

# Reaction-Diffusion Equations

**Lecturer:** Prof. Dr. Klemens Fellner

**Time and Room:** Mo 10:00 - 11:30 SR 11.33  
Mi 15:00-16:30 SR 11.33

**Content:**

Chapter 1: Modelling with continuum equations, selected application described by Reaction-Diffusion (RD) equations

Chapter 2: existence theory for RD equations (local/global existence, weak/mild/classical solutions)

Chapter 3: Qualitative and large-time analysis: stationary states, Lyapunov- and entropy methods

Chapter 4: Pattern and Waves: Fisher-KPP, stability of travelling waves, pattern formation, Turing instability.

Full lecture notes will be available. The exercises will out of analytical and numerical (MatLab) examples as well as some chemical demonstrations.

**Previous knowledge expected:**

Some basic knowledge of measure theory (Lebesgue integrals), functional analysis (Lebesgue spaces) and ordinary differential equations would be desirable but will not be necessary.

**Objective:**

The course presents reaction-diffusion equations both as partial differential equations featuring highly interesting mathematical phenomena as well as mathematical models of prominent applications in biology, life-sciences, chemistry, population dynamics, ... The aim is to introduce the fundamental ideas of the existence theory of solutions and to describe the techniques which analyse the qualitative and the large-time behaviour of solutions in terms of selected model applications.

**Course language:** English