

MODELING WITH PDE

MA 4/561-1B, Spring 2020

Instructor: Dr. Y. Zeng, UH 4012, 934-2154, ynzeng@uab.edu

Time & Location: MWF, 9:05 a.m. – 9:55 a.m., HHB 221

Office Hours: MW, 2:30 p.m. – 3:30 p.m. (or by appointment)

Pre-requisite: MA252 (minimum grade C) or permission of instructor

Text: Lecture notes and assignments are posted on Canvas.

Grading Policy:

- **MA 461:**

attendance	15 %
(approximately weekly) written assignments/projects	85 %

- **MA 561:**

attendance	10 %
(approximately weekly) written assignments/projects	75 %
a term project	15 %

- Overdue assignments turned in before the last day of class receive half credits. No overdue assignments will be accepted after the last day of class.

- Your final grade is determined according to the following table:

Course performance:	88-100	75-87	62-74	50-61	below 50
Final Grade:	A	B	C	D	F

Syllabus:

- Flocking: the Cucker-Smale model, flocking theorems, a flock of two birds, language evolution
- Synchronization: Peskin's model for pacemaker cells (integrate-and-fire dynamics), the synchrony of two cells, Peskin's conjectures, the Kuramoto model, phase-locked states
- Guitar/Violin Strings – Waves: equation, initial and boundary conditions

- Vibrating Membranes – The 2-D Wave Equation: a wave animation, musical and non-musical sounds
- Heat Flow: heat flow problem, the heat equation, initial and boundary conditions, steady state temperature distributions
- Diffusion: diffusion equation, population dynamics, space structured population dynamics, invasion fronts
- Introduction of Nonlinear Theory: weak solutions and elementary waves
- Traffic Flows: fundamental diagram of traffic flow, green light effect – rarefaction waves, red light effect – shock waves

Important dates:

- First day of class: January 13, 2020
- Martin Luther King, Jr. Holiday: January 20, 2020
- Last day to drop/add without paying full tuition: January 21, 2020
- Last day to withdraw with a “W”: March 13, 2020
- Spring Break: March 16 – 22, 2020
- Last day of class: April 24, 2020