PMRF-ISSS Teaching Programme

Prime Minister Research Fellowship students' teaching requirement facilitated by the Institute of Smart Structures and Systems

Module **PMRF-ISSS147/II/2024**

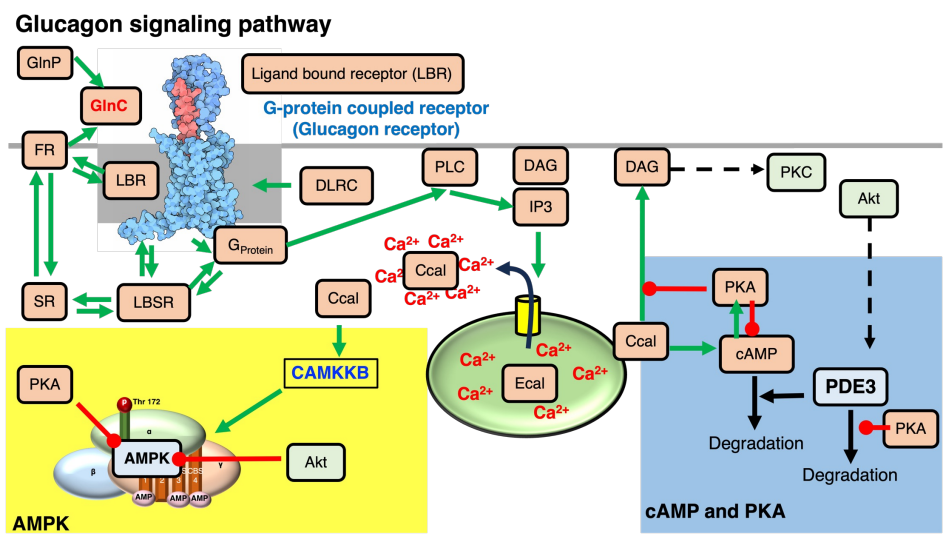
Experimentation and modeling of intracellular signaling network and metabolic pathways in biology

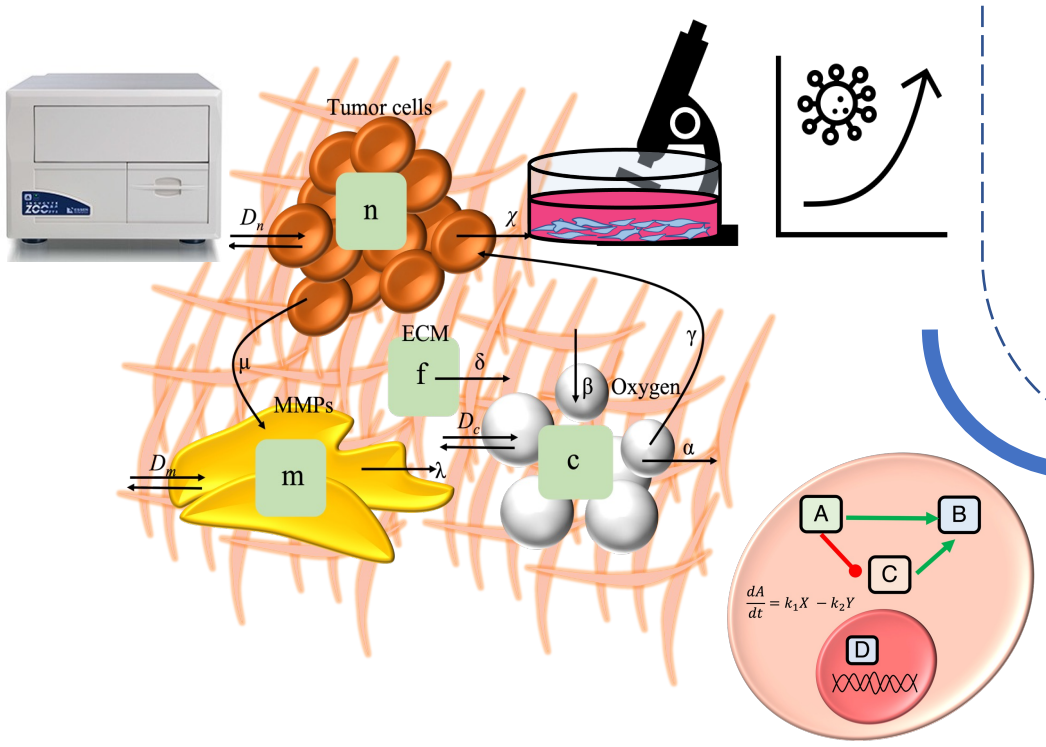
Name of the PMRF student

Sayoni Maiti

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





Details of the content of the module

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

Experimentation
- Glucose uptake assay
- ATP determination assay
- Western blotting
- Transfection

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: 20th September 2024

End date: 13th December 2024

Day and time: Fridays, 7-9 pm

Meeting link : Will be shared later

Contact email ID: sayonimaiti@iisc.ac.in

Registration link:

https://forms.gle/ATriX5QcsaKWkCc38