ICTP-ESP Diploma Course / ESFM PhD Program

2014–2015 Fluid Mechanics

Riccardo Farneti
(ESP Section, ICTP)

Lecture 1	Introduction to Fluid Mechanics and Properties of Fluids I
Lecture 2	Properties of Fluids II and Statics
Lecture 3	Scalars, Vectors, Tensors, Gradient, Divergence, Curl
Lecture 4	Kinematics: Material derivative, streamline, streamfunction, strain rates, relative motion near a point, Vorticity and circulation
Lecture 5	Conservation laws I: Mass, tracer, Advection-Diffusion Equation
Lecture 6	Conservation laws II: Momentum and the Navier-Stokes Equations
Lecture 7	Conservation laws II: Energy and Bernoulli equations
Lecture 8	Boussinesq approximation and the governing equations of Geophysical Fluid Dynamics
Lecture 9	Dynamic similarity and non-dimensional numbers
Lecture 10	Geostrophic flow, Vorticity dynamics
Lecture 11	Laminar and turbulent boundary layers
Lecture 12	Instabilities: Rayleigh-Benard Convection, Kelvin-Helmholtz instability

- Each lecture is 1.5 hour long, for a total of 18 hours.
- This is a preliminary schedule and may be revised during the course.
- TEXTBOOKS: any textbook on Fluid Mechanics, but particularly: 'Fluid Mechanics' by P. K. Kundu and 'Physical Fluid Dynamics' by D. J. Tritton.

Lecturer: Riccardo Farneti (rfarneti@ictp.it)