

FLUID-DYNAMIC STABILITY

SSD	CFU	Anno (I o II)		Semestre (I o II)		Lingua	
		I	II	I	II	Italiano	Inglese
ING-IND/06	6		✓		✓		✓

Insegnamenti propedeutici previsti: nessuno

Classi				
Docenti				

OBIETTIVI FORMATIVI

The course addresses basic theories and advanced investigation methodologies to analyze flows instabilities. Inner and open shear flows are particularly investigated. Industrial problems such as the prediction of laminar-to-turbulence transition and the break-up of two-phase interface leading to atomization phenomena are some of the major application fields.

PROGRAMMA

Basic concepts and definitions of stability in Fluid mechanics. Lyapunov and asymptotic stability. Bifurcation and instability. Basic elements of function spaces, inner product and norm. Linearized equations of disturbances. Temporal normal modes analysis for parallel flows. Sturm-Liouville eigenvalues problem. Some classic models: Kelvin-Helmholtz instability, capillary instability of a jet. Localized disturbances in space and time, spatio-temporal theory. Absolute and convective instability. Spatial normal modes. Landau-Ginzburg equation. Stability of parallel flows: inviscid and viscous theories. Rayleigh inflection point theorem. Squire theorem. Orr-Sommerfeld equation. Stability of non-parallel flows. Global instability. Connections between global instability and absolute/convective instability for locally parallel flows. Theory of non-modal instability. Growth function and pseudospectrum. Comparison of modal and non-modal theories for industrial flows: Poiseuille flow, Blasius flow, jet, wake, mixing layer. Laminar-to-turbulent transition in wall bounded flows. Criteria of turbulence prediction. e^N method.

MODALITA' DIDATTICHE

Lectures, numerical exercises, application seminars.

MATERIALE DIDATTICO

Notes on lectures delivered by the teacher and available on web site <https://www.docenti.unina.it>. Some suggested textbooks: P.G. Drazin, Introduction to Hydrodynamic Stability, Cambridge University Press, 2002. P. Huerre and P.A. Monkewitz, Ann. Rev. Fluid Mech., 32, 473-537, 1990. P.J. Schmid and D. S. Henningson, Stability and Transition in Shear Flows, Springer, 2001.

MODALITA' DI ESAME

L'esame si articola in prova	Scritta e orale	<input type="checkbox"/>	Solo scritta	<input type="checkbox"/>	Solo orale	<input checked="" type="checkbox"/>
In caso di prova scritta i quesiti sono	A risposta multipla	<input type="checkbox"/>	A risposta libera	<input type="checkbox"/>	Esercizi numerici	<input checked="" type="checkbox"/>
Altro						