Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Earthquake Engineering				
TEACHER: Donatello Cardone				
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Language: Italian				
ECTS: 9	n. of hours: 81	Academic year: 2014/15	Campus: Potenza	Semester: II

TOPICS

Seismic Dynamics of Structures; Structural Ductility, Seismic Design of Structures, Structural Modeling, Innovative Design in Seismic Zone

TEACHING METHODS (please tick one or more options)

☒ Theoretical lessons
☒ Tutorials in classroom
☐ Tutorials in laboratory
☒ Project works
☐ Technical visits
Other activities (please specify) _____

TEXTBOOKS

1. A. Chopra, Dynamics of Structures–Theory and Applications to Earthquake Engineering, Prentice Hall, 1995.
2. G.G. Penelis, A.J. Kappos, Earthquake Resistant Concrete Structures, E&F Spon, London, 1997.
3. A. Ghersi, P. Lenza, Edifici Antisismici in cemento armato, Flaccovio editore, 2009.
4. Skinner RI, Robinson WH, Mc Verry GH (1993) An Introduction to Seismic Isolation. John Wiley & Sons Ltd.

ON-LINE EDUCATIONAL MATERIAL

web address:

LEARNING OUTCOMES

Understanding of the seismic response of buildings and bridges. Ability to discretize, model and analyze complex structures such as multi-storey buildings and multi-span bridges. Ability to design structures (especially buildings) located in high seismicity regions. Understanding of the seismic response and performances of structures with seismic isolation.

REQUIREMENTS

Techniques of constructions

EVALUATION METHODS (please tick one or more options)

☐ Intermediate verifications
☐ Written examination
☒ Discussion of a project work
☐ Practical test
☒ Oral examination
Other methods (please specify) _____

DETAILED CONTENT

Part 1. SEISMIC DYNAMIC OF STRUCTURES: (i) Dynamic properties of structures, (ii) Degrees of freedom and structural discretization methods, (iii) Equations of motion, (iv) modeling of structures as elementary systems, (v) Non-linear systems, (vi) Ductility ratio, (vii) Classification of earthquakes, (viii) elastic, non-linear and design response spectra, (ix) Continuous systems, (x) seismic dynamics of systems with multi-degrees of freedom, (xi) Modal analysis, (xii) Linear and non-linear methods of analysis, (xiii) Simplified design approaches.

Part 2. STRUCTURAL DUCTILITY: (i) Seismic behavior of masonry buildings, (ii) local and global ductility, (iii) Dissipating capacity and damage of reinforced concrete structures, (iv) Seismic behavior of framed and wall buildings, (v) Construction details, (vi) Seismic behavior of bridges.

Part 3. ANTI-SEISMIC DESIGN OF STRUCTURES: (i) The Italian seismic code (NTC 2008): Safety requirements, testing criteria, definition of seismic action, general design criteria, (ii) Methods of analysis: linear dynamic analysis, linear and non-linear static analysis, (iii) design rules for reinforced concrete buildings.

Part 4. STRUCTURAL MODELING: (i) Introduction to the finite element method, (ii) dynamic and kinematic degrees of freedom, (iii) modeling and analysis of reinforced concrete buildings, (iv) modeling of bridges, (v) modeling of the seismic action, (vi) verification of results.
Part 5. INNOVATIVE SEISMIC PROTECTION TECHNIQUES: (i) passive, semi-active and active control of structural vibrations, (ii) dissipation of energy: fundamentals, technologies for energy dissipation, examples of application, (iii) Seismic isolation: strategies for seismic isolation, currently used isolation systems, mechanical properties of currently used isolation systems, performance requirements of isolated structures, methods of design and analysis of buildings and bridges with seismic isolation, construction details, examples of application, seismic code aspects.
Part 6. TUTORIAL DESIGN: Design of a multi-storey building with reinforced concrete framed structure

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☒

FURTHER INFORMATION