

FACULTY OF **ENGINEERING**

DEGREE COURSE: **CIVIL AND ENVIRONMENTAL
ENGINEERING BS**

SUBJECT: STRUCTURAL MECHANICS

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OBJECTIVES

The course of Structural Mechanics has the following aims:

1. to provide the basic principles for modeling structural systems and applied loads.
2. To provide the definition of the physical quantities necessary for the structural analysis (stress, strain, internal forces, curvature...).
3. To provide the basic analytical tools for the structural analysis and design.

CONTENTS

Geometry and type of structural elements.

Constraints.

Equilibrium of rigid elements: equilibrium equations and principle of virtual work.

Unstable, statically determinate and statically indeterminate structures.

Determination of reactions for statically determinate structures.

Internal forces and their relationships.

Trusses: method of joints and method of sections.

Continuum mechanics: Cauchy stress tensor, strain tensor, Hooke's law for continuous media.

De Saint-Venant principle.

Bending, shear, and torsion for prismatic beams.

Deflection and deformation of beams: the Euler–Bernoulli beam theory, moment-curvature relationship, application of the principle of virtual work.

Solution of statically indeterminate structures: the force and the displacement methods.

Buckling of slender columns: the Euler's approach.

Failure and yielding criteria: Tresca, Von Mises, Mohr-Coulomb criteria.

LEARNING OUTCOMES

- The ability to analyze structures using manual computation tools.
- Education of the students on the structural behavior.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

- Jerome J. Connor, Susan Faraji. Fundamentals of structural engineering. Springer, 2012, ISBN ISBN 978-1-4614-3261-6, 978-1-4614-3262-3 (eBook).
- Martin H. Saad. Elasticity – Theory, Applications, and Numerics. Elsevier, 2005. ISBN 0-12-605811-3.
- Stephen Timoshenko, James M. Gere. Mechanics of materials. Van Nostrand Reinhold Co., 1972.

