**Introduction to Nuclear Engineering**

**NE 3301**

**(3 credit hours – 2 hours lecture + 2 hours lab)**

**College of Engineering**

**The University of Texas at Arlington**

**Arlington, Texas**

**Fall 2016**

Tuesday and Thursday from 2:00 p.m. to 2:50 p.m.

**Instructor:** Rasool Kenarangui, Ph.D., P.E.

**OFFICE:** 531 Nedderman Hall

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**INSTRUCTOR WEB SITE:** www-ee.uta.edu/online/Kenarangui

**COURSE WEB SITE:** www-ee.uta.edu/online/Kenarangui

**Phone:**  (817)-272-3423

**Office Hours:** Open door Policy

**Graduate Teaching Assistants:**

email:

**Required Texts:**

**Fundamentals of Nuclear Science and Engineering**, J.Kenneth Shultis and Richard E. Faw,

2nd Edition, CRC Press / Taylor & Francis, 2008, ISBN 13: 978-1-4200-5135-3.

**CATALOG COURSE DESCRIPTION**

**NE 3301. Introduction to Nuclear Engineering (3 credit hours, 2 lecture + 2 hours lab)**

Catalog description: Fundamentals of radiation, radiation decay, binding energy, nuclear reactions, radiation interactions , shielding, radiation detections and measurement of radiation, applications of nuclear science and engineering such as principles of nuclear reactors, reactor generations I, II, III, IV, fusion reactor, biological effect of radiation, radiation therapy, food irradiation , radionuclide production, radiopharmaceuticals, principles of positron emission tomography (PET).

Prerequisite: Math 3319 (differential equations / linear algebra) or MAE 3360, Phys 1444 (general technical physics II)

### COURSE LEARNING GOALS/OBJECTIVES

The course objectives for NE 3301 Introduction to Nuclear Engineering are the following:

* To introduce the students to the fundamental principles of nuclear engineering. These topics include atomic and nuclear physics, fission and fusion, isotopes and radioactivity, nuclear reactions, chart of nuclides, radiations; detection and interaction with matter.
* Introduction to criticality and reactor kinetics, reactor licensing, safety, economic and environment impact.
* In addition to light water reactors the CANDU, Gas Cooled Reactors, Liquid Metal Fast Breeder and fusion reactors design will be introduced.
* Discussion of lesson learned from Three Mile Island and Chenobyl accidents.
* Introducing discussion of Generation II (current) and Generation III, IV (future nuclear) nuclear power plants.
* Discussion of fuel loading, coolant, loss of coolant, severe accidents, reprocessing, spent fuel management and storage.
* Use radiation detection instruments, detection limits, and uncertainty analysis on measurements.
* Visiting of Nuclear power plant
* Invited guest speaker from nuclear industry

**ATTENDANCE AND DROP POLICY**

• Attendance at each class is fully expected in order to achieve satisfactory and timely progress.

• Excessive absences will be noted and the student contacted for an explanation.

• The drop policy for this course is in accordance with University and Department rules and regulations. It is the student's responsibility to be familiar with these policies.

**Specific Procedures:**

**Homework:**

There will be about ten sets of homework fifteen points (15).

**Exams:**

There will be two (2) midterm exams and a final for this course. Each midterm exam will be worth twenty-five (25) points and will cover the most recent material. The final exam will be comprehensive and will worth twenty (20) points.

All exams are closed book and closed notes. The formula sheet will be provided. You must work alone on all exams. Calculators may be used during exams, but all programmable calculators must be cleared of all programs and/or data before entering the examination room. Discussion and/or communication with anyone, except the instructor, during an exam is forbidden. Any student who willingly provides information to another student during a quiz or exam is as guilty as the student that receives the information.

**Laboratory**

The course has two (2) hours of lab per week and it is expected to have thirteen (13) experiments directly related course materials. The laboratory part will count twenty (20) points.

