Instructor: Dr. Y. Zeng, CH 496A, 934-2154, ynzeng@uab.edu

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

Office Hours: MW, 10:15 a.m. – 11:15 a.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:

<table>
<thead>
<tr>
<th>Course performance:</th>
<th>88-100</th>
<th>75-87</th>
<th>62-74</th>
<th>50-61</th>
<th>below 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Grade:</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>F</td>
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</tbody>
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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 07, 2019
- Last day to drop/add without paying full tuition: January 14, 2019
- Martin Luther King, Jr. Holiday: January 21, 2019
- Last day to withdraw with a “W”: March 01, 2019
- Spring Break: March 11 – 17, 2019
- Last day of class: April 19, 2019