



Module PMRF-ISSS079/2023

Mathematical modeling of intracellular signaling network in biology

Name of the PMRF student

Sayoni Maiti

Details of the content of the module

Required background of the students taught

Undergraduate in science or engineering
(Any discipline)

Interested to learn an interdisciplinary approach and apply principles of physics, chemistry, mathematics and coding to understand biological systems

Introduction to mathematical modeling in biology

- What does it mean to model something?
- Process of mathematical modeling in biosciences
- Basics on linear algebra and differential equations
- Math models in different disciplines
- Types of mathematical models

Mathematical oncology and signal transduction

- Understanding the mathematics in cancer
- Key intracellular signaling pathways in cancer
- Enzymes as key nodes of network

Principles of chemical engineering in modeling

- Rate laws and order of reactions
- Steady state and quasi-steady states
- Enzyme-substrate kinetics

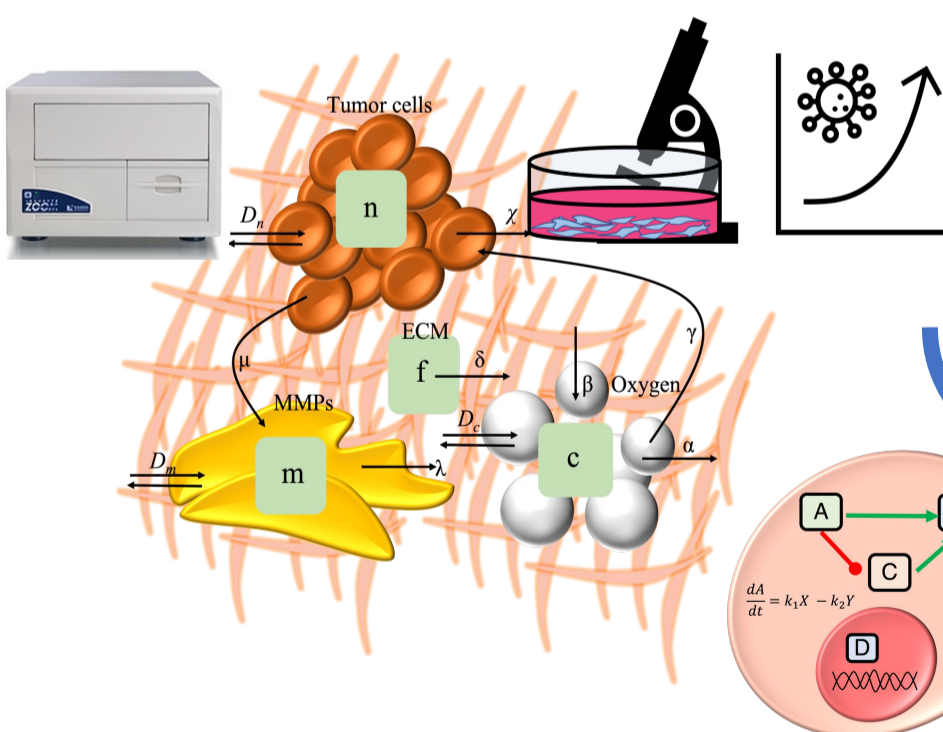
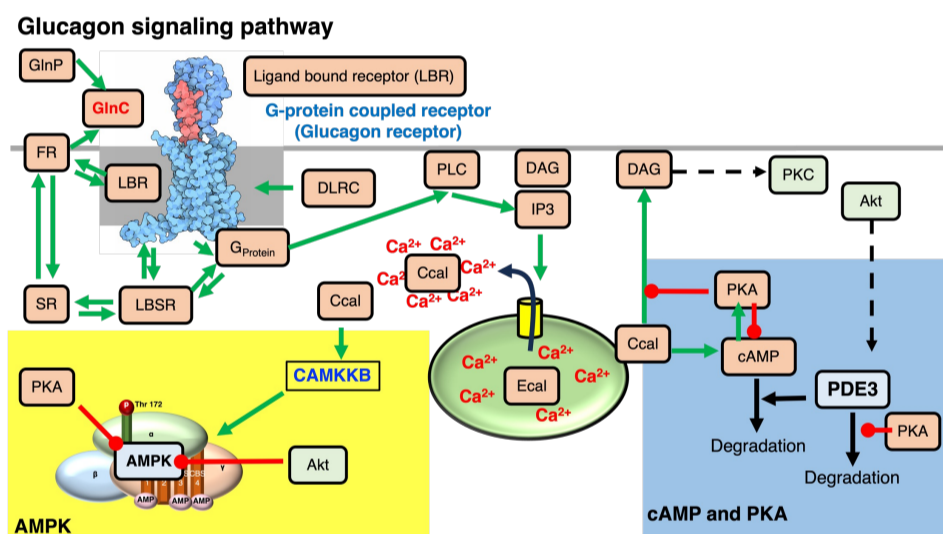
Understanding the fundamentals of equation writing in biology

- Identification of variables in biological systems
- Drawing integrated network using variables
- Writing mass balance, rate equations and differential equations
- Understanding mathematical tools like MATLAB

Experimental validations of models

- Understanding model outcomes
- Hypotheses generation using models
- Experimental planning for model validation

Nature of module: Lectures, discussions and assignments



Schedule of the module

Start date: 16th February 2024

End date: 10th May 2024

Day and time: Fridays, 6-8 pm

Meeting link : Will be shared later

Contact email ID: sayonimaiti@iisc.ac.in

Registration link:

<https://forms.gle/SR1BeefqN8rYDRi6>