18.354J Nonlinear Dynamics II: Continuum Systems

Spring 2019 – Course Info

Lectures: MW 11:30-1:00 in 2-135
Instructor: Philip Pearce
Contact: ppearce@mit.edu 2-179
Office Hours: M 2:00-3:00 (2-179)
Course website: math.mit.edu/~ppearce/Teach/18.354_Sp19/

1. W Feb 6 Introduction, overview & mathematical basics
2. M Feb 11 Dimensional analysis & scalings
3. W Feb 13 Hamiltonian dynamics & Kepler’s laws
— M Feb 18 PRESIDENTS DAY – CLASS ON TUESDAY
4. T Feb 19 Random walkers
5. W Feb 20 Diffusion equation: Fourier method
6. M Feb 25 Diffusion equation: Green’s function method
7. W Feb 27 Linear stability analysis & pattern formation PS1 due
8. M Mar 4 Calculus of variations
9. W Mar 6 Surface tension
10. M Mar 11 Elasticity
11. W Mar 13 Deformation of a thin beam PS2 due
12. M Mar 18 Towards hydrodynamics Proposal due
13. W Mar 20 Navier-Stokes equations I
— M Mar 25 SPRING VACATION
— W Mar 27 SPRING VACATION
14. M Apr 1 Hydrodynamics equations PS3 due
15. W Apr 3 Stokes limit & Oseen tensor
16. M Apr 8 Navier-Stokes equations II
17. W Apr 10 Singular perturbations
— M Apr 15 MIT HOLIDAY (PATRIOTS DAY)
18. W Apr 17 Towards airplane flight
19. M Apr 22 Euler equations: basic solutions and forces PS4 Due. Mid-term posted
20. W Apr 24 2D hydrodynamics
21. M Apr 29 Conformal maps & airfoils Mid-term due
22. W May 1 Waves & solitons
23. M May 6 Final projects: student presentations
24. W May 8 Final projects: student presentations Project report due
25. M May 13 Guest lecture
26. W May 15 Guest lecture