Strength of Materials 2

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1. Course Description

In this lecture, following topics are taught;
(1) Torsion; Combined stress; Plain problems
(2) Strain energy; Problem under impact loading; Buckling
(3) Stress concentration; Mechanical properties of materials

2. Course Objectives

This course is a follow-up to "Strength of Materials 1",and aims to provide students with an understanding of the way in which engineers design mechanical components that can meet specified requirements. Specifically, we study torsion, combined stress, buckling, stress concentration, and mechanical properties of materials.

3. Grading Policy

Your overall grade in the class will be decided based on followings:
- Term-end examnination (60%)
- Reports (20%)
- Mini tests in the class (20%)

Those who are absent from the final exam without justifiable reasons are not eligible to take the exam again.
Feedback will be given by returning the previous mini tests and making comments on the answer during lesson.

4. Textbook and Reference

Textbook
Seiichiro Seike   Strength of Materias
  Kyoritsu Publishing (1997) ISBN 978-4-320-08117-8
Reference
Goichi Nabe et al.   Standard Mechanics of Materials   Nikkan Kogyo Shimbun (2001) ISBN 4-526-047-19-8
Jyuhachi Oda, Toshiro Miyoshi   Exercise on Strength of Materials [New Revised Edition]   Science Co., Ltd. (2001)   ISBN 4-7819-0975-2

5. Requirements(Assignments)

Please review the whole contents you learned in "Strength of Material 1" well. If you do not take the course, it is necessary to learn the fundamentals of the course by yourself.
As preparation for the first lesson, answer all "Example" in Chapter 1 (p.1-10) of the textbook on your own. Please confirm that they match the answers posted in the textbook. Also, please practice handling of units related in this subject and basic calculation method.
Before each lesson, please read the relevant part of the textbook and confirm the relation with the contents of the previous lesson.(1 hour)
After each lesson, please review the content of the lesson by text and the handouts distributed in class. Please answer the examples and the problems in the handouts. In addition, please work on the problem in the textbook instructed in the handouts. (2 hours)
Detailed preparation for the second and subsequent lessons will be instructed in class.

6. Note

This subject is an optional compulsory course, but it is essential for those who are aiming for a career related to mechanical engineering. Applicants are strongly encouraged to take this course.
Please bring a scientific calculator as we will do problem solving exercises during class.

7. Schedule

[1]	Summary of beam bending and unstable beam: Bending stress and deflection of beams, Statically indeterminate beam
[2]	Torsion 1: Torsion of thin cylinder, Relationship between torsion of thin cylinder and torsion of round bar
[3]	Torsion 2: Torsion of round bar, Torsion of various cross-section rod
[4]	Combined stress 1: Combined stress, Stress on the surface tilted from the coordinate axis
[5]	Combined stress 2: Principal stress, Principal plane, Maximum shear stress, Mohr's Circle
[6]	Combined stress 3: Stress-strain relationship in three dimensions, Plane stress, Plane strain
[7]	Strain energy: strain energy, Castiano's theorem
[8]	Impact load problem: Deformation and stress caused by impact tension
[9]	Buckling of long column 1: Short column and long column, Buckling of long column of one end free other end fixed

[10]   Buckling of a long column 2: Buckling of a long column in various cases, Euler's formula,
         Experiment formula of a column
[11]   Axisymmetric problem: polar coordinate of stress/strain, Thin wall cylinder under internal
         pressure
[12]   Bending of plate: Cylindrical bending of rectangular plate
[13]   Stress concentration: Nominal stress, Stress concentration factor, Flat plate with holes, Flat
         plate with notches
[14]   Mechanical properties of materials: Tensile test, Hardness, Ductile fracture and Brittle fracture,
         Fatigue, Creep
[15]   Overall summary and Term-end exam