

We hope to run two new topics: Dynamical functional equations and applications, and Mathematical modelling of interfacial flows and microfluidics. We may also run a third new topic: Aperiodic Tilings. There may also be vacancies on one or more of the existing topics.

Please clearly specify which M840 topic(s) you are applying for on your application form, and also ensure you address your suitability for the topic(s).

Further details of each topic are below.

Dynamical functional equations and applications

Dynamical functional equations arise in the study of critical phenomena in the sciences and in complex social systems such as financial markets. They have been used to model geophysical phenomena (such as volcanic eruptions and earthquakes), financial crashes, stress in materials leading to rupture, and critical behaviour in physical systems, particularly in solid state physics. In this M840 topic you will study the basic theory of linear dynamical functional equations and then study in detail one or two applications, reading the original literature and, if desired, conducting your own explorations theoretically and/or numerically.

Mathematical modelling of interfacial flows and microfluidics

Many natural and technological processes involve the understanding and modelling of systems in which a viscous liquid is in contact with other phases (e.g. gas and/or solid). Examples of applications include the coating of a substrate by a liquid, transport processes in falling liquid films, fluid flow in porous media, and many problems in the fields of nano- and micro-fluidics, such as inkjet printing or lab-on-a-chip devices. In this topic you will learn the mathematical modelling of interfacial phenomena. Some problems of current interest will be considered, such as for example, the motion of thin liquid films, droplets evaporating on solid surfaces, or fluid flow in confined systems. Basic knowledge of fluid mechanics (e.g. Mathematical Methods and Fluid Mechanics (MST326)) is desirable but not necessary.

Aperiodic Tilings

Aperiodic tilings are of interest not only for their aesthetic appeal, but also due to their applications in mathematical crystallography, where they serve as structure models of quasicrystalline materials. In this M840 topic you will explore some concepts of symbolic dynamics, in particular substitution rules on finite alphabets. Their geometric counter-parts give rise to inflation tilings. The topic involves reading recent original literature in the field and offers the option of constructing and exploring tilings via analytic or computer-based approaches.

Please see the M840 website for the current topics.

<http://www.open.ac.uk/postgraduate/modules/m840>