PHYS4343 Modern Physics II

Department: Mathematics, Physics and Engineering
Credit Hours: 3

Required or Elective (circle one)

Current Catalog Description:
The constitution of the atomic nucleus; natural radioactivity; artificially induced nuclear transmutations; alpha, beta, and gamma decay; nuclear reactions; nuclear structure and nuclear forces; nuclear fission; neutron physics. Prerequisites:

Course Schedule:
3 lecture hr/wk, 0 lab hr/wk

Textbook(s):
Modern Physics, 2nd Edition, by Serway, Moses, Moyer
Saunders College Publishing, ISBN: 0-03-001547-2

Coordinator:
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Course Web Page: N/A

Prerequisites by Topic:
PHYS3343 – Modern Physics I
MATH3063 – Differential Equations (co-requisite)

Program Outcome and Course Learning Goals Map:
The Program Outcomes for Engineering Physics are:

A. an ability to apply knowledge of math, engineering & science
B. an ability to design and conduct experiments, as well as to analyze and interpret data
C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
D. an ability to function on multi-disciplinary teams
E. an ability to identify, formulate, and solve engineering problems
F. an understanding of professional and ethical responsibility
G. an ability to communicate effectively
H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
I. a recognition of need for, and ability to engage in life-long learning
J. a knowledge of contemporary issues
K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

Course Goals Upon completion of this course with a C or better, students will	**Program Outcome(s):**
1. be able to apply the rigid rotator model and the quantum concept of angular momentum to calculate energy levels of rotational spectra.	A, L
2. be able to apply the quantum harmonic oscillator model to calculate energy levels of vibrational spectra.	A, L
3. be able to use quantum concepts including energy levels, wave function, and the Pauli exclusion principle to explain qualitatively how energy bands can develop in a quantum system.	A, L
4. be able to apply simple models including the Drude and Konig-Penny models to describe the electrical properties of materials.	A, L
5. be able to explain the differences between paramagnetism, diamagnetism, and ferromagnetism and solve problems using models of magnetism like Curie's law.	A, G, L
6. be able to explain qualitatively the meaning of terms and models used in studying superconductivity including critical temperature, Meissner effect, BCS theory, and Cooper pairs.	A, G, L
7. be able to describe Geiger and Marsden's experimental setup and how their results suggest the existence of the nucleus.	A, G, L
8. be able to describe basic properties of various nuclei including size, nucleon density, magnetic moment, etc.	
9. be able to apply nuclear models including liquid drop, Fermi gas, and shell model to solve problems including calculation of binding energy and nuclear stability.	A, L
10. be able to apply energy level diagrams to solve problems involving alpha, gamma, and isobaric decay.	A, L
11. be able to apply energy diagrams and nuclear reaction models to make simple nuclear reaction calculations including determining Q-values, threshold energies, and resonance energies.	A, L
12. be able to describe the application of various nuclear physics based techniques to other areas of human endeavors including manufacturing, medicine, art, etc.	A, H, L
13. be able to explain what is meant by the terms spontaneous emission, spontaneous absorption and stimulated emission.	A,L
14. be able to describe the various components of a laser system and the advantages and disadvantages of 2-level, 3-level, and 4-level laser systems.	A, L
15. Be able to use Einstein's energy relationship for photons and energy diagrams to determine solve laser problems including the wavelength required for optical pumping and the laser's output wavelength.	A, L

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure of give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of

Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:
Math/Science Topics: 100%

Status of Continuous Improvement Review of this Course:
Prepared by: Daniel K. Marble
Date: 3/12/2008

Reviewed by: Jim McCoy
Date: 3/26/2008