MAT 475

Differential Equations

The course will most likely be taught as part of ASU_{sync}. I.e. we will meet on zoom on the assigned meeting time. Office hours and hallway discussions will be set up on line.

Instructor:
Dieter Armbruster, Professor and Director for Graduate Studies
School of Mathematical and Statistical Sciences, WXLR 821 and WXLR 216, 965-5441, 965-3953
email: armbruster@asu.edu
meeting time: 4:35 - 5:50pm MW
line number: 71109
place: TBD

Topics
This course is an excellent preparation for the Core Course APM 501 in the Applied Mathematics Ph.D. program. The topics covered are fundamental for every student interested in applied mathematics and mathematical biology. They include:

- Phase plane analysis
- General theory of systems of linear differential equations.
- The Existence and Uniqueness Theorem (including a simplified proof)
- Lyapunov stability theory
- Elements of nonlinear dynamics including: Linearization, Poincare-Bendixson Theorem, limit cycles, bifurcations, Hamilton systems, etc.

Applications can be found everywhere but will be chosen for obvious reasons this Fall from epidemiological modeling.

The goal of this course is to give you a solid foundation, both intuitively and theoretically for the study of dynamical systems. Along the way we will introduce several useful computer programs (symbolic as well as numerical).

Prerequisites:
MAT 275/MAT 343/MAT 371

Text:
Differential Equations, Dynamical Systems, and an Introduction to Chaos, M. Hirsch, S. Smale and R. Devaney, AP,; 3nd edition, 2013 ISBN-978-0-12-382010-5
This is a great book by three outstanding applied mathematicians, one of them (S. Smale) a Fields medalist.

Additional references on epidemiology and other special topics will be given in class.

Homework will be assigned and collected typically every two weeks

Exams: There will be a midterm examination (open books and open notes), a class project and a take home final. Each one of these exams will count for 25% of the course grade. The remaining 25% are determined from homework.