Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Structural Mechanics II				
TEACHER: Antonio D. Lanzo				
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Language: italian				
ECTS: 6	n. of hours: 54	Academic year: 2014/15	Campus: Potenza	Semester: First

TOPICS

Integral and variational formulation of elasticity. Euler-Bernoulli and Timoshenko beam models. Stiffness method. Matrix structural analysis. Structural computational analysis. Spatial trusses and frames. Planar system of beams. Beams on Winkler elastic foundation.

TEACHING METHODS (please tick one or more options)

X Theoretical lessons
X Tutorials in classroom

TEXTBOOKS

- A. D. Lanzo, Analisi delle Travature Elastiche: Metodi ed Applicazioni, AracneEditrice, Roma, 2007. (isbn 978-88-548-1162-1)
- Slides from lectures.

ON-LINE EDUCATIONAL MATERIAL

web address:

LEARNING OUTCOMES

With reference to the analysis of elastic frames by a computational approach, the course aims to provide basic knowledge of matrix analysis of structures, developing both the formal aspects of the theoretical framework that the application aspects in particular related to the choices of algorithms to be implemented in codes of automatic analysis.

REQUIREMENTS

The students must have successfully completed the basic course of structural mechanics.

EVALUATION METHODS (please tick one or more options)

X Intermediate verifications
X Written examination
X Discussion of a project work
X Oral examination

DETAILED CONTENT

Elements of static and lagrangian mechanics: Differential beam equilibrium equations, Lagrangian equilibrium formulation; The Virtual Work Principle, Euler-Bernoulli and Timoshenko beam models; Variational formulations of static elastic problem: principle of minimum total potential energy and principle of minimum total complemetary energy.

Stiffness method and matrix structural analysis: The equations of the “elastica”; The stiffness matrix of Euler-Bernoulli beam model; The stiffness method for the analysis of elastic frames; Nodal loads and distribution of loads; Efficient local formulation of the matrix problem; The stiffness matrix of Timoshenko beam.

Implementation aspects of the analysis: Numerical algorithms for solving systems of linear algebraic equations; The Gauss method; Numerical implementation of Gauss method; The Newton-Raphson iterative strategy; The boundary conditions.

Automatic analysis code organization: The data structures and the variables; Description of code procedures for the analysis of a plane frame; Planar system of beams; Spatial trusses and frames; Beams on Winkler elastic foundation; The code for the analysis of planar system of beam on Winkler elastic foundation.

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO X