MODELLING AND SIMULATION PRACTICES

Practice 1 - SS 2014 – Daniela Müllerová

What do we do in today's practice?

1. Organization of practices
2. Entrance test
3. Why modeling and simulation?
4. Foundations of Mathematics
5. Introduction to Matlab
6. Introduction to Simulink
7. Summary

What are practices organized?

Biomedical Technician BMT (17ABBMS)

- **1 group**
- **2 students**
- **13 practices x 1.5 hours**

17ABBMS - Modelling and Simulation WWW pages (2+2) - even and odd week

hour	1	2	3	4	5	6	7	8	9	10	11	12
time	8:00 - 8:50	9:00 - 9:50	10:00 - 10:50	11:00 - 11:50	12:00 - 12:50	13:00 - 13:50	14:00 - 14:50	15:00 - 15:50	16:00 - 16:50	17:00 - 17:50	18:00 - 18:50	19:00 - 19:50
Monday												
Tuesday	KL:A-12 - Lec M. Kana 1(1 stud.)											
Wednesday												
Thursday	KL:B-505 - Pra D. Müllerová 1(1 stud.)											
Friday												

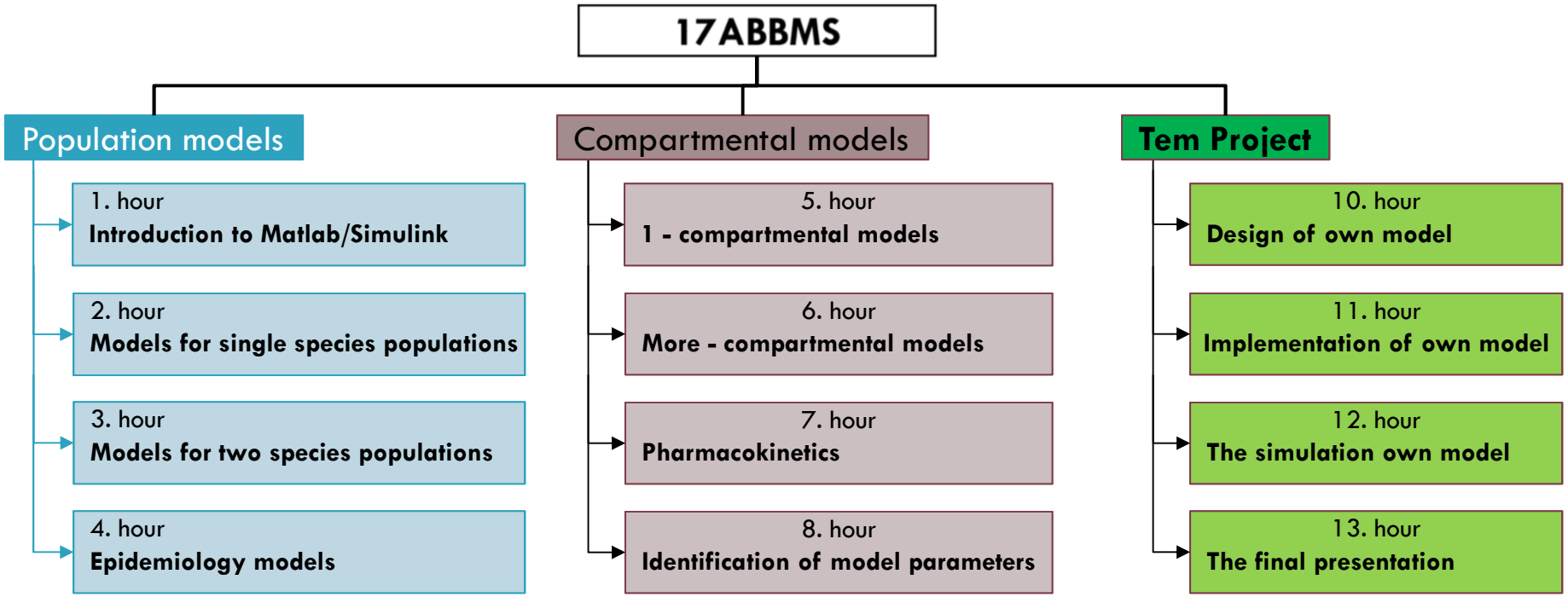
Lectures | Practice | Laboratory | Other

What you should already know?

Biomedical Technician BMT (17ABBMS)

- **Linear Algebra and Differential Calculus**
- **Integral Calculus**
- **Programming in Matlab**
- **Introduction to Signals and Systems**

What will you practice throughout the semester?



Obtaining credit of exercises

Maximum 40 points can be obtained from practices. It is necessary obtain **20 points** to the credit.

