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# Systems Biology: Simulation of Dynamic Network States

## BIOINF 4394 (6 ECTS credits)

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### Overview

This class teaches how methods from mathematical modeling can be applied to biological systems. This includes creating models of biochemical reaction networks, simulation and analysis of their dynamic responses as well as fundamental programming techniques for solving problems of systems biology.

### Goals

- Introduction to the fundamental concepts of biological networks
- Knowledge about biophysical and biochemical constraints and implicit assumptions, principles of enzyme catalysis, open and closed systems, effects of reversible reactions on the overall system as well as multiple time scales.
- Practical experience in deriving kinetic equations and the dynamic simulation of systems biological models as well as subsequent analysis

### Requirements

- Weekly participation within the tutorial
- Joint completion of a small project, documentation as scientific essay, and presentation of the project.

### Evaluation

- Assignments will have to be individually submitted. Instructors will check for duplicate solutions and reserve the right to distribute points across all identical solutions.
- Students caught copying solutions can be excluded from the course!
- Work on projects will be in teams of 2-3 students.
- 50% of the achievable points in both assignments and project are required for passing and participation in the final exam. Points achieved in excess of 50% in assignments and projects will be added as bonus points to the final exam. Bonus points will improve the final exam grade up to 15% of the regular points in the final exam.
- The final exam will be a written text.

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Winter Semester 2016  
Monday 16-18 and Thursday 14-16  
in Room A104, Sand 1

Instructors:  
Dr. Andreas Dräger & Sebastian Winkler  
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Office Hours: Monday 11-12:30

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### Materials

Slides and complementary material will be made available at the ILIAS page about this class.

Recommended literature:

- Pálsson. Systems Biology: Simulation of Dynamic Network States. Cambridge University Press, 2011.
- Goodsell. The Machinery of Life. 2<sup>nd</sup> edition, Springer-Verlag, 2009.
- Koolman & Roehm. Color Atlas of Biochemistry. 2<sup>nd</sup> edition. Thieme-Verlag, 2005.

### Milestones

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**October 17<sup>th</sup> 2016**

First lecture

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**October 27<sup>th</sup> 2016**

First homework assignment due

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**December 15<sup>th</sup> 2016**

Begin of project work

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**January 30<sup>th</sup> 2017**

Submission of projects

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**February 2<sup>nd</sup> 2017**

Presentation of projects

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**February 13<sup>th</sup> 2017**

Final exam

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