Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
  • Submit original form and attach a course syllabus.

1. This form is for:
   Department of Nuclear Engineering

2. Course prefix, number and complete title of course: NUEN 651 Nuclear Fuel Cycles and Nuclear Material Safeguards

3. Course description (not to exceed 50 words): Study of civilian and military nuclear fuel cycles and application of nuclear material safeguards to secure these cycles; topics include the physics of the fundamental fuel cycle components; the application of nuclear material measurements systems; and the technical and legal basis for material protection, control and accounting systems

4. Prerequisite(s):
   NUEN 601 or Equivalent

   Cross-listed with:

   Cross-listed courses require the signature of both department heads.

5. Is this a variable credit course? ☑ Yes ☐ No If yes, from _______ to _______

6. Is this a repeatable course? ☐ Yes ☑ No If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester? ☐ Yes ☑ No

7. Has this course been taught as a 489/689? ☑ Yes ☐ No If yes, how many times? 2
   Indicate the number of students enrolled for each academic period it was taught. Spring 07(12), Spring 2008(5)

8. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   M.S. in Nuclear Engineering

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments.
   Attach approval letters.

10. Prefix | Course # | Title (excluding punctuation)
    NUEN 651 | FUEL CYCLES & MATLS SAF & RDS

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Approval recommended by: [Signature] 11/25/08

Head of Department Date

Chair, College Review Committee Date

Dean of College Date

Dean of College [Signature] 12/14/08

Submitted to Coordinating Board by:

Associate Director, Curricular Services Date

Questions regarding this form should be directed to Sandra Williams at 845.8201 or sandra.williams@tamu.edu
Curricular Services – 10/08
Course title and Number: NUEN 651 – Nuclear Fuel Cycles and Nuclear Material Safeguard
Term (e.g., Fall 200X): Spring 2010
Meeting times and location:

Course Description and Prerequisites

A description of the civilian and military nuclear fuel cycles is given including the physics of the fundamental components of the fuel cycle (including enrichment, fuel fabrication, reactors, and reprocessing). The student learns methods for analysis of these cycles. Topics include the nuclear fuel resources, mining, and metallurgy; enrichment and conversion; reactor fuel design and fabrication; in-core fuel management; reprocessing and recycling; fuel cycle economics and analysis; heavy water and tritium production; and high level waste management. The course also details the fundamentals of nuclear material safeguards. This includes material protection, control, and accounting practices and the IAEA system of safeguards. The course also covers statistics applied to safeguards; the additional protocol; strengthened and integrated safeguards; environmental sampling; remote monitoring; application of NDA and DA to safeguards; and application of measurement techniques to reactors, fuel fabrication facilities, reprocessing plants, enrichment plants, and critical assemblies.

Learning Outcomes or Course Objectives

The primary goal of this course is to educate the student in the fundamentals of nuclear fuel cycles and nuclear material safeguards and how to design and analyze these. After completing this course, the student will be able to:
1. Describe all of the steps in military and civilian nuclear fuel cycles.
2. Perform engineering calculations to assess major elements of a fuel cycle.
3. Describe the fundamentals of how nuclear material safeguards are implemented to secure nuclear material from theft and diversion.
5. Assess the effectiveness of safeguards systems.
6. Design a safeguards system for implementation in a fuel cycle facility.
7. Use quantitative and qualitative assessment techniques to provide estimates of data reliability.

Instructor Information

Name: William Charlton
Telephone Number: 979/845-7092
Email address: wcharlton@tamu.edu
Office Hours: TR 9:00-10:00 or by appointment
Office Location: TEAGUE 322A

Name: David Boyle
Telephone Number: 979/862-8037
Email address: wcharlton@tamu.edu
Office Hours: MW 3:00-4:00, or by appointment
Office Location: TEAGUE 324A
Textbook and/or Resource Materials

Lecture Notes
The primary reference for this course is a set of lecture notes which will be provided in electronic format to the students via the university’s WebCT system. The students should print these notes and bring them to class for each lecture session. The lecture notes provided to the students will include blank spaces which will need to be filled in by the students during the lecture.

Required Text
The following textbook is required for this class:

This text is available for purchase online at http://www.ans.org/store/vi-350015. Readings for the lectures will be assigned from this text as well as selected problem sets.

Electronic Documents
Several electronic resources will also be used for course readings. The majority of these can be found on the open web and will be provided via download from WebCT. The following electronic documents will be provided to the student:
6. ITN

Grading Policies
The student’s grade will be determined based on the following percentages:
   40% - Homework
   30% - Mid-Term Exam
   30% - Final Exam

The grades will be determined on the following scale:
A - 90.00-100.00
B - 80.00-89.99
C - 70.00-79.99
D - 60.00-69.99
F - 0.00-59.99

Late Policy
Late homework may be submitted late but will be deducted 10% per day after the due date.

Course Topics, Calendar of Activities, Major Assignment Dates

Other Pertinent Course Information

Homework
Homework assignments will consist of short problem sets (generally 4-6 problems each assignment). These assignments are intended to exercise the student's understanding of both lecture and reading material. Homework will be assigned approximately every week and will be due according to the schedule at the end of this syllabus.

Each Homework submitted should (1) give the assignment number, (2) use only the front side of each page, (3) provide a brief problem statement, (4) be neat and legible and present work logically to allow the reader to follow the solution progression, (5) provide units for solutions where applicable, and (6) be stapled together.

Mid-Term Examination
A written mid-term examination will be conducted according to the schedule below. This exam will be an in-class, closed-book, closed-notes exam and will cover all matter covered up to the date of the exam.

Final Examination
A final examination for the class will be scheduled according to the approved University Final Examination Schedule. This exam will be comprehensive and cover all information discussed in lectures, readings, and homework. A review sheet will be provided to the student to aid in studying for this exam.

Online Course Material
An electronic copy of this syllabus, the course schedule, all lecture notes, data tables, supplemental readings, and homework assignments will be available to the student through the University’s WebCT system.

The instructor will use the WebCT email system and discussion boards to communicate important messages to the students. Students should check their email often to keep updated on current messages. Also, the student's grades will be posted on the WebCT system, and the students can use this system to check their grades at any time.

The WebCT system can be accessed through elearning.tamu.edu. If you are unfamiliar with this system, please ask the instructor for help or consult the Information Technology Services staff by emailing them at its@tamu.edu.

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Academic Integrity
For additional information please visit: http://www.tamu.edu/aggiehonor

"An Aggie does not lie, cheat, or steal, or tolerate those who do."