INQ 250: Astronomy Controversies of the Modern Era F-2024

Instructor: Dr. Truong Le (he/him)
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Credits for the course: 1
Lectures Time: TTH 10:10-11:40 am
Lectures Room: Trexler Hall, 362

Office Hours: MWF (10:00-11:30 am), and by appointment.

Course Description: Introduces the methodologies of the natural sciences through an inquiry-focused approach to a topic. Students will explore the types of questions that science asks and how it attempts to answer them by defining and classifying information, developing models, identifying patterns, and drawing conclusions based upon data (**Credit cannot be received for both HNRS-250 and INQ-250 from the same discipline**).

Class Environment: This classroom is a respectful and inclusive space for everyone, regardless of age, background, belief, or identity. All members are expected to foster a welcoming environment. Let me know early in the course if you prefer an alternate name or pronoun, so I can update my records. Silence your phone during lectures and step outside for emergency calls. Disruptive behavior may lead to expulsion. **The syllabus may be adjusted based on student feedback.**

Course Material: Required and recommended

- **Calculator (required):** A scientific calculator.
- **Text (required):** Astronomy (OpenStax: https://openstax.org/details/books/astronomy) by Andrew Fraknoi, David Morrison, and Sidney Wolff.
- **Text (required):** College Physics (OpenStax:https://openstax.org/details/books/college- physics) by Paul Urone and Roger Hinrichs.

Laboratory: You must be enrolled in the laboratory portion INQ 250L of this course. Although INQ 250L operates as a separate course, it counts as 20% of the course grade for INQ 250. Please refer to the lab course syllabus for important information about the lab specifics and final grade.

Goals & Objectives: All sections of INQ 250 share a common set of learning outcomes related to the skills students will develop in this course. These outcomes are:

- Students will be able to describe and apply scientific methodologies appropriate for the course's discipline and topic, including the ability to design and conduct simple experiments and to draw conclusions based upon data.
- Students will be able to write about course topics clearly and effectively.
- Students will be able to interpret quantitative information related to the course topic.

Our course covers a broad range of topics, primarily focusing on physics and astronomy. We will also incorporate elements of history, philosophy, and mathematics. A set of course-specific secondary learning outcomes which enhance and support those outlined above, have also been developed and are presented below.

- Understand fundamental historical, philosophical, and physical concepts, principles, and ideas.
- Understand major ideas and concepts that have shaped and are shaping 21st century scientific thought and discoveries.
- Understand connections between past, present, and future scientific developments and discoveries that have come to shape our conceptions of the universe.
- Understand and identify the major contributions of individual philosophers, scientists, astronomers, mathematicians, who have played a role in helping to develop our understanding of the universe.
- Appreciate science and the fundamental ideas and laws that govern the Universe.

Attendance: You are expected to attend every class and are responsible for all covered material and any announcements. If you have a fever of 100.4^o F or higher or COVID symptoms, stay home and contact Health Services immediately. To excuse your absence, Health Services must notify me. If you're advised to isolate, let me know so we can plan your coursework. Absences due to COVID-related issues will be excused, but you must complete all work and assignments.

Tutorial/Quiz: Tutorial and quiz will occur almost in every lectures. Students need to submit these material for credit. The quiz tests your understanding of the tutorial.

Homework: Homework will be **assigned during each class and is due by midnight after the next class.** Each assignment will consist of 3-15 multiple-choice questions, and you should plan to spend about 2 hour on each homework. If you find yourself spending more than 2 hours, please meet with me for assistance. **Homework will be posted on Inquire.** Discuss and understand the material with others, but focus on learning rather than copying answers. Understand the homework, as similar problems will be on exams. **Submit all assignments on time for full credit.**

Exams: There will be two exams in this course. You may use your tutorial materials during the exams. **If you miss an exam, it will count as zero points unless you have an excused absence (e.g., illness, scheduled College event). You must notify me before or immediately after the missed exam.** If your absence is excused, you may be able to make up the exam based on arrangements decided by the instructor.

