# Introduction to Mathematical Modeling

## Spring 2024 tentative schedule

The following (preliminary) schedule serves as a guideline for the sections covered in the lecture.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
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| 1    | Mon, Jan 22nd | Fibonacci Numbers, the Golden Ratio, and Laws of Nature?  
Wed, Jan 24th | Phyllotaxis  
         | Predator-prey model                                                  |
| 2    | Mon, Jan 29th | Predator-prey model & Simple harmonic oscillator               
Wed, Jan 31st | Simple harmonic oscillator & Flows on the circle: synchronization,  
         | fireflies, neurons                                                  |
| 3    | Mon, Feb 5th  | Flows on the circle: synchronization, fireflies, neurons             
Wed, Feb 7th  | Models for thin structures                                         |
| 4    | Mon, Feb 12th | Beam buckling                                                  
Wed, Feb 14th | Collapsing Bridges: Tacoma Narrows                                  |
| 5    | Mon, Feb 19th | — President’s Day (no class)                                       
Wed, Feb 21st | Angular momentum and moment of inertia                             |
| 6    | Mon, Feb 26th | Conservation of angular momentum and Kepler’s 2nd law                
Wed, Feb 28th | Planetary motion                                                   |
| 7    | Mon, Mar 4th  | Data-driven modeling: discovery of dynamical systems from data                  
Wed, Mar 6th  | Midterm exam                                                       |
| 8    | Mon, Mar 11th | Data-driven modeling: discovery of dynamical systems from data                  
Wed, Mar 13th | Method of characteristics                                           |
| 9    | Mon, Mar 18th | — Spring Break (no class)                                             
Wed, Mar 20th | — Spring Break (no class)                                             |
| 10   | Mon, Mar 25th | Method of characteristics & Traffic models                           
Wed, Mar 27th | Traffic models                                                      |
| 11   | Mon, Apr 1st  | Gas dynamics                                                        
Wed, Apr 3rd  | El Niño                                                            |
| 12   | Mon, Apr 8th  | Vortex motion                                                       
Wed, Apr 10th | Vortex motion & Leapfrogging of vortex pairs                        |
| 13   | Mon, Apr 15th | Leapfrogging of vortex pairs                                       
Wed, Apr 17th | Equations of 2D waves and water waves                               |
| 14   | Mon, Apr 22nd | Water waves and dispersion relations                                
Wed, Apr 24th | Dispersion relations and standing waves                             |
| 15   | Mon, Apr 29th | Particle paths and surface tension                                 
Wed, May 1st  | Presentation of final projects                                     |
| 16   | Mon, May 6th  | Presentation of final projects                                      |