MA1600 – Introduction to Scientific Simulations[1]
Michigan Technological Univeristy
Department of Mathematical Sciences
Spring 2015

Instructor: Benjamin Ong
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Office Hours: By appointment
                http://ongbw.youcanbook.me

Prerequisites: None . . . but enthusiasm in mathematics and computing highly encouraged!

Textbook: *Insight Through Computing*
            C. F. Van Loan and K. Y. Fan
            ISBN: 978-0-898716-91-7

Additional Reading: Excursions in Modern Mathematics (7th Edition)
                      P. Tannenbaum
                      ISBN: 978-0-321568-03-8

Software: MATLAB (available for download at https://downloads.it.mtu.edu/)
            or you may use Python (iPython notebooks preferred)

Course Aims:

1. Experience using mathematics & computers to gain insight into real-life problems.

2. Understanding approximations and their implications.

3. Appreciating sequences and their implications.

Grading:

- 50% – in class quizzes, assignments and projects

- 20% – midterm

- 30% – final/final project

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[1]Instruction using a flipped classroom methodology, see page 2

More information:

MA1600, "Introduction to Scientific Simulations", will be taught using a flipped classroom methodology. A good summary of why I'm choosing to flip the classrom can be found in this pdf. Simply put, classroom time will focus on group-learning, problem-solving exercises/projects, new material is taught via online resources, outside of classroom time.

Expectations for students:

- Students are responsible for viewing online resources (at their own pace) before the next class. A short in-class quiz at the beginning of a class will be used to ensure that material is being reviewed. Online resources may consist of streaming video, handouts, and exercises.

- Students are expected to actively participate in group exercises. Initially, groups and "roles" will be assigned. This will be revisited this after the first week. Each group should have a minimum of three members with different roles. Possible roles include:

FACILITATOR	SCRIBE	PRESENTER
Role:	**Role:**	**Role:**
● Keep the discussion moving	● The most important role!	● Presents summary to class
● Keep track of time	● Your notes summarize the group's efforts (may be graded!)	● Must be clear and concise
● Make sure every voice is heard		
Good phrases:	**Good phrases:**	**Good phrases:**
● We have ___ minutes left to complete our task.	● I think I heard you say ____.	● Let me summarize what we've discussed.
● Let me repeat the question.	● Can you summarize that for me?	● How would you like this to sound?
● Let's hear from ____.	● This is what I wrote, do you agree?	

- Since group-based activities are the foundation of this course, a large portion of the grade relies on punctuality, attendance and participation. Unfortunately, there is noway to "make up" for missing a session. However, extra credit projects will be available to everyone.

Expectations for the instructor:

- Create/gather online content / structure in-clas activity

- Update Banweb with grades regularly (usually after each class)

- Available to individual or groups http://ongbw.youcanbook.me

Course Topics:

1. Introduction to programming (conditional statements, loops, functions)

2. Introduction to visualization

3. Dealing with numbers

4. Root finding

5. Fitting curves through data (interpolation and extrapolation)

6. Advanced modules (to be decided, based on class interest)

   (a) Gravitational motion
   (b) Signal attenuation
   (c) Image compression
   (d) Random collisions
   (e) The "Game of Life"
   (f) Spread of infectious diseases
   (g) Optimal control
   (h) Clustering the Iris flower data set