

Introduction to continuum physics

INSTRUCTOR: Predrag Cvitanović

INSTRUCTOR HOMEPAGE: www.cns.gatech.edu/~predrag

TIME: Spring semester 2010, MWF 2:05-2:55pm

ROOM: Howey S204

EXPECTED ENROLLMENT: 15

COURSE DESCRIPTION:

Continuum physics describes the macroscopic physical world around us. The enormous progress of quantum physics in the 20th century has almost eliminated macroscopic phenomena from the core physics curriculum. Nonetheless, research in engineering, geophysics, and biology demands increased mastery of its methodology.

The course aims to redress the balance by offering a modern, unified introduction to the basic concepts and phenomenology of continuous macroscopic systems. It presupposes a knowledge of Newtonian mechanics and differential equations, with the equations of continuum mechanics derived from Newtonian particle mechanics. The basic concept is the concept of stress, valid for all continuous materials. The course proceeds along the two tracks, the two extremes in the world of continua: elastic solids (Hooke) and viscous (Newtonian) fluids. Emphasis is placed equally on intuition and formalism with the many examples from geophysics, astrophysics and other fields.

The course is intended for physics, biology, mathematics, chemistry, engineering and geophysics advanced undergraduates and starting graduate students. The mathematical prerequisites are modest and are developed further as the need arises.

PREREQUISITES:

A basic background in calculus, ordinary differential equations and classical mechanics. Weekly homework assignments require both analytic and numerical work, so familiarity with a programming language is a plus.

TEACHING METHOD:

Three lectures and a homework problem set per week.

TEXTBOOK:

B. Lautrup, ***Physics of Continuous Matter, Exotic and everyday Phenomena in the Macroscopic World***

This course is a pre-publication test run of the 2. edition, with chapters provided as PDF files. Your active participation in improving the book is very much encouraged.

START:

Monday Jan 11 2010, 2:05 in Howey S204,
with detailed schedule and reading assignments posted on

COURSE HOME PAGE:

ChaosBook.org/~predrag/courses/PHYS-4421-10