What is Metabolism?

Definitions (from the web):

"Metabolism (from 'metabolismos' the Greek word for "change", or "overthrow" Etymonline), is the biochemical modification of chemical compounds in living organisms and cells...."

"Enzymatic transformation of organic molecules. Synthesis corresponds to anabolism, and degradation to catabolism"

"The sum of the processes by which a particular substance is handled (as by assimilation and incorporation, or by detoxification and excretion) in the living body."

What is not covered by metabolism?

A lot:

- Building of proteins: transcription, translation and protein folding: ready-made proteins are our building blocks
- Gene expression and protein expression (proteomics): we typically analyze situations where expression can be assumed to be constant
- Signaling between cells
- ...

Outline of the course

Aim of the course: to learn techniques that are used to analyze metabolism

Particular techniques include

- Metabolic reconstruction: given a newly sequenced organism, how to estimate how the metabolism of the organism looks.
- Analysis of metabolic networks: what can we say about the organism just by looking at the metabolic production routes it has
- Flux estimation: given a metabolic network, estimate the activity of the different metabolic pathways
- Metabolic-level regulation: how does the cell react to sudden changes, when regulation of expression is too slow

Prerequisites

We will assume that you know the following

- Introduction to bioinformatics: protein, cell
- Data structures: graphs and networks
- Elementary probability calculus

We will give a crash-course reviews of the following, but please be ready to put some of your own time for studying/refreshing your knowledge of:

- Linear algebra / Matrix computation
- (the very) basics of differential equations

Passing the course

- Course exam (2.5. from 9-12): maximum 40 points
- Exercises: maximum 20 points

30 points required for passing the course (grade 1/5), 50 points gives maximum grade 5/5.