Plasma and Fusion

ENU 4710 Section PLF2
Class Periods: M, W, F | period 7 (1:55 pm – 2:45 pm)
Location: WEIM 1076
Academic Term: Spring 2026

Instructor:
Associate Professor Chris McDevitt
cmcdevitt@ufl.edu
(352) 846-3785
Office Hours: 174 Rhines Hall, Tuesdays (3 – 4 pm) and Thursdays (11 am – 12 pm), or by appointment

Teaching Assistant:
Ethan Webb
ewebb2@ufl.edu
Office Hour: TBD

Course Description
3 credit hours.
This course provides an introduction to plasma physics along with its application to fusion science.

Course Pre-Requisites / Co-Requisites
PHY 2049 and ENU 4001 or instructor permission.

Course Objectives
1. Provide students with an understanding of the fundamentals of fusion energy science.
2. Give a broad introductory account of the basic principles of plasma physics
3. Demonstrate how fundamental concepts in plasma science are used to constrain the design concepts of fusion reactors

Relation to Program Outcomes (ABET):
N/A – elective course

Required Textbook
- Introduction to Plasma Physics and Controlled Fusion
- Francis F. Chen
- 3rd Edition
- ISBN 978-3-319-22308-7

Recommended Textbook
- Plasma Physics and Fusion Energy
- Jeffrey Freidberg
- ISBN 978-0-521-73317-5

Recommended Materials
- NRL Plasma Formulary
- U.S. Naval Research Laboratory
- A pdf can be downloaded at: https://www.nrl.navy.mil/ppd/content/nrl-plasma-formulary

Required Computer
UF student computing requirement: *https://news.it.ufl.edu/education/student-computing-requirements-for-uf/*

Course Schedule

Week 1: Light element fusion reactions and fundamentals of fusion power	
Week 2: Cross sections, mean-free-path and the fusion reactivity integral	
Week 3: Coulomb collisions and Bremsstrahlung radiation	
Week 4: Power balance and ignition criteria	HW 1
Week 5: Approaches to fusion energy	
Week 6: Debye Shielding and plasma fundamentals	HW 2 Exam 1
Week 7: Charged particle motion (1)	Project
Week 8: Charged particle motion (2)	
Week 9: Plasmas as fluids (1)	HW 3
Week 10: Spring break	
Week 11: Magnetohydrodynamic equilibrium	HW 4 Exam 2
Week 12: Waves in plasmas (1)	
Week 13: Waves in plasmas (2)	HW 5
Week 14: Fluid instabilities (1)	
Week 15: Fluid instabilities (2)	HW 6 Exam 3

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is encouraged but not required. Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

For most excused absences, HW deadlines will be extended. For prolonged absence, when HW solutions are released prior to your return, the HW missed may be taken as excused with the weight of other homework increased to preserve the total fraction of the grade allocated to HW.

Makeup exams will be offered for the same reasons as all other excused absences. Personal conflict with instructor-proposed makeup timings will not generally be honored.

Evaluation of Grades

Assignment	Percentage of Final Grade
Homework Sets	30%
Project	10%
Exam 1	20%
Exam 2	20%
Exam 3	20%
	100%

Homework:

Homework assignments will be posted on Canvas. Homework should be submitted electronically via the Canvas website only. The lowest homework score will be dropped. Students may work in groups, though each student should submit their own homework assignment. Late homework assignments will be penalized by 20% per day until solutions are posted.

Project:

One project focused on the first five weeks of material will be assigned. This project will involve the identification of optimal parameters for the design of a fusion device. The project should be submitted electronically via the Canvas website.

Exams:

Three exams will be given during the semester. These exams will be administered during the normal class time. I will provide roughly one week of advance notice.

Grading Policy

Percent	Grade	Grade Points
91 - 100	A	4.00
87 – 90.9	A-	3.67
82 - 86.9	B+	3.33
78 - 81.9	B	3.00
74 - 77.9	B-	2.67
69 - 73.9	C+	2.33
65 - 68.9	C	2.00
61 - 64.9	C-	1.67
56 - 60.9	D+	1.33
52 - 55.9	D	1.00
48 - 51.9	D-	0.67
0 - 47.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu