepare your homework in a professional manner and show all steps and all calculations. Data plots and figures must be generated with a computer. Provide labels and make sure that plots are to scale. Any homework which is sloppy or difficult to understand will be returned without grades.

Follows are several tips for writing your assignment.

- Write your name and school ID number
- Work neatly, do not crowd your work.
- Sketch and label with given data as appropriate
- State any assumption you make
- Work vertically, do not string equations horizontally
- Show all major steps in your calculations or reasoning, so it is clear how you proceed
- Box the final answer and be sure to give proper units
- Do not tear pages out of books or manuals. If a problem involves completing a figure, photocopy the figure and attach it onto your solution sheets.

IN-CLASS PRACTICE

You will quickly learn after college that most practicing engineers spend more time and effort communicating their ideas, analyses, and results than they do performing technical calculations. To encourage the development of these vital professional skills, three or four students are grouped into a team and work together to solve the in-class practice problems. They are also required to present their solution in the class.

EXAMINATIONS

Exams will consist of a mixture between discussion and technical questions to evaluate your comprehension of the material. Formula sheets, design charts and similar materials will be given on the exams when needed, In addition, you should bring a straight edge and calculator to the exams. Also As engineers, you should inherently be neat and organized. You should certainly strive for neat work because you will probably have to return to design calculations at a variety of times in your careers and if you cannot figure out your own work you could be in severe difficulty. On exams, I will not give credit for answers I cannot read and will not change grading based on subsequent verbal explanations. It is your responsibility to communicate effectively with me on exams.

COURSE GRADE DISTRIBUTION

In-class practice and presentation	10%
Homework (Around 7 times)	20%
First Midterm Exam	20%
Second Midterm Exam	20%
Final Exam	30%
Total	100%

*The final grade will be failed if absences from class are over 5 times without justifiable reasons

FINAL COMMENT

Good luck to all of you in this course. This course is not intended simply to throw information at you. You will be expected to read and think about material outside class, and to take part actively in class discussions. These discussions will enhance the learning process, allow sharing of experiences, and hopefully make this course more interesting. Do not hesitate to ask questions in class, or if necessary, to see your instructor outside of class. Regularly after class discussion is expected. Please do not be afraid of your teacher, I am here to help you. I want to be your friend. Any specific comments that students have on how the course might be improved are particularly welcomed.

ACADEMIC HONESTY

The engineering profession does not need, and should not tolerate, dishonesty. All students of the National Taiwan University are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code (Student Affair) Council. Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).

COURSE OUTLINE

Topics	Book Chapter
1. Introduction (1wk)	
• Introduction of mechanics of materials	1.1
• Review of Statics	1.3
2. Tension, Compression, and Shear (1.5wk)	
• Stress and strain	1.4,1.8
• Elasticity, plasticity and creep	1.5-1.6
• Linear elasticity and Hooke's law	1.7
• Allowable stress and loads	1.9
3. Axial Loaded Members (1.5wks)	
• Changes in lengths	2.1-2.3
• Statically Indeterminate structures	2.4
• Thermal effects and misfits	2.5
4. Torsion (2wks)	
• Torsional deformation	3.1-3.3
• Nonuniform torsion	3.4
• Transmission of power by circular shafts	3.7
• Statically indeterminate torsional members	3.8
• Thin-wall tubes	3.11
5. Shear Forces and Bending Moments (2wks)	
• Loads, shear forces and bending moments	4.1-4.4
• Shear-force and bending moment diagram	4.5
6. Stress in Beams (2wks)	
• Pure and nonuniform bendings	5.1-5.2
• Curvature and longitudinal strains in beams	5.3-5.4
• Normal stresses in beams	5.5
• Design of beams for bending stresses	5.6
• Shear stresses and shear flows in beams	5.8-5.11
7. Deflections of Beams (2wks)	
• Differential equations of the deflection curves	9.1-9.2
• Deflection by integration of differential equation	9.3-9.4
• Method of superposition	9.5
• Moment-area method	9.6
• Nonprismatic beams	9.7
8. Statically Indeterminate Beams (1wk)	
• Types of statically indeterminate beams	10.1-10.2
• Analysis by the differential equations	10.3
• Method of superposition	10.4
9. Columns (2wk)	
• Buckling and Stability	11.1-11.2
• Columns with pinned ends	11.3
• Columns with other support conditions	11.4
• Columns with eccentric axial loads	11.5
• The secant formula for columns	11.6
10. Analysis of Stress and Strain (2wk)	
• Plane stress transformation	7.1-7.2
• Principle stresses and maximum shear stresses	7.3
• Mohr's circle for plane stress	7.4-7.6
• Plane strain	7.7
• Applications of plane stress	8.1-8.5