COURSE		**STRENGTH OF MATERIALS I**		
LECTURER		Prof. Mustafa Hrasnica Ph.D.		
STUDY	***STATUS***	***SEMESTER***	***LECTURES L+E***	***ECTS***
B - CE	compulsory	2	2+1	4

LEARNING OBJECTIVES

- Provide education on basics of stress and strain analysis of the deformable solids, as well as on design of simple structural elements, bars and frames, mostly in the elastic range of material behaviour. Mechanical properties of materials, stress-strain diagrams, simple stress states, axial deformations.

LEARNING OUTCOMES

- Understanding the terms about stresses, strains and deformations, its components, stress-strain states in plane and space, relations between stresses and strains.
- Calculation and diagrams of cross-section forces for the basic types of girders in plane.
- Competences to explain material behaviour diagrams (stress-strain diagrams) and basic terms: strength-resistance, deformability, allowable and equivalent stresses.
- Mastering of stress states in axially loaded bars, compression and tension.

COURSE CONTENT

- Strength of materials tasks. Basic assumptions. Structural elements. Cross-section method. Internal and cross-section forces. Calculation and diagrams of cross-section forces for the basic types of girders in plane: simple beam, cantilever, beam with cantilever arms, three-hinged arch, Gerber beam.
- Stress: definitions, components, normal and shear strain. Stress states at a point, in plane and space. Principal stresses and principal planes, extreme shear stresses. Mohr's circle. Spherical and deviator parts of stress tensor. Invariants of stresses. Differential equations of equilibrium, relations between stresses and surface forces.
- Strain, components: linear strain-dilatation and shear angles, plane and space state of strain at a point. Equations of compatibility. Principal strains and principal planes. Spherical and deviator parts of strain tensor. Invariants of strains. Bulk dilatation. Measurements of componential strains.
- Relations between stress and strain, work and idealized σ-ε diagrams. Hooke's law, elastic materials constants. Theories of failure criteria, ductile and brittle materials. Ultimate, allowable and equivalent stresses, factor of safety.
- Axial state of stresses. Compression and tension. Design. Elongation and contraction, thermal strain. Static indeterminate problems of axially loaded bars.

RECOMMENDED LITERATURE

1. Branislav Verbič, *Otpornost materijala*, Građevinski fakultet u Sarajevu.
2. Other contemporary textbooks about *Strength of Materials* or *Mechanics of Solids*.

Examination procedure:

Tests during the term (min. two), evaluation of compulsory homeworks.

Evaluation: Work during the term, min. 50%, final exam max. 50 % of the final grade.