



## A new course proposal

### BE 228 (JAN) 3:0 Introduction to Mathematical Oncology

This course shall introduce how different mathematical models and computational techniques can be used to understand the dynamics of in cancer progression at various temporal and spatial scales, in close collaboration with existing experimental data. We shall emphasize how computational methods can influence both our fundamental understanding of tumor growth, as well as suggest new therapeutic strategies to control tumor aggressiveness, including various case studies. We shall introduce various hallmarks of cancer (cell cycle deregulation, angiogenesis, metastasis) from a mathematical perspective, and discuss research papers related to simulating them using ordinary/partial differential equations.

**Instructor:** Mohit Kumar Jolly

### References

Course material will consist of research papers from peer-reviewed literature.

### Pre-requisites

Basic grasp of engineering mathematics and programming skills in MATLAB, C, Mathematica or Python is recommended. Basic introduction to biology at an under-graduate level (or the drive to self-educate).

### Additional information

This course is open to doctoral and master's students from all disciplines. Undergraduate students with sufficient background can approach the instructor.

### Evaluation

The first part of the course will be based on lectures and assignments. The later part would be based on research paper presentation and project, related to one or more of the themes mentioned here:

1. Modeling gene regulatory networks related to cancer behavior.
2. Modeling tumor microenvironment behavior – hypoxia, angiogenesis, tumor-stroma crosstalk
3. Modeling cell plasticity – Epithelial-Mesenchymal Transition, Cancer Stem Cell, Metabolic switches
4. Modeling new drug development and/or delivery approaches

The evaluation will be based on a few assignments and then the project progress (identifying research question, presentation of related papers and hypothesis, initial model development, final presentation).