

University of Naples Federico II

Department of Structures for Engineering and Architecture

via Claudio 21, 80125, Napoli, Italy

dr. Ida Mascolo, Assistant Professor

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Proposed Short Course for Ph.D. Students (24 hours – 3 CFU)

Title

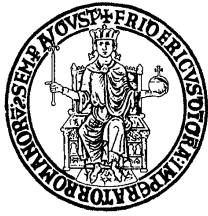
Structural Stability and Bifurcation: from Statical to Dynamical Systems

Abstract

The course explores the key aspects of structural stability and bifurcation, providing terminology and methodologies of non-linear mechanics from both a static and dynamic perspective. In the first part of the course, a phenomenological approach is adopted, using simple models to describe and analyze structural behavior. In the second part, a description of nonautonomous and autonomous systems is first provided. Subsequently, some basic concepts of non-linear dynamics, related to one- and two-dimensional flows, are illustrated.

Short Course Program

Part 1 - STATICAL SYSTEMS	Hours	Date	Instructor
1.1 Introduction			
Background	2	10/2025	Mascolo
Static and energy criterion of stability	2	10/2025	Mascolo
1.2 Non-Linear Behavior			
Stiffening and unstiffening behaviour	2	10/2025	Mascolo
Experimental and theoretical mechanical model	2	10/2025	Mascolo
1.3 Asymmetrical Bifurcation			
Experimental and theoretical mechanical model	2	10/2025	Mascolo
Influence of imperfections	2	10/2025	Mascolo
Part 2 - DYNAMICAL SYSTEMS			
2.1 Introduction			
Equilibrium equations	2	10/2025	Vaiana
Nonautonomous and autonomous systems	2	10/2025	Vaiana
2.2 One-Dimensional Flows			
Flows on the line	2	10/2025	Vaiana
Bifurcations	2	10/2025	Vaiana
2.3 Two-Dimensional Flows			
Linear systems and phase plane	2	10/2025	Vaiana
Limit cycles and bifurcations	2	10/2025	Vaiana



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Final Exam

Discussion of a written report focused on a topic selected by the student.

Instructors

I. Mascolo - Assistant Professor of Structural Mechanics

N. Vaiana - Tenure Track Assistant Professor of Structural Mechanics