

# MATH 598

## Introduction to Biomathematics

<http://www.math.iupui.edu/~leo/m598>

**When:**

Wednesdays 10:40-11:30am

**Where:**

TBA

**Credit Hours: 1****Pre-requisites:**

Multivariate calculus,  
differential equations,  
linear algebra,  
or consent of instructors

**Instructors:**

**Giovanna Guidoboni**  
[gguidobo@math.iupui.edu](mailto:gguidobo@math.iupui.edu)  
LD 270E

**Leonid Rubchinsky**  
[leo@math.iupui.edu](mailto:leo@math.iupui.edu)  
LD 270M or by appointment

**Class Topics:**

*Models of continuum media*  
*Models of biological tissues*  
*Models of biological flows*  
*Models of interactions between  
fluid and structure*  
*Models of cardiovascular system*  
*Models of biological pattern  
formation and growth*  
*Models of cellular and molecular  
biology*  
*Models of excitable cells*  
*Models of systems physiology*  
*Models of neurodynamics*

**Course Description:**

The class will cover a variety of mathematical methods in applications to different areas of life sciences. The class is conceived as an introduction to a very wide area, characterized by diverse mathematical methods and diverse applications, and therefore the focus will be on the breadth, rather than on the depth.

Mathematical concepts will be introduced in a *problem-driven* way. We start with real life sciences problems and discuss appropriate mathematical models of the processes considered. We will learn more about biology involved in the processes under consideration and we will discuss meaning, strengths and weaknesses of different mathematical models for the same process. We will also present the necessary mathematical apparatus for the model analysis.

By the end of the class, you will gain general knowledge of the mathematical methods used in various life sciences applications as well as some practical knowledge of some particular subfields. You will also have a chance to get a more in-depth exploration by working on a project in your area of interest. Towards the end of the class, we will have several guest lectures, delivered by applied mathematicians from the Department of Mathematical Sciences, as well as by faculty from the School of Medicine engaged in biomathematics research. You will have a chance to interact with all of them. By the end of the class, you will surely be more prepared for your academic and/or industrial careers.

**Who should take this class?**

**Newly enrolled graduate students:** this class will give you the chance to learn why and how mathematics can be applied to problems arising in life sciences. This can be very useful for your future career, independently of your future PhD research area either in pure or applied mathematics.

**Continuing graduate students:** this class will broaden your scientific perspective. You may discover that some mathematical techniques that you are currently studying can be successfully used in other contexts. Similarly, you may learn that applied problems you are currently studying may be investigated with different mathematical techniques in order to answer different questions.

**The class will have a substantial amount of material, not covered in the Spring 2011 class. Therefore students enrolled into Introduction to Biomathematics in Spring 2011 are encouraged to enroll again.**

**Assignments and Policies**

The class involves **one assignment only**, which consists of an **individual project**. Projects will be assigned in late March and will be collected during the last class meeting. The project grade will determine the course grade. The course does not involve a separate Final Exam. Instructors will offer a wide choice of projects related to different topics covered in class, but additional projects can be designed upon students' suggestions. The project completion will require the submission of a short written report (details will be clearly listed in the project description ).