

NUCL 35000: FLUID MECHANICS GRADER POSITION, Fall 2022

An undergraduate grader position is available for 10 hours a week, \$12 per hour. The class size is 33 students. There is no HW grading because it is performed by the McGraw-Hill Connect website.

The duties are:

- 1) office hours (3). HW solutions are available in Connect.
- 2) a recitation once a week.
- 3) grading and proctoring of exams. All exam keys are available.
- 4) maintenance of grades on BrightSpace.

If interested please contact the instructor below. Applicants must have taken Fluid Mechanics and received an A grade.

Instructor: Martin Bertodano, bertodan@purdue.edu

Resources: BrightSpace BoilerCast lectures, etc.
White, Fluid Mechanics, 9e with McGraw-Hill Connect key

Grading: Exams: 60%
Homework: 25%
Attendance: 15%
A+: 95-100, A: 90-94.9, A-: 85-89.9, B: 70-84.9, C: 55-69.9, D: 40-54.9, F: 0-39.9
B, C, D, F are broken in plus-minus ranges of 5 points like A.

Exams: Two 1 hour in class exams and one 2 hour final (with bonus problem). A few quizzes too.

Homework: Homework assignments are listed in the schedule at the end of this document. They MUST be completed in [McGraw-Hill Connect](#) (best grade from several trials chosen). Due dates are listed with 10% daily penalty thereafter; lateness may be excused for acceptable reasons. *Homework handed outside of class will not be graded.* No homework are dropped in the final grade.

Be extremely critical of your own work!! You are responsible for making certain that your results are correct. You can achieve this by using the tests of “reasonableness”, checking by another method or against previous results, and/or consulting with other students, the grader, or the instructor.

When a homework dispute arises please discuss it with the grader first.

Attendance: TBA

Course Description:

The first of an integrated two-course sequence introducing the concepts of nuclear reactor thermal transport and associated hydraulics with applications to design and safety. Control volume and macroscopic balances, dimensional analysis, and flow measurement. Fluid behavior, momentum transfer, and applications to reactor systems and design.

Prerequisite: NUCL 273 **Classification:** Required

Learning Outcomes:

- a. Understand basic fluid mechanics principle, practices, design and applications in different systems.
- b. Develop qualitative and quantitative analysis of engineering principles and their application to reactor fluid transport systems.
- c. Formulate and solve design problems through exercise in analysis and in a group design project
- d. Formulate and solve typical problems in fluid mechanics to reactors systems.
- e. Communicate on fluid flow systems as applied to nuclear power plants
- f. Understand overall impact of this discipline to society.

Schedule: Next page.

Class	Date	Text sections	Remarks	HW due
1	22-Aug		Introduction to Fluid Dynamics	
2	24-Aug	1-1 to 1-6	Introduction	
3	26-Aug		Fundamental concepts	
4	29-Aug	1-7 to 1-11	Fluid motion, viscosity	Set 1
5	31-Aug	2-1 to 2-4	Hydrostatics and manometry	
6	2-Sep	2.5 to 2-10	Force on submerged surfaces	
7	7-Sep	3-1 to 3-2	Basic laws for a system	Set 2
8	9-Sep	3-3	Conservation of mass	
9	12-Sep	3-4	Momentum equation for inertial control volume	Set 3
10	14-Sep	3-5 to 3-6	Rectilinear acceleration case and angular momentum	
11	16-Sep	3-7	Control volume energy balance	
12	19-Sep	4-1 to 4-2	Differential mass conservation	Set 4
13	21-Sep	4-3	Differential momentum conservation	
14	23-Sep	4-6	Boundary conditions	
15	26-Sep	4-7 to 4-9	Euler's equations	Set 5
16	28-Sep		Review	
17	30-Sep		Exam 1	
18	3-Oct	4-10	Viscosity	Set 6
19	5-Oct	5-1 to 5-3	Dimensional analysis	
20	7-Oct	5-4	Non-dimensional equations	
21	12-Oct	5-5	Flow similarity and scaling	Set 7
22	14-Oct	6-1 to 6-3	Internal laminar flow	
23	17-Oct	6-4	Laminar pipe flow	Set 8
24	19-Oct	6-5 to 6-6	Turbulent flow	
25	21-Oct		Turbulent flow	
26	24-Oct	6-7 to 6-8	Solution of pipe flow problem	Set 9
27	26-Oct		Review	
28	28-Oct		Exam 2	
29	31-Oct	6-9	Minor losses	Set 10
30	2-Nov	6-12	Flow measurement	
31	4-Nov	7-1 to 7-2	Fluid drag	
32	7-Nov	7-3 to 7-4	Boundary layer introduction	Set 11
33	9-Nov	9-1 to 9-2	Review of thermodynamics and propagation of sound waves	
34	11-Nov	9-3 to 9-4	Isentropic flow	
35	14-Nov		Isentropic flow	Set 12
36	16-Nov	9-5 to 9-6	Shock waves	
37	18-Nov	9-7	Flow with friction	
38	21-Nov		Introduction to two-phase flow (1)	Set 13
39	28-Nov		Introduction to two-phase flow (2)	
42	30-Nov		Introduction to two-phase flow (3)	
43	2-Dec		Introduction to two-phase flow (4)	
44	5-Dec		Introduction to two-phase flow (5)	
45	7-Dec		Review	
46	9-Dec		Review	