



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE OUTLINE W2017

1. **Course:** Physics 561, Stable and Radioactive Isotope Fundamentals

Instructor: Dr. Ann-Lise Norman | SB 133 | 403.220.5405 | alnorman@ucalgary.ca | Office Hours: TBA
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Lecture Sections: L01: TR, 15:30 – 16:45, SA 125

Course Website: d2l.ucalgary.ca

Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

2. **Prerequisites:** consent of the department

3. **Grading:** The University policy on grading and related matters is described sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments (3)	30%
Independent Study Project	15%
Presentation	5%
Midterm tests (2)	50% (February 16, March 30, 2017)

Percentage to letter grade conversion scale:

>= 95 %	A +	>= 78 %	B +	>= 65 %	C +	>= 50 %	D +
>= 88 %	A	>= 74 %	B	>= 60 %	C	>= 45 %	D
>= 83 %	A -	>= 69 %	B -	>= 55 %	C -	< 45 %	F

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar
5. **Scheduled out-of-class activities:** Out of class activities that are not scheduled by the registrar may be chosen by the student. Students can choose to either do a lab/field based project or a literature review. Field and/or lab activities take place outside of class time and are based on the student's availability and are expected to include approximately one hour per week.
6. **Course Materials:** Relevant course material will be distributed to the class and/or posted on D2L. There is no textbook for this course.
7. **Examination Policy:** Midterm exams are closed book but calculators are allowed. Students should also read the Calendar, [Section G](#), on Examinations.
8. **Course fees:** none
9. **Writing across the curriculum:** In this course, the quality of the student's writing in laboratory reports will be a factor

in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

10. **Human studies statement:** Students in this course are not expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar.

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.

(b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).

(c) **Academic Accommodation Policy:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics and Astronomy, Dr. David Feder, by email (dfeder@ucalgary.ca) or by phone (403.220.3638).

(d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.

(f) **Student Union Information:** [VP Academic](#) Phone: 220-3911 Email: suvpaca@ucalgary.ca.
SU Faculty Rep: Phone: 220-3913
Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca
Student Ombuds Office: 403 220-6420
Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>

(g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

12. OTHER COURSE RELATED INFORMATION:

(a) Course Description

This course will provide an overview of nuclear physics with an emphasis on isotope formation, stable and radioactive isotope fractionation and the application of radioactive and stable isotope techniques. The

purpose of the course is to give an overview of fundamental physical processes governing the abundance of isotopes.

(b) Course Learning Outcomes

Course outcomes for Phys 561:

- Understand and apply nuclear concepts to relate nuclide properties to macroscopic observations such as abundance and stability of the isotopes.
- Explain how quantum properties of atoms can result in measurable macroscopic properties of matter.
- Select and manipulate appropriate mathematical equations to derive macroscopic isotopic properties from spectroscopic data.
- Evaluate isotopic data and relate this to physical, chemical and/or biological processes or sources. Conceive, propose, carry out and produce a formal report and oral presentation on an independent study project on a topic related to isotope science that may or may not involve field and laboratory work.

(c) Syllabus

TR	15:30 - 16:45	SA 125
Week	Dates	Content
1.	Jan 10-12	Overview, Course Introduction, Outline, Expectations, Marking, Exams, Introduction to Isotopes & Properties of the nucleus
2.	Jan 17–19	Chart of Nuclides, Abundance variations, Nuclear Force & BE, BE/A, SEMF
3.	Jan 24–26	Nuclear Models I, Nuclear Models II, Radioactivity, Decay Chain
4.	Jan31-Feb2	Radioactive Decay, Fission, Okla Reactor, Secular Equilibrium, Disequilibrium
5.	Feb 7-9	Interaction with Matter, Dose, Exposure, Applications of Radioactivity
6.	Feb 14	Nuclear Reactors, Nuclear Waste
7.	Feb 16	Midterm Exam I
8.	Feb 21-23	READING WEEK
9.	Feb 28-Mar 2	Nucleosynthesis I, Nucleosynthesis II
10.	Mar 7-9	MS & Vacuum, Data Corrections, Isotope Fractionation and Spectroscopy
11.	Mar 14-16 R	Rotational, Vibrational, Translational Energy, Partition Functions, Ratios, Equilibrium Fractionation
12.	Mar 21-23	Equilibrium Fractionation, Teller Redlich Theorem, T Dependent Fractionation
13.	Mar 28	Kinetic Isotope Fractionation
14.	Mar 30	Midterm Exam II
15.	Apr 4	USRIs
16.	Apr 6	Student Presentations
17.	Apr 11	Student Presentations

(d) Lab Schedule TBD

(e) Department

Approval _____ Date _____