**Course Grading:**

HW 10 Points

Lab 20

Exam I 25

Exam II 25

Final 20

Course Total 100 Points

**Grade Basis:**

Student Course Average Final Letter Grade

90 - 100 **A**

80 - 90 **B**

70 - 80 **C**

60 - 70 **D**

< 60 **F**

**Course Policies:**

**Missed examinations**

There will be no makeup of missed examinations. In emergency situations (death in family, etc.), if the instructor has been petitioned in writing, and if the instructor agrees another exam may be given.

**Academic Dishonesty**

Evidence of academic dishonesty will be dealt with severely. Copying homework or examinations will result in administrative dismissal from the course. The grade recorded will be F.

# Tentative Schedule, NE 3301 Sec 001 Fall 2016

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Class No.** | **Date** | **Day** | **Lecture, Exams, Etc.\*** | **HW Problems** |
| 1 | 8/25 | Thursday | **Course and Syllabus description,** |  |
| 2 | 8/29 | Tuesday | Chap 1 – Fundamental Concept |  |
| 3 | 9/1 | Thursday | **Chap 1 – Fundamental Concept** |  |
| 4 | 9/06 | Tuesday | Chap4 – Nuclear Energetics | HW # 1 Chap 1 |
| 5 | 9/08 | Thursday | Chap4 – Nuclear Energetics |  |
| 6 | 9/13 | Tuesday | Chap 5 – Radioactivity | HW # 2 Chap4 |
| 7 | 9/15 | Thursday | **Chap 5 – Radioactivity** |  |
| 8 | 9/20 | Tuesday | Chap 5 – Radioactivity |  |
| 9 | 9/22 | Thursday | **Midterm 1** |  |
| 10 | 9/27 | Tuesday | Chap 6 – Binary Nuclear Reactions | HW # 3 Chap 5 |
| 11 | 9/29 | Thursday | Chap 6 – Binary Nuclear Reactions |  |
| 12 | 10/04 | Tuesday | Chap 6 – Binary Nuclear Reactions |  |
| 13 | 10/06 | Thursday | **Chap 7 – Radiation Interactions with matter** | HW # 4 Chap 6 |
| 14 | 10/11 | Tuesday | **Chap 7 – Radiation Interactions with matter** |  |
| 15 | 10/13 | Thursday | **Chap 8 – Detection and Measurement of Radiation** | HW # 5 Chap 7 |
| 16 | 10/16 | Tuesday | **Chap 8 – Detection and Measurement of Radiation** |  |
| 17 | 10/20 | Thursday | **Chap 8 – Detection and Measurement of Radiation** |  |
| 18 | 10/25 | Tuesday | **Chap 9 – Radiation Does and Hazard Assessment** | HW # 6 Chap 8 |
| 19 | 10/27 | Thursday | Chap 9 – Radiation Does and Hazard Assessment |  |
| 20 | 11/01 | Tuesday | Chap 10 – Principle of nuclear Reactors | HW # 7 Chap 9 |
| 21 | 11/03 | Thursday | Chap 10 – Principle of nuclear Reactors |  |
| 22 | 11/08 | Tuesday | Chap 10 – Principle of nuclear Reactors |  |
| 23 | 11/10 | Thursday | Chap 10 – Principle of nuclear Reactors |  |
| 24 | 11/15 | Tuesday | Midterm 2 | HW # 8 Chap 10 |
| 25 | 11/17 | Thursday | Chap 11 – Nuclear Power |  |
| 26 | 11/22 | Tuesday | Chap 11 – Nuclear Power |  |
| 27 | 11/24 | Thursday | Thanksgiving Holidays |  |
| 28 | 11/29 | Tuesday | Chap 12 – Fusion Reactors and Other Conversion Devices Chap | HW # 9 Chap 11 |
| 29 | 12/01 | Thursday | Chap 12 – Fusion Reactors and Other Conversion Devices Chap |  |
| 30 | 12/06 | Tuesday | Review for Final | HW # 10 Chap 12 |
| 31 |  |  | Final As Scheduled by the University |  |

\* Homework will be assigned on Tuesday and will be due to the following Tuesday at the beginning of class. Revised 08/26/2016