UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: December 2001
REVISED COURSE IMPLEMENTATION DATE: January 2019
COURSE TO BE REVIEWED: (six years after UEC approval) May 2024
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

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

Course Code and Number: ASTR 104	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Stars, Galaxies, and the Cosmos **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Physics

Calendar Description:

This introductory course focuses on the properties and life cycles of stars and galaxies, as well as modern theories about the origin and evolution of the universe.

Note: The emphasis will be on conceptual development, but some math is required.

Prerequisites (or NONE):	None.
Corequisites (if applicable, or NONE):	None.
Pre/corequisites (if applicable, or NONE):	One of the following: (Principles of Mathematics 11, Pre-Calculus 11, or Math 085) or (C or better in one of Applications of Mathematics 11 or Foundations of Mathematics 11).

Equivalent Courses (cannot be taken for additional credit)

Former course code/number: **PHYS 104**

Cross-listed with:

Equivalent course(s): **PHYS 104**

Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit

Transfer credit already exists: ☒ Yes ☐ No

Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☐ No (if yes, fill in transfer credit form)

Resubmit revised outline for articulation: ☐ Yes ☒ No

To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 75

Typical structure of instructional hours:

Lecture hours	45
Seminars/tutorials/workshops	
Laboratory hours	30
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**75**

Special Topics

Will the course be offered with different topics?
☐ Yes ☒ No

If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit

Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): Every year

Department / Program Head or Director: Jeff Chizma	**Date approved:**	February 2018
Faculty Council approval	**Date approved:**	March 2, 2018
Campus-Wide Consultation (CWC)	**Date of posting:**	April 13, 2018
Dean/Associate VP: Lucy Lee	**Date approved:**	March 2, 2018
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	May 18, 2018

Learning Outcomes

Upon successful completion of this course, students will be able to:

- Describe the structure and contents of the universe and astronomical time-scales.
- Employ the basic laws of physics and chemistry to explain the life cycle of stars and galaxies.
- Compare related phenomena like black holes, quasars, pulsars and active galactic nuclei.
- Discuss some of the latest discoveries in astronomy such as gravitational waves, dark matter and dark energy.
- Describe the stages of the universe since the Big Bang.
- Identify different types of astronomical instruments.
- Write a basic lab report, including organized data tables, graphs, sample calculations, simple error analysis etc.
- Incorporate the experience of labwork into an understanding of the difficulties and ethics required of scientific investigations used to determine scientific truth
- Build a simple Keplerian and a simple Galilean telescope, and understand the ray optics underpinning their operation.
- Investigate the "distance ladder", i.e. estimate astronomical distances using Standard Candles (such as variable stars and supernovae) and Standard Metrics (such as Hubble's Law).
- Discuss the ethical considerations which must be taken into account when humans send spacecraft to other planetary bodies.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes* See Physics PLAR policy on dept. webpage ☐ No, PLAR cannot be awarded for this course because

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

Lecture, demonstration, small group practice, discussion, audiovisual presentation, use of models and charts, and laboratory experiments.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☒ No ☐

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
1.	Fix, John	Astronomy: Journey to the Cosmic Frontier	☒	McGraw-Hill	2011
2.	Freedman R., Geller R. & Kaufmann W.	Universe	☒	Macmillan	2013
3.	OpenStax	Astronomy	☒	Houston, TX	2016
4.			☐		
5.			☐		

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

Calculator, lab manual.

Typical Evaluation Methods and Weighting

Final exam:	45%	Assignments:	10%	Midterm exam:	20%	Practicum:	%
Quizzes/tests:	10%	Lab work:	15%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Week 1 Surveying the heavens
Week 2 Analyzing starlight
Week 3 Double stars
Week 4 The stars, a celestial census
Week 5 Gas and dust in space
Week 6 The Sun, structure
Week 7 The Sun, nuclear powerhouse
Week 8 The birth of stars
Week 9 Star clusters, stellar evolution
Week 10 Evolution and death of stars
Week 11 General Relativity, curved spacetimes
Week 12 The Milky Way
Week 13 Galaxies
Week 14 Structure and evolution of the universe
Week 15 The Big Bang

LABORATORY EXPERIMENTS

Between 6 and 7 labs will be done (two of them require 2 lab periods) depending on whether or not the student has taken Astronomy 103. These experiments will help clarify some of the abstract concepts presented in class. Other lab periods can be used for observation, weather permitting.

0. Introduction & Math Review
1. Inverse Square Law
2. Spectroscopy
3. Mirrors, Lenses, Telescopes and Binoculars
4. Blackbody Radiation and BV Filter Photometry
5. Hertzsprung-Russell Diagram (two lab periods)
6. Distance Ladder and Hubble (two lab periods)
7. The Tully-Fisher Relationship
8. Possible Observation Lab (selected from a list of 20+ procedures)