European Master in Advanced Solid Mechanics

STRAINS

UNIVERSITÀ DELLA CALABRIA

The University of Calabria

Module handbook for Semester 2

6 COMPULSORY MODULES	
1 Nonlinear Structural Analysis	6 ECTS
2 Computational Mechanics	6 ECTS
3 Steel Structures	6 ECTS
4 Advanced Structural Design	6 ECTS
5 Earthquake Engineering	6 ECTS

Module #1	NONLINEAR STRUCTURAL ANALYSIS			
Information	Credit Points : 6 ECTS	Workload : 50h	Mode : Compulsory	Offered : 2nd semester
Institution in charge	University of Calabria at Cosenza			
Instructors	Prof. Giovanni Garcea			
Contents	The course provides the basic tools for the nonlinear structural analysis. The principal topics treated regard the structure instability phenomena and the plasticity theory. During the course a number of applications are provided with reference to beam systems, trusses, plate and shell using a finite element formulation.			
Examination	Written final exam			
Requirement for examination	No specific requirement			
Learning outcomes	The course aims to provide the methodological tools to address and solve problems of nonlinear analysis of structures with respect to the large deformations and constitutive nonlinearities. The theoretical arguments are converted into numerical algorithms and finite element codes developed in MATLAB or C++. Commercial code ABAQUS is used to model more complex structures.			

Module #2	COMPUTATIONAL MECHANICS			
Information	Credit Points : 6 ECTS	Workload : 50h	Mode : Compulsory	Offered : 2nd semester
Institution in charge	University of Calabria at Cosenza			
Instructors	Profs. Salvatore Lopez / Antonio Bilotta			
Contents	This course covers the relevant computational structural mechanics method of computational engineering. Students will understand the energetic principles of structural mechanics and will be able to apply finite element modelling. They will develop the ability to realize and to apply appropriate computational algorithms for the solution of linear and nonlinear structural problems.			
Examination	Written final exam			
Requirement for examination	No specific requirement			
Learning outcomes	The course aims at providing the methodological tools to address and solve problems of structural analysis using computational tools. The theoretical arguments are converted into numerical algorithms and finite element codes developed in Maple and C++. Commercial codes to model more complex structures are described.			

Module #3	STEEL STRUCTURES			
Information	Credit Points : 6 ECTS	Workload : 50h	Mode : Compulsory	Offered : 2nd semester
Institution in charge	The University of Calabria at Cosenza			
Instructors	Prof. Luciano Ombres			
Contents	The course provides basic technical knowledge and codes provisions for the structural design of steel constructions. In particolar, the course furnishes knowledges on procedures for the analysis and design of structural elements and connections at the serviceability (deformability)and ultimate limit states (strength and stability). In addition, procedures and methologies for the design of structural systems (moment resistance frames, bracing frames (X bracing, V bracing) Of single-storey and multi-storey steel constructions in seismic areas are furnished together with actual Codes provisions (Eurocodes, NTC).			
Examination	Written final exam			
Requirement for examination	No specific requirement			
Learning outcomes	The course provides basic technical knowledge and codes provisions for the structural design of steel constructions. **Specific skills** • Acquisition of the basis procedures for the analysis and design, common to each steel structures typology • Procedures and methodologies for the design of single-storey steel buildings • Procedures and methodologies for the design of multi- storey steel buildings • Design a steel structures (modelling and analysis, graphical representation of structures with details) **Transversal skill** • Ability to define structural systems of steel buildings • Ability and autonomy to define optimal structural design solutions Ability to collaborate with other students (group project) and to present obtained results of the work.			

Module #4	ADVANCED STRUCTURAL DESIGN			
Informations	Credit Points : 6 ECTS	Workload : 50h	Mode : compulsory	Offered : 2nd semester
Institution in charge	The University of Calabria at Cosenza			
Instructors	Prof. Paolo Nevone Blasi			
Contents	The course provides advanced tools for the analysis and designing of reinforced concrete structures, considering both strength and ductility. Specifically, it deals the structural issues concerning the analysis and designing of a multistory building in seismic zone. The building has cantilever lateral slabs and cantilever corner slabs, staircases, shear walls and other structural elements. In addition, the course provides the ground rules for designing with strut & tie models and for studying the structural problem of punching shear.			
Examination	Written final exam			
Requirement for examination	No specific requirement			
Learning outcomes	The objective is to provide the bases for the structural design of structural systems, using the main building materials, according to the limit state method. **Specific skills**: - Structural model and analysis of a multistory reinforced concrete building in seismic area - Structural model, analysis and design of structural systems: slabs, staircases, foundation, shear walls, etc.. - Analysis and design using strut and tie models and punching shear problems - Drafting of a design: analysis, design, internal reinforcement drawing and details **Transverse skills**: - Ability and autonomy in solving work tasks - Capability to collaborate, develop, share, and present group activities			

Module #5	EARTHQUAKE ENGINEERING			
Information	Credit Points : 6 ECTS	Workload : 50h	Mode : Compulsory	Offered : 2nd semester
Institution in charge	University of Calabria at Cosenza			
Instructors	Prof. Fabio Mazza			
Contents	Criteria and methods are given for the structural design in a seismic area. Although particular attention is addressed to the seismic design of building structures, the basic knowledge for design of different structures (bridges, tanks, dams, retaining walls) is also given.			
Examination	Written final exam			
Requirement for examination	No specific requirement			
Learning outcomes	The course aims providing with the knowledge necessary for the seismic design of structures.			