Bachelor Thesis
(Bakkalaureatsarbeit)

on the topic

"Diffusion-Convection-Reaction Equations"

- **Title:** Diffusion-Convection-Reaction Equations

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- **Abstract:** Diffusion-Convection equations are a class of partial differential equations which describe physical phenomena where particles, energy or other physical quantities are transferred inside a physical system. By adding a zero-order term, chemical reactions in which substances are transformed into each other can be modeled. Moreover, many applications from the life sciences, such as population dynamics or the flow of pedestrians can be modeled by means of this class of equations. In this Bachelor thesis, we will consider several applications of Diffusion-Convection-Reaction equations.

- **Road Map for the Bachelor Thesis:**

  1. Introduction
  2. Derivation of thermodynamic equations
  3. Dispersal of pollutants
  4. Chemical reactions
  5. Population models
  6. Pedestrian flow
  7. Conclusions
  8. References

- **Literature:** Lectures and Seminars (Proseminar) on Mathematical Models in Engineering

- **Additional Literature:** [1], [2], [3], [4]

References

[1] C. Kuttler. Reaction-diffusion equations with applications. Lecture Notes TU Munich, 2011.

[2] A. Friedman and W. Littman. *Industrial Mathematics: A course in solving real-world problems.* SIAM, 1994.

[3] A. Jüngel. *Diffusive and nondiffusive population models*, chapter Part III, pages 397–426. Birkhäuser, 2010.

[4] R. Hughes. A continuum theory for the flow of pedestrians. *Transp. Research Part B*, 36:507–535, 2002.