Project: This is a group project, and this assignment is different from your homework and exams. This project allows you to creatively demonstrate your understanding of a topic related to our course themes. You can choose a topic from readings, lectures, discussions, or video segments. Your project must include a written commentary. In this commentary, explain your project, its significance, and how it connects to one or more historical cosmological models. Possible topics for your creative projects include (but are not limited to):

- The creation of a piece of artwork (e.g. a collage, drawing, painting, sculpture, a particular model of the universe, etc.).
- A musical expression of some type (e.g. writing a song, creating an interpretive dance).
- A creative literary piece (e.g. a piece of poetry, a short story, creation of a website, a blog, a piece of science journalism such as an interview with a scientist, cosmologist, astronomer, etc.).
- The creation and performance of a short skit or play.
- You might also create a video that might serve as a stand-alone piece or that might accompany your project.

To get approval for your creative project, submit a brief proposal detailing how your topic connects to historical cosmologies and their original sources. Include at least one cited source in your proposal. Further details will be provided in class. At the end of the semester, your group will give a 10-minute presentation of your project.

Grading: Your grade in this class will be determined by a combination of project, exams, homework, laboratory, and class participation. The separate weightings will be:

Class Participation (tutorial, quiz): 15%
Homework: 15%
Laboratory: 20%
Midterm: 20%
Project: 10%
Final: 20%

Final Grade: Final course grades will be assigned using the following scale:

A	93% or more	A-	90-92.9%		
B+	87-89.9%	B	83-86.9%	B-	80-82.9%
C+	77-79.9%	C	73-76.9%	C-	70-72.9%
D	60-69.9%	F	below 60%		

Accessible Education Services (AES): Located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Becky Harman, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at aes@roanoke.edu to schedule an appointment.

Academic Integrity: Your learning and integrity are at the core of your RC education. For this reason, you must follow the rules outline in the College AI policies. See https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity. **If I become aware of a possible violation of these guidelines, I am contractually obligated to report it to the Academic Integrity committee.**

Preliminary Schedule: I will inform you the reading material at the beginning of every class:

Dates	**Topic**	**Lab**
	Is the Earth at the center of the universe?	
W1: Aug 29	Welcome and Course Introduction	
W2: Sep 3,5	Tour of the universe: Estimating, orders of magnitude, factors of 1000 Angular Size & Field of Views (FoV)	1: Scale the solar system
W3: Sep 10,12	Early civilization, Greek civilization Retrograde motions & Motion of the Sun	2. Angular Size-FoV
W4: Sep 17,19	Scientific Rev. I: Copernicus, Galileo Tycho, Kepler's Laws	3. Outdoor/Telescope
W5: Sep 24, 26	Scientific Rev. II: Newton, velocity, acceleration, force, circular motion, and gravity	4. Night Observation
	Are there planets beyond our solar system?	
W6: Oct 1, 3	Properties of the solar system Early hypotheses of the solar system & Exoplanets	5. Kepler Laws
W7: Oct 8,10	Escape Velocity and the Earth's Atmosphere Project Distributed (3/group)/Review for Midterm **Midterm** (Oct 10)	6. Exoplanets
W8: Oct 12-20	Fall Break	
	Are there black holes?	
W9: Oct 22, 24	light, stars, and white dwarfs neutron stars, black holes	7. Planck Radiation
W10: Oct 29, 31	Einstein's Special Relativity Einstein's General Relativity Project Proposal Due (Nov 3 - Midnight)	8. Black Hole
	Is there one galaxy or many?	
W11: Nov 5, 7	Cepheids Variable, The Milky Way Galaxy & Dark Matter	9. Hubble Deep Field
	Did the universe have a beginning?	
W12: Nov 12, 14	Dark Matter & Galaxies	10. Dark Matter
W13: Nov 19, 21	An Expanding Universe	11. Speed of a Galaxy
W14: N 26, D 3	The Fate of the Universe	12. Hubble's Law
W15: Dec 6	Review for Final (Last day of class)	13. Project Presentation
W16: Dec 12	**Final Exam (8:30-11:30 am)**	

I have read and understood this syllabus. Sign, date, and submit this page on **Inquire** for 10 points toward your participation grade on your first day of class.

Student's Name: **Date:**