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MAP 6488: Biomathematics Seminar II
Spring 2018
University of Florida

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Location: Little Hall 217
Time: MWF period 5, 11:45-12:35

Instructor: Libin Rong
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Office hours: MW period 7, 1:55-2:45 PM or by appointment

Course Objective and Description: To introduce students to mathematical models that describe and study virus dynamics and theoretical immunology. Mathematical models (systems of ordinary, delay, or partial differential equations) will be introduced to the study of various virus infections (HIV, hepatitis, influenza, etc), drug treatment, and immune responses. Model prediction will be compared with experimental data if available for validation. Mathematical analysis, numerical simulation, and data analysis methods such as data fitting and parameter estimates will be discussed.

Prerequisite: There is no explicit prerequisite for this seminar course but basic knowledge in differential equations, linear algebra and numerical methods will be useful. Prior knowledge in virology and immunology is not necessary. If students have concern about the prerequisite, please contact the instructor.

Attendance: Attendance of each class is expected.

Homework: There will be occasional homework after some lectures. Homework will be collected and graded.

Project: Students are expected to read papers that expand the topics of lectures, make a computer-based presentation, and write a final report. They can make presentations on virus dynamics or theoretical immunology (i.e. within-host dynamics), or more broadly, on mathematical epidemiology or ecology. Ideally, students can build and analyze a new model that improves the published one. The instructor can also assign papers to students for the project if needed.

The presentation/report may include: background of the biological question, motivation of the study, model formulation, analytical results of the model, numerical simulations of the model, and biological/medical implications. The final report is based on the presentation but includes more details.

Grades: Grades will be based on attendance, homework and project.

References: Students don't have to buy any books but the following will be good references for this course.

Lecture notes

Articles sent to students before class

Virus Dynamics: Mathematical Principles of Immunology and Virology, by Martin Nowak and Robert May, Oxford University Press, 2000

Killer Cell Dynamics: Mathematical and Computational Approaches to Immunology, by Dominik Wodarz, Springer, 2007

Theoretical Immunology, by Rob de Boer, online at bioinformatics.bio.uu.nl/rdb/books/ti.pdf

How the Immune System Works, by Lauren Sompayrac, Wiley Blackwell, 5th Edition, 2016 (If students are interested in learning more immunology, they can start with this short book, which provides an overview of how the immune system fits together to fight against infectious diseases.)