ESI Erwin Schrödinger International Institute for Mathematics and Physics

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DVR 0065528

ESI Senior Research Fellow Lecture Course
Summer Term 2026

The Erwin Schrödinger International Institute for Mathematics and Physics (ESI) of the University of Vienna offers the following Lecture Course held by a Senior Research Fellow in residence during the Summer Term 2026:

Fluid Mechanics, covering Rotational Water Waves and Rayleigh-Taylor Instabilities for Potential Flows
Joachim Escher (Leibniz U of Hannover)

Lecture Course (250100 VU)
Start: Tuesday, March 3, 2026, 10:00 - 11:30 h
Further dates:
Wednesday, March 4, 2026, 10:00 - 11:30 h
Tuesday, March 10, 2026, 10:00 - 11:30 h
Wednesday, March 11, 2026, 10:00 - 11:30 h
Thursday, March 19, 2026, 09:00 - 10:30 h
Tuesday, June 2, 2026, 09:00 - 10:30 h
End: Thursday, June 11, 2026, 10:00 - 11:30 h

Venue: Erwin Schrödinger Institute, Schrödinger Lecture Hall

Abstract:
Fluid Mechanics is a key area in which progress at any time can be seen as a benchmark for evaluating the actual achievements of mathematical science. The course offers an introduction to modern aspects of Mathematical Fluid Mechanics. Some tools and methods from Analysis and Functional Analysis for dealing with nonlinear partial differential equations stemming from Fluid Mechanics will be presented. Starting from fundamental physical principles, the complete Euler system of hydrodynamics including free boundaries is derived. Building on this, two distinguished classes of hydrodynamic flows will be studied in detail: traveling waves and potential flows. Questions like existence, uniqueness, stability, regularity of solutions, or bifurcation and wave-breaking phenomena will be addressed.

Contents of the course:
• First principles and Euler's equations
• Travelling waves for rotational 2D Euler flows
• Hodograph transformation
• Existence of large rotational waves
• Analyticity of rotational waves
• Dary's law and potential flows
• Rayleigh-Taylor instabilities
• Bifurcation of fingering solutions

Course website: https://www.esi.ac.at/events/e584/

Christoph Dellago
Director