

ANALYSIS OF REACTION-DIFFUSION SYSTEMS

BAO QUOC TANG

ABSTRACT. This lecture aims to introduce the analysis, namely global existence and large time behaviour, of reaction-diffusion systems arising from chemistry or biology. Our main goal is to introduce powerful methods to deal with those fundamental questions. Recent advances are also mentioned/included. Especially, open research questions are posed for interested participants.

TIME AND PLACE

**Room 301, Vietnam Institute of Mathematics, 18 Hoang Quoc Viet
8-11/8/2022**

OUTLINE AND SCHEDULE

(1) *Monday, 8/8/2022, 9:00 - 10:00, 10:30 - 11:30*

Introduction and Preliminaries

- Reaction-diffusion systems arising from chemistry or biology
- Sobolev and Bochner spaces
- Heat regularisation
- L^p -maximal regularity of parabolic equations
- Local existence of strong solutions

(2) *Tuesday, 9/8/2022, 9:00 - 10:00, 10:30 - 11:30*

Global existence of reaction-diffusion systems

- Quasi-positivity and mass dissipation
- (Improved) duality method
- Global weak solutions for quadratic systems
- Global classical solutions in $2D$ and nD with quasi-uniform diffusion

(3) *Wednesday, 10/8/2022, 9:00 - 10:00, 10:30 - 11:30*

Entropy method and convergence to equilibrium

- Entropy method
- Examples
- Bakry-Emery approach
- Historical notes

(4) *Thursday, 11/8/2022, 9:00 - 10:00, 10:30 - 11:30*

Entropy method for reaction-diffusion systems

- Detailed balanced chemical systems
- Vector-valued functional inequalities

- Convergence to equilibrium for renormalised solutions
- Conclusions and **Open questions**

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