18.354J Nonlinear Dynamics II: Continuum Systems

Spring 2015 – Course Info

Lectures: TR 1-2:30 in E17-136
Instructor: Jörn Dunkel
Email: dunkel@mit.edu
Phone: 253-7826
Office: E17-412
Office hours: Thursday 2:30-3:30 (E17-412)
Course website: http://math.mit.edu/~dunkel/Teach/18.354/

1. T Feb 3 Introduction, overview & mathematical basics
2. R Feb 5 Dimensional analysis & scalings
3. T Feb 10 Hamiltonian dynamics & Kepler’s laws
4. R Feb 12 Random walkers
— T Feb 17 MIT MONDAY (PRESIDENTS DAY)
5. R Feb 19 Diffusion equation: Fourier method
6. T Feb 24 Diffusion equation: Green’s function method
7. R Feb 26 Linear stability analysis & pattern formation PS1 due

8. T Mar 3 Calculus of variations
9. R Mar 5 Surface tension
10. T Mar 10 Elasticity
11. R Mar 12 Deformation of a thin beam PS2 & proposal due
12. T Mar 17 Towards hydrodynamics
13. R Mar 19 Navier-Stokes equations I
— T Mar 24 SPRING VACATION
— R Mar 26 SPRING VACATION
14. T Mar 30 Hydrodynamics equations

15. R Apr 2 Stokes limit & Oseen tensor PS3 due
16. T Apr 7 Navier-Stokes equations II
17. R Apr 9 Singular perturbations
18. T Apr 14 Towards airplane flight PS4 due
19. R Apr 16 Euler equations: basic solutions and forces Mid-term posted
— T Apr 20,21 MIT HOLIDAY (PARENTIS DAY)
20. R Apr 23 2D hydrodynamics Mid-term due
21. T Apr 28 Conformal maps & airfoils
22. R Apr 30 Waves & solitons

23. T May 5 Final projects: student presentations
24. R May 7 Final projects: student presentations Project report due
25. T May 12 Bouncing droplets
26. R May 14 Topological defects & active matter