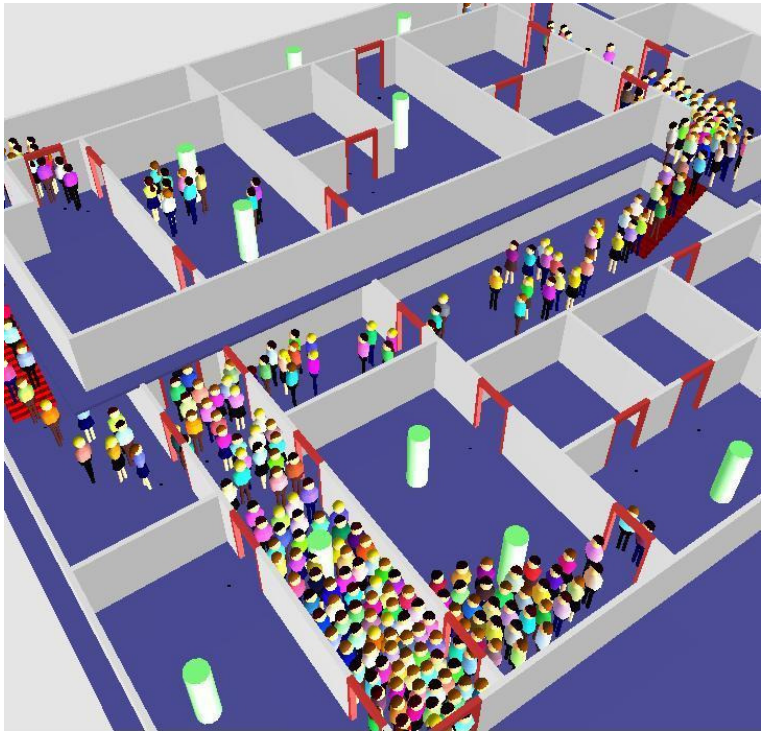
Up to 11 points can be obtained for active participation in practices *(1 point per hour).*

Up to 15 points can be obtained for a credit test, which will take place on the 9th hour.

Up to 14 points can be obtained for a credit test, which will take place in the 13th hour.

Entrance test

Why modeling and simulation?



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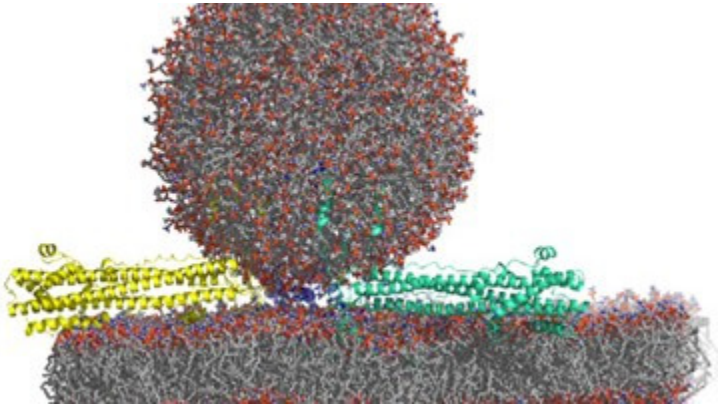

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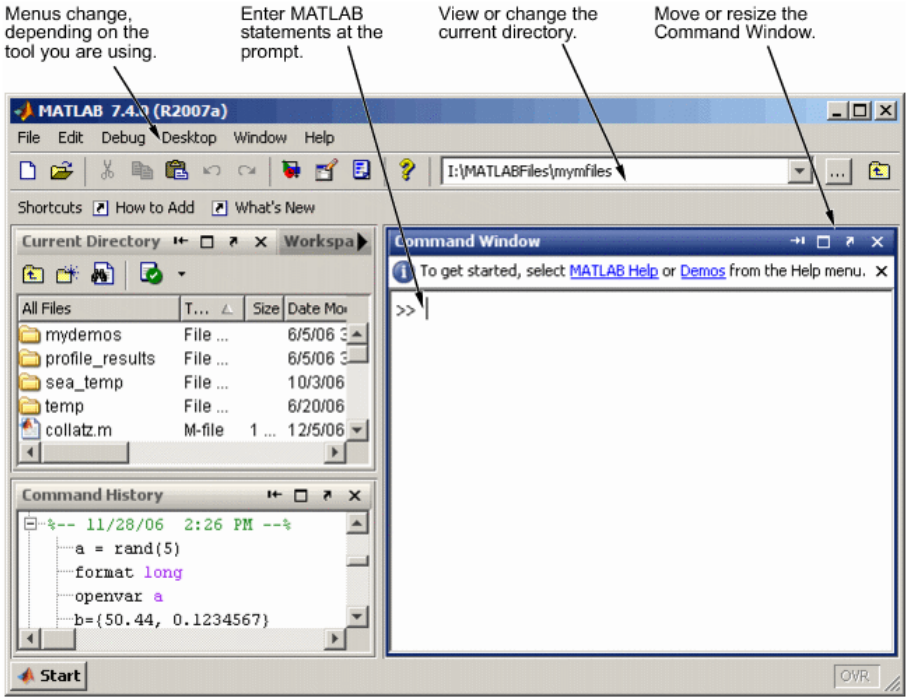
Foundations of Mathematics

