

NPRE412: Nuclear Power Economics and Fuel Management

University of Illinois, Urbana-Champaign

Fall 2017

Instructor: Prof. Kathryn Huff

Time: MWF 10:00am– 10:50am

Email: kdhuff@illinois.edu

Place: 106B1 Engineering Hall

Course Pages:

1. <https://compass2g.illinois.edu>
2. <https://github.com/katyhuff/NPRE412>

TA Office Hours: The teaching assistant for the course, Greg Westphal, will hold office hours Mondays and Tuesdays from 2pm to 3pm in 220 Talbot Laboratory (student lounge).

Office Hours: Prof. Huff will hold office hours on Tuesdays and Fridays from 3pm-COB in her office, 118 Talbot Laboratory at 104 S. Wright St. If you have a private issue requiring confidentiality, please make an appointment at <https://katyhuff.youcanbook.me>. If your colleagues might be helpful, please work directly with them rather than attending office hours.

Main References: A few essential references for this course will be assigned as readings. The recommended text for this course is [1].

- [1] Nicholas Tsoulfanidis. *The Nuclear Fuel Cycle*. American Nuclear Society, La Grange Park, Illinois, USA, 2013. 00177. [1](#)

Objectives: This course will equip students to:

- Quantify impacts of the nuclear power industry
- Calculate nuclear fuel cycle and capital costs for thermal and fast reactors.
- Optimize nuclear fuel management for lowest energy costs and highest system performance.
- Differentiate among features of fossil fuel systems, fission systems, and controlled thermonuclear fusion systems.
- Quantitatively analyze nuclear fuel cycle technologies for both once-through and closed strategies.
- Comparatively assess spent fuel storage, reprocessing, and disposal strategies.

Prerequisites:

- Junior standing is required.
- NPRE 402 or 247

Grading Policy: Grades will be assigned as a weighted sum of the following work.

Work	Weight (Undergraduate)	Weight (Graduate)
Quizzes	(20%)	(0%)
Homework	(40%)	(40%)
Midterm 1	(10%)	(10%)
Midterm 2	(10%)	(10%)
Final Exam	(20%)	(20%)
Final Proj.	(0%)	(20%)
Total	(100%)	(100%)

Important Dates:

Midterm #1 10:00-10:50am, October 3, 2017
 Midterm #2 10:00-10:50am, November 7, 2017
 Final Exam 1:30-4:30pm, December 14, 2017

Class Policies:

Integrity: This is an institution of higher learning. You will be swiftly ejected from the course if you are caught undermining its integrity. Note the [Student's Quick Reference Guide to Academic Integrity](#) and the [Academic Integrity Policy and Procedure](#).

Attendance: Regular attendance is mandatory. Request approval for absence for extenuating circumstances prior to absence.

Electronics: Active participation is essential and expected. Accordingly, students must turn off all electronic devices (laptop, tablets, cellphones, etc.) during class. Exceptions may be granted for laptops if engaging in computational exercises or taking notes.

Collaboration: Collaboratively reviewing course materials and studying for exams with fellow students can be enriching. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one's own independent work.

Late Work: Late work has a halflife of 1 hour. That is, adjusted for lateness, your grade $G(t)$ is a decaying percentage of the raw grade G_0 . An assignment turned in t hours late will receive a grade according to the following relation:

$$G(t) = G_0 e^{-\lambda t}$$

where

$G(t)$ = grade adjusted for lateness

G_0 = raw grade

$\lambda = \frac{\ln(2)}{t_{\frac{1}{2}}} = \text{decay constant}$

t = time elapsed since due [hours]

$t_{1/2} = 1 = \text{half-life [hours]}$

Make-up Work: There will be no negotiation about late work except in the case of absence documented by an absence letter from the Dean of Students. The university policy for requesting such a letter is in [the Student Code](#). Please note that such a letter is appropriate for many types of conflicts, but that religious conflicts require special early handling. In accordance with university policy, students seeking an excused absence for religious reasons should complete the Request for Accommodation for Religious Observances Form, which can be found on the Office of the Dean of Students website. The student should submit this form to the instructor and the Office of the Dean of Students by the end of the second week of the course to which it applies.

Accessibility: I hope that this course will be inclusive and accommodating for all learners. As such, I am committed upholding the vision and values of [Inclusive Illinois](#) in my classroom. With regard to accommodating all learners, please note that many resources are provided through [the Division of Disability Resources and Educational Services](#). To request particular accommodations, please contact me as soon as possible so that we can work out any necessary arrangements.

Other Resources: University students typically experience a wide range of stressors during their time on campus. Accordingly, campus resources exist to help students manage stress levels, mental health, physical health, and emergencies while navigating this environment. I hope you will take advantage of these campus resources as soon as they can be of help.

- [The Campus Recreational Centers](#)
- [The Counselling Center](#)
- [The McKinley Mental Health Clinic](#)
- [The Emergency Dean](#)

Course Schedule: *Note that this schedule is subject to change*

Date	Week	Day	Unit	Chap.	Quiz	HW Given	HW Due
08-28	1	M	Intro	1			
08-30	1	W	Overview	1			
09-01	1	F	Overview	1		HW1	
09-04	2	M	• No Class •	8	Q1		
09-06	2	W	Economics	8			
09-08	2	F	Economics	8		HW2	HW1
09-11	3	M	Economics	8	Q2		
09-13	3	W	Economics	8			
09-15	3	F	Economics	8		HW3	HW2
09-18	4	M	Mining & Milling	2	Q3		
09-20	4	W	Mining & Milling	2			
09-22	4	F	Conversion	3		HW4	HW3
09-25	5	M	Enrichment	3	Q4		
09-27	5	W	Enrichment	3			
09-29	5	F	Enrichment	3		HW5	HW4
10-02	6	M	Fuel Fabrication	4	Q5		
10-04	6	W	Fuel Fabrication	4			
10-06	6	F	Fuel Fabrication	4		HW6	HW5
10-09	7	M	• Midterm •		Q6		
10-11	7	W	Reactors	5			
10-13	7	F	Reactors	5		HW7	HW6
10-16	8	M	Reactors	5	Q7		
10-18	8	W	Fuel In-Core	6			
10-20	8	F	Fuel In-Core	6		HW8	HW7
10-23	9	M	Fuel In-Core	6	Q8		
10-25	9	W	Reprocessing	7			
10-27	9	F	Reprocessing	7		HW9	HW8
10-30	10	M	Reprocessing	7	Q9		
11-01	10	W	Reprocessing	7			
11-03	10	F	HLW	9		HW10	HW9
11-06	11	M	HLW	9	Q10		
11-08	11	W	HLW	9			
11-10	11	F	HLW	9		HW11	HW10
11-13	12	M	• Midterm •		Q11		
11-15	12	W	HLW	9			
11-17	12	F	HLW	9		HW12	HW11
11-20	13	M	• No Class •				
11-22	13	W	• No Class •				
11-24	13	F	• No Class •				
11-27	14	M	LLW	10	Q12		
11-29	14	W	LLW	10			
12-01	14	F	Nonproliferation	11		HW13	HW12
12-04	15	M	Environment	12	Q13		
12-06	15	W	Environment	12			
12-08	15	F	Environment	12			HW13
12-11	16	M	Environment	12			
12-13	16	W	Review				
12-15	16	F	• No Class •				
12-18	17	M	• No Class •				
12-20	17	W	• Final Exam •				