

## CE 221 MECHANICS OF SOLIDS I (TEP/TEPE)

**Course:** Core Course (TEP-TEPE)

**Credit:** 3 (3-0-6)

**Prerequisite:** CE 202 Engineering Mechanics

**Semester:** 2 **Year:** 2017

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**Section:** 750001 (Tue. 09.30 – 12.30 ) ENG-606/1

**Instructor:** Dr. Krisada Chaiyasarn TEP/TEPE Office

**Objectives:** Students are expected to:

1. be able to explain mechanics of a deformable body loaded by applied forces, such as axial load, torsion, bending, and shear.
2. be able to determine the responses of the deformable body, for examples, support reactions, internal forces in the body, and deformation, and be able to solve practical problems.
3. be able to determine load-carrying capacity of simple structures, such as axially loaded members, shaft, and column, and be able to make a proper design of these structures as well.

**Course Description:** Introduction to mechanics of deformable bodies. Relations among loads and deformations, Material testing, Stress-strain relationship, Axial loading, Torsion, Bending in elastic range. Bending and shearing stresses in beams, Transformation of stress, Mohr's circles, Introduction to failure theory, Deflection of beams by integration, Eccentric loading, Bucking of compression members.

**Reviewed Materials:** Free-body diagrams, Equilibrium of forces, Bending moment diagram and Shear force diagram, Cross-sectional properties of members such as Centroid and Moment of inertia.

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### **Teaching Schedule:**

Course Topics

#### **CHAPTER 1 STRESS**

Introduction to simple stresses, Average normal stress in an axially loaded bar, Average shear stress, Bearing stress, Allowable stress, Design of simple connections.

#### **CHAPTER 2 STRAIN**

Deformation, Strain

#### **CHAPTER 3 MECHANICAL PROPERTIES OF MATERIALS**

The tension and compression test, The stress-strain diagram, Stress-strain behavior of ductile and brittle materials, Hooke's law, Strain energy, Poisson's ratio, The shear stress-strain diagram

#### **CHAPTER 4 AXIAL LOAD**

Saint-Venant's principle, Elastic deformation of an axially loaded member, Thermal stress, Principle of superposition, Statically indeterminate axially loaded member.

#### **CHAPTER 5 TORSION**

Torsional deformation of a circular shaft, The torsion formula, Power transmission, Angle of twist, Statically indeterminate torque-loaded members

#### **CHAPTER 6 BENDING**

Bending deformation of a straight member, The flexural formula, Composite beams

#### **CHAPTER 7 TRANSVERSE SHEAR**

Shear in straight members, The shear formula, Shear stresses in beams, Shear flow in built-up members

#### **CHAPTER 8 COMBINED LOADINGS**

Thin-walled pressure vessels, State of stress caused by combined loadings

#### **CHAPTER 9 DEFLECTIONS OF BEAMS**

The elastic curve, Slope and displacement by integration

#### **CHAPTER 10 BUCKLING OF COLUMNS**

Critical load, Ideal column with pin supports, Columns having various types of supports.

#### **Text:**

Hibbeler, R.C., (2004/200x). **Mechanics of Materials (SI Edition)**. Prentice Hall, Singapore. 8th Edition.

#### **METHODS OF ASSESSMENT:**

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| 1. | Homework/Quiz                      | 5 %  |
| 2. | Class attendance                   | 5 %  |
| 3. | Mid-term examination (Chapter 1-4) | 35 % |
| 4. | Final Examination (Chapter 5-10)   | 55 % |