GMU Department of Mathematical Sciences
Math 413: Modern Applied Mathematics I
Fall 2020
Syllabus

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**Instructor:**
Prof. Maria Emelianenko
Email: memelian@gmu.edu
Office Hours: M 9:00-10:00am on Zoom (link in BB)

**Time and Room:**
W 9:00-10:15am on Zoom (problem solving session, link on BB)
Course materials, assignments and announcements will be available on Blackboard.
**Prerequisite:** Grade of C or better in MATH 203 and 214 or 216.

**Textbook:** The textbook we will follow is "Introduction to the Foundations of Applied Mathematics" by M. Holmes, Springer, 2009.

The course will use the following supplementary texts:

1. Steven H. Strogatz, "Nonlinear dynamics and chaos", Westview Press, 1994
2. J. David Logan "Applied Mathematics", 4th edition, Wiley, 2013
3. Ralph C. Smith, "Uncertainty Quantification: theory, implementation and applications", SIAM 2014
4. Steven L. Brunton, J. Nathan Kutz, "Data-driven science and engineering", Cambridge University Press, 2019

**Course Description:**
This course describes the role of analytical and computational mathematics tools in modern data-driven world. It emphasizes interplay between discrete and continuous mathematics and shows how mathematical structure can be revealed by various equilibrium and dynamic models. We will learn how to formulate, analyze and solve real problems arising in the fields of science, engineering, social networks, finance etc. We will be performing careful analysis of the real data sets, studying their structure, then building and analyzing discrete or continuum models describing their behavior. Both analytical and computational assignments will be given and students will be expected to submit homework assignments and make oral presentations. In-class demonstrations will employ MATLAB tools and the use of MATLAB will be expected when doing computational assignments.

**Software:**

MATLAB is a computing environment with programming capability, good graphics, and powerful library functions. It is available on the Mason cluster and several Unix computer labs. Alternatively, a student version can be purchased at the bookstore at a reasonable price. MATLAB tutorials will be available at our class Blackboard page if you are new to MATLAB. Alternatively, the online documentation is available at https://www.mathworks.com.

**Grading policy:**

Your grade in this course will depend on your performance on graded projects and one final exam. Tentative weight of assessment components:

- Projects and graded homework assignments: 70%
- Take-home final exam: 20%
- Participation: 10%

Occasional practice problems will be given that will not count towards the final grade, unless specifically noted. I strongly encourage all participants to do these exercises in order to gain the necessary grasp of the material and perform well on exams and graded assignments.

**Academic Policies:**

It is expected that students adhere to the George Mason University Honor Code as it relates to integrity regarding coursework and grades. The Honor Code reads as follows: "To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student members of the George Mason University community pledge not to cheat, plagiarize, steal and/or lie in matters related to academic work." More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be found at the Office of Academic Integrity website at http://oai.gmu.edu.