

University of Naples Federico II

Department of Structures for Engineering and Architecture
via Claudio 21, 80125, Napoli, Italy

PhD program in Structural Engineering, Geotechnics and Seismic Risk
(DISGERS)

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 static and dynamic perspectives. 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 the harmonic oscillator, through Lagrangian and Hamiltonian physics, is provided. Subsequently, some basic concepts of nonlinear dynamics, related to one- and two-dimensional flows, are illustrated.

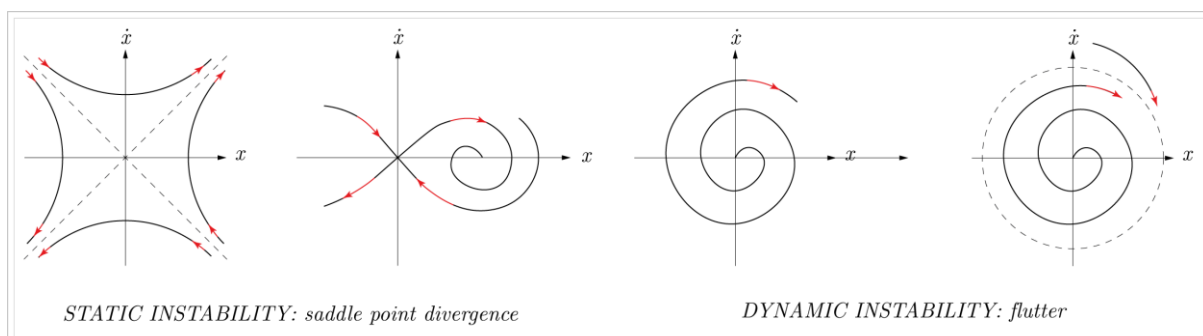
Instructors

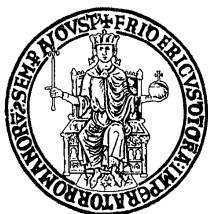
Ida Mascolo - Assistant Professor of Structural Mechanics

e-mail: ida.mascolo@unina.it

Nicolò Vaiana - Tenure Track Assistant Professor of Structural Mechanics

e-mail: nicolò.vaiana@unina.it





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Short Course Program

Part 1 - STATICAL SYSTEMS	Date	Time	Instructor
1.1 Introduction			
Background	26/11/2025	10:30 - 13:30	Mascolo
Static and energy criterion of stability			
1.2 Non-Linear Behavior			
Stiffening and unstiffening behaviour	27/11/2025	10:30 - 13:30	Mascolo
Experimental and theoretical mechanical model	03/12/2025	10:30 - 13:30	Mascolo
1.3 Asymmetrical Bifurcation			
Experimental and theoretical mechanical model	04/12/2025	10:30 - 13:30	Mascolo
Influence of imperfections			
2.1 Introduction			
Equilibrium equations	10/12/2025	10:30 - 13:30	Vaiana
Nonautonomous and autonomous systems			
2.2 One-Dimensional Flows			
Flows on the line	11/12/2025	10:30 - 13:30	Vaiana
Bifurcations	17/12/2025	10:30 - 13:30	Vaiana
2.3 Two-Dimensional Flows			
Linear systems and phase plane	18/12/2025	10:30 - 13:30	Vaiana
Limit cycles and bifurcations			

Final Exam

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

