Series of Lectures

An introduction to Free boundary problems

Henrik Shahgholian

Course time: 14:30-16:30 (GMT+03:30) Tehran local Time
Each Tuesday from March 1 to March 22, 2022.
Meeting ID: 550 2589 4725
Meeting Password: 123456
Link: https://meeting.tencent.com/dm/hQstEcGaBhxc

Abstract:

In these lectures I shall cover some basic materials in free boundary problems, from various applications. These include problems from classical theory, as well as several new problems. The lectures will be at elementary level for both advanced master and Ph.D. students. Each lecture will be 2h, with a short break in between.

Syllabus

The lectures will comprise the following moments:

1- What is a free boundary (examples from applications to modelling)
I shall discuss several examples of free boundary problems, and the state of art for these problems. A few examples of such problems are: Ice melting, Hele-Shaw flow, Muskat problem, Control problem, Obstacle problem and their applications, Jets and Cavities, Scattering problems, Thin obstacle problem (nonlocal problem, with underlying levy process), and many others, if time allows for the first lecture. The idea is to present a diverse range of problems, where free boundaries appear.

2- Mathematical modelling of a few free boundary problems
Some basics for mathematical modelling of several problems mentioned above will be introduced.

3- Mathematical preliminaries for FBP
Several mathematical preliminaries for treating free boundary problems will be given, along with an over view to some tools. These include: Variational problems, Viscosity solutions, Existence theory.

4- Advanced theory
Soft approach to Regularity of solutions, and free boundaries. We shall expand further on the theory, introducing several advanced and modern tools, and using them for treatment of a few specific problems.

5- Open problems and future developments
The participants will be introduced to several problems within the topic with exact ovulations and possible approaches, whenever there is one.