NE585
NUCLEAR FUEL CYCLES
Introduction to the course
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What is this course about?

What is nuclear engineering?

What kind of work is done?

NE585 sets the table for success in the nuclear engineering department at the University of Idaho

The course is research driven and focused on developing *transferable skills*

Research is a higher level of learning

Social media and online content

Twitter
@TheDoctorRAB

GitHub
TheDoctorRAB

What to get out of the course

Understanding nuclear engineering problems

Developing skills to solve them – scientific computing, critical thinking, MCNP, writing

You're adults. You get what you put in

Workload

Three credit course

How much time will you put in (average) each week?

Assignments usually require outside research

Collaboration is encouraged because that is what happens in the real world

Everyone hands in their own assignments though

Email homework as pdf to *gmail address* with NE585 in the subject title

Textbook suggestions

Introduction to nuclear engineering, John R. Lamarsh, ISBN 0-201-14200-7 (1983)

Fundamentals of nuclear science and engineering, J. Kenneth Shultis, Richard E. Faw, ISBN 0-8247-0834-2 (2002)

Nuclear chemical engineering, M. Benedict, T. H. Pigford, H. W. Levi, ISBN 0-07-004531-3 (1981)

NE585 is based on Lamarsh

Any edition is ok – try not to spend too much

Other textbooks are just for additional reference

No specific reading assignments but it's expected you're reasonably prepared for each class period

Pedagogical approach

Context based learning

That means ‘student-driven’

Talking at you isn’t the best use of our time

Homework presentations for each class

Regular participation is expected

Class management

Piazza will contain all the course materials

We also use this for discussion outside of class

Still trying to convert to Canvas

This is a very good platform for a nontraditional student body

Don’t email class questions

Someone else might have the same question

Someone else might have a better answer than me

MCNP

MCNP is a WIDELY used computational tool in nuclear engineering for literally anything you can think of

Our goal is to gain facility

Many many many students who have learned it in NE585 have leveraged that for internships

It's free, but export controlled

Please go to RSICC and request MCNP6.2

You need to register for an account, and they use that for your license

DOE or INL may be different

Prerequisites

Assumed you've had most engineering courses (linear algebra, statics, etc.)

I am not teaching these subjects

Differential equations - just Laplace transform and standard models

Learn a real graphing program – **NO EXCEL GRAPHS**

VLab has some software

Or use my python routine on my github

Math is going to be done

Being able to describe phenomena with math is important skill in research.

Learning modules

(1) Fundamental nuclear physics

(2) Interaction of radiation with matter

(3) Nuclear fuel cycle analysis

(4) **Nuclear reactor theory**

(5) **Monte Carlo methods and MCNP**

The challenge is when/how to kick off MCNP

Aristotle also had something to say about engineering education

Techne
Human skill based on a set of principles derived from practices and capable of being taught

Epistme
Knowledge, which consists of knowing why or knowing that

Praxis
The end of which is realized in the very doing of the activity

Phronesis
Practical wisdom