

**University of Maryland
Department of Physics**

Physics 762

Spring 2024

GENERAL INFORMATION

- Title: Plasma Physics II: Topics in nonlinear plasma theory
- Instructors: Dr. James F. Drake
Office: A. V. Williams Bldg. (3311)
e-mail: drake@umd.edu
Office Hours: by appointment or random access.
- Dr. Ian Abel
Office: A. V. Williams Bldg. (3323)
e-mail: iabel@umd.edu
Office Hours: by appointment or random access.
- Rooms and Time: TuTh 9:30-10:45 – Rm 0405 Physics
Website: All course materials, including homework assignments and solutions and class notes will be put on the class website (www.terpconnect.umd.edu/drake/classes/physics762).
- Textbook: No one text will be followed. Notes on all topics will be uploaded on the class website. The following are suggested additional references:
Davidson Methods in nonlinear plasma theory
Sagdeev/Galeev Nonlinear Plasma Theory
Biskamp Nonlinear Magnetohydrodynamics
Biskamp Magnetic Reconnection
Melrose Instabilities in space and laboratory plasma
Schekochihin Lectures on Kinetic Theory and Magnetohydrodynamics of Plasmas
(<https://www-thphys.physics.ox.ac.uk/people/AlexanderSchekochihin/KT/2015/KTLectureNotes.pdf>)
- Topics: The dynamics of plasmas are often controlled by nonlinear behavior. This course will introduce some of the basic techniques which have been developed to understand and describe these dynamics with applications in space and laboratory plasmas. Topics include nonlinear waves and shocks, wave-particle interactions, quasilinear theory and maps, wave-wave interactions, parametric instabilities, Navier Stokes and MHD turbulence, cascade processes and intermittency, magnetic reconnection and the dynamo.
- Homework: Assignments will be made and collected. There will be no exams.