ORIGINAL COURSE IMPLEMENTATION DATE: September 2010
REVISED COURSE IMPLEMENTATION DATE: January 2021
COURSE TO BE REVIEWED (six years after UEC approval)**:** October 2026
Course outline form version: 05/18/2018

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: PHYS 408	**Number of Credits:** 3 Course credit policy (105)

Course Full Title: Special Topics in Physics
Course Short Title:
(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

Faculty: Faculty of Applied and Technical Studies	**Department (or program if no department):** Physics

Calendar Description:

Covers a topic in physics which is not included within the current course offerings of the department, allowing students to study areas such as astrophysics, atmospheric physics, biophysics, climate physics, geophysics, medical physics, oceanography, quantum field theory, quantum chromodynamics, string theory, photonics, and quantum computing. Interested students should contact the Physics Department Head for more information.

Note: Independent study will be required.
Note: This course will be offered under different letter designations (e.g. C-Z) representing different topics. This course may be repeated for credit provided the letter designation differs.

Prerequisites (or NONE):	6 credits of PHYS 300 or above, and permission of the instructor. Certain programs of study may require more particular prerequisites.
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number:
Cross-listed with:
Dual-listed with:
Equivalent course(s):
(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar hours	30
Tutorials/workshops	
Supervised laboratory hours	
Experiential (field experience, practicum, internship, etc.)	
Student directed learning	
Other: Presentations, seminars, student lectures	15
Total hours	**45**

Labs to be scheduled independent of lecture hours: ☐ No ☐ Yes

Special Topics *(Double-click on boxes to select.)*
This course is offered with different topics:
☐ No ☒ Yes *(If yes, topic will be recorded when offered.)*

Independent Study
If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*
☐ No ☐ Yes, repeat(s) ☒ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☒ No ☐ Yes
Submit outline for (re)articulation:
☒ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System
☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only): 6

Expected Frequency of Course Offerings:
Every 2-3 years as demand warrants *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Norm Taylor	**Date approved:**	October 2019
Faculty Council approval	**Date approved:**	November 1, 2019
Dean/Associate VP: John English	**Date approved:**	November 1, 2019
Campus-Wide Consultation (CWC)	**Date of posting:**	February 21, 2020
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	October 2, 2020

Learning Outcomes:

Upon successful completion of this course, in a branch of physics not currently covered by the department's undergraduate curriculum, students will be able to:

- Solve problems at a level typical of an upper-year physics course in the topic area.
- Identify key sources of information for self-guided study in the area in question i.e. books, journal articles, online resources, etc.
- Deliver effective oral presentations on a course topic.
- Critique the presentations and lectures of other students.
- Prepare a major written document on their selected relevant topic after reviewing the current literature.

Prior Learning Assessment and Recognition (PLAR)

☐ Yes ☒ No, PLAR cannot be awarded for this course because this course requires direct supervision

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion.)*

Directed reading, oral presentations and/or short student lectures, written project, lectures or labs, if appropriate.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials *(If more space is required, download Supplemental Texts and Resource Materials form.)*

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
For PHYS 408D, Astrophysics and PHYS 408E, Quantitative Survey of Astronomy:					
1.	Carroll B. & Ostlie D.	An Introduction to Modern Astrophysics, 2nd ed.	☒	Addison-Wesley	2006
	Other supplemental texts may include:				
2.	Liddle A.	Introduction to Modern Cosmology, 3rd ed.	☒	Wiley	2015
3.	de Pater I. & Lissauer J.	Planetary Sciences, 2nd ed.	☒	Cambridge University	2015
4.	Jones M. ed. et al	Introduction to Galaxies & Cosmology	☒	Cambridge University	2015

The availability of texts and other materials will depend to a great extent on the chosen topic.

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Online resources, such as the Los Alamos pre-print server or the SPIRES or arXiv database.

Typical Evaluation Methods and Weighting

Final exam:	30%	Midterm exam:	15%	Written Project:	25%	Oral Presentations	30%

Details (if necessary):

For PHYS 408D, Astrophysics:

1st lecture/talk by student:	5%
2nd lecture:	10%
3rd lecture:	10%
Participation:	10%
Project (5000+ word paper):	20%
Midterm:	15%
Final exam:	30%

For PHYS 408E, Quantitative Survey of Astronomy:

Project:	20%
Assignments:	10%
Presentations:	20%
Midterm exam:	15%
Final exam:	35%

Typical Course Content and Topics

The main purpose of this class is to allow students to study a branch of physics in which the department currently does not offer a course, possibly in preparation for graduate studies. Examples of such areas may include astrophysics, atmospheric physics, biophysics, climate physics, geophysics, medical physics, oceanography, quantum field theory, quantum chromodynamics, string theory, photonics, and quantum computing. Specific course content will necessarily vary with the subject area, and each separate area will use a different letter attached to the course number.

For PHYS 408D, Astrophysics:

Week 1: Celestial sphere and review of mechanics and EM radiation, i.e. light
Week 2: Instrumentation and observation

Week 3: Observing stars and telescopes
Week 4: Stars #2: measuring stars and the HR diagram
Week 5: Stars #3: stellar structure; student lectures
Week 6: Formation and evolution of stars
Week 7: Variable stars and supernovae
Week 8: Stellar remnants
Week 9: GR and black holes; student lectures
Week 10: Structure and evolution of galaxies and evidence for dark matter
Week 11: Cosmology #1
Week 12: Cosmology #2 and evidence for dark energy
Week 13: Student lectures; optional field trip

For PHYS 408E, Quantitative Survey of Astronomy:
Week 1: Introduction and history: Stone Age to Arabic astronomy
Week 2: History: Renaissance to the 20th century
Week 3: Observing light: different scopes for all wavelengths
Week 4: Gravitation, accretion disks, and making a solar system
Week 5: Terrestrials, Jovians, left-overs, and exoplanets
Week 6: Making a star
Week 7: Life cycles of stars: on the main sequence
Week 8: At the end: blow up, or burn out and fade away
Week 9: Variable stars and their connection to the distance ladder
Week 10: Pulsars, black holes, and other oddities in the stellar menagerie
Week 11: Quasars, SMBHs and galactic evolution
Week 12: Cosmology: the Big Bang and its aftermath
Week 13: Presentations