Point Loma Nazarene University

Department of Physics and Engineering

Fall 2026

PSC 3004/L Astronomy and Lab (3 + 1 units)

Class meetings: MWF 1:30–2:25 pm in RS 365

Lab meetings: T 2:25–5:45 pm in RS 365 (Dr. Anthony Cortez)

Final Exam: Monday, December 14, 1:30–4:00 pm

Instructor: Dr. Paul D. Schmelzenbach

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Office hours: RS258 by appointment

PLNU Mission: To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission

The Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

General Education Mission

PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

Course Description

An introduction to astronomy for non-majors covering the night sky, gravity and orbits, light and spectra, telescopes, the Sun and stars, galaxies, black holes, cosmology, and exoplanets. Letter grade.

Course Learning Outcomes

After completing this course, students can

1. Apply core physical principles (gravity, energy, light–matter interaction) to explain astronomical phenomena from the Solar System to cosmology.
2. Interpret observations of the sky—motions, phases, eclipses, spectra—and connect them to underlying scientific models.
3. Describe the life cycles of stars and the structures of galaxies and the universe, relating observational evidence to scientific models.
4. Create and interpret graphical representations of data.

5. Gather and interpret data in a lab setting.
6. Evaluate how astronomical knowledge intersects with society, including sustainability, and communicate evidence-based positions clearly to non-specialists.

General Education Learning Outcomes

This course is one of the components of the Foundational Experience program at Point Loma Nazarene University, through which students will acquire knowledge of human cultures and the physical and natural world while developing skills and habits that foster life-long learning. Specifically, this course supports this broader context in developing GELO 1e. Quantitative Reasoning: Students will be able to solve problems that are quantitative in nature. Assessment of this learning outcome will be demonstrated on the final exam embedded in questions typical of introductory physics.

General Education Course Tags

GE Course Tag(s): Service and Action; Sustainability

Required Texts and Materials

Palen, Stacy, and George Blumenthal. 2020. Understanding Our Universe. 4th ed. Calculator.

Course Credit Hour Information

In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 4-unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Assessment and Grading

The grade you earn in this course is based on the scale below. The points you receive during the course are weighted accordingly:

(15%) Preparation and Practice

- Preclass (5%): 2–3 short questions on the reading, due 10pm the night before.
- Homework and Activities (10%): on-paper practice of what we have been learning. The lowest two scores will be dropped.

(10%) Quizzes

In class, roughly weekly, drawn directly from the homework and preclass questions. Lowest two dropped.

(20%) Lab

Labs emphasize hands-on measurement, data interpretation, and construction.

(15%) Astro Project

Development and execution of astronomy outreach activities as a service for the campus community, including planning, presentation, and reflection components.

(25%) Exams

Three exams will be given during the semester. Exams will include both multiple-choice or short answer conceptual questions, and problems to solve. Exams will be closed book, but a sheet of formulas will be provided. Partial credit will be given for correct reasoning at any step of a problem, but only if it is communicated clearly enough for me to understand.

(15%) Final Exam

The final examination will be comprehensive, with a slight emphasis on the final section of material in the course.

A	B	C	D	F
92–100 (A)	87–89 (B+)	77–79 (C+)	67–69 (D+)	< 59
90–91 (A−)	83–86 (B)	73–76 (C)	63–66 (D)	
	80–82 (B−)	70–72 (C−)	60–62 (D−)	

Late Assignments

Typically labs will be submitted at the end of the lab period. Activities, Quizzes, and homework and pre-class must be submitted on-time for credit. If an emergency occurs, please be in contact with me as soon as you are able.

Exams and Missing Exam Policy

Examinations and the Final Examination will include problems and questions over material assigned in the text, explored in homework, as well as material presented in class. Distributed specific learning outcomes for the section, or for the entire class, will provide a good means of study. No examination shall be missed without prior consent or a well-documented emergency beyond your control. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control. If such an event arises, please ensure that you communicate with the professor as soon as possible