- **Polynomial**
  - $f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0$
  - coefficients of polynomial, order of polynomial, roots of polynomial
- **Equations**
  - equation with one variable
  - linear system of equations
  - non - linear system of equations
- **Matrices**
  - square schema of numbers, row and column
  - row matrices, column matrices
  - square matrices, main diagonal of matrix, identity matrix
  - matrix operations: sum, difference, product, determinant, transpose of matrix, inverse matrix
- **Differential equations**
  - mathematical equation which contains derivative of function
  - linear differential equation and system of equations

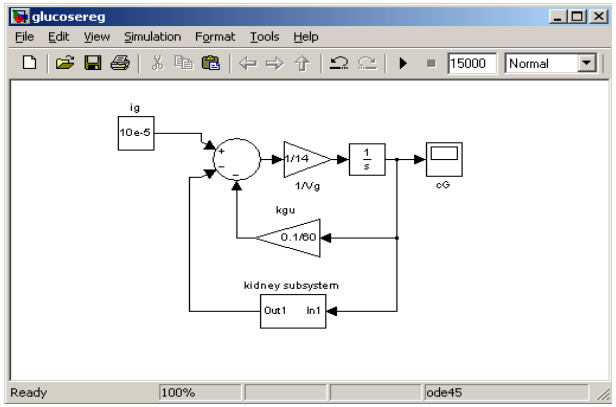
Introduction to Matlab

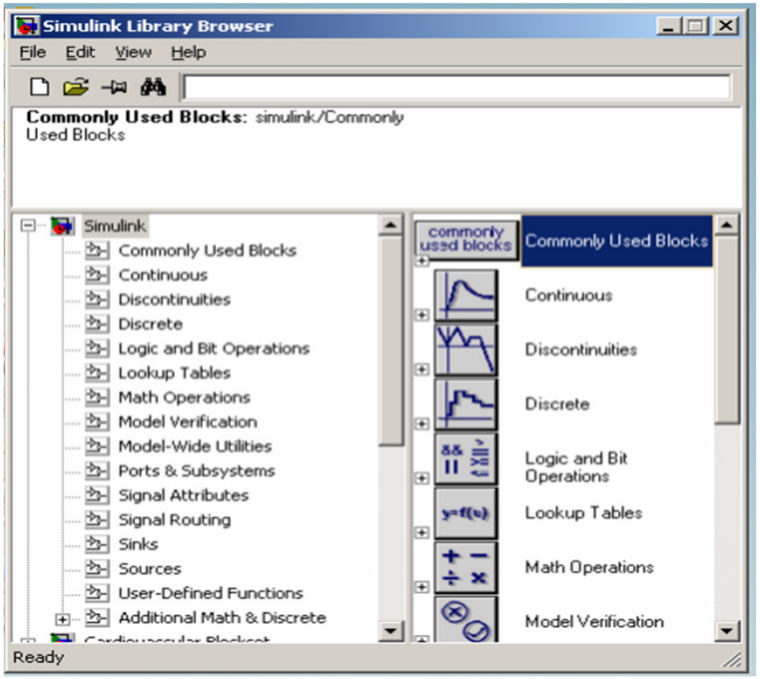
- interactive programming environment
- counting with matrices
- plotting 2D and 3D graphs of function
- implementation of algorithms
- analysis and presentation of data
- creating an application, including the user interface



Introduction to Simulink

- environment for the simulation of dynamic systems using block diagram
- offer libraries of signal sources, basic continuous, discrete and nonlinear blocks and blocks for displaying and saving signals





Summary of today's practice

[Organization of practices]
13 hours with Matlab and Simulink, the basics of modeling and the creation of a own model.
To obtain the credit you need 20 points.
11 points can be obtained for active participation in the practices. 29 points can be obtained for the test, which will take place on the 9. an hour and 13. an hour.

[Foundations of Mathematics]
Polynomials, equations, matrices

[Matlab, Simulink]
Matlab is an interactive Programming environment for computing with matrices, plotting graphs of functions, implementation of algorithms, analysis and presentation of data, creating applications.
Simulink is an environment for the simulation of dynamic systems using block diagram.

[What is next?]
Next week we will continue with Simulink models of single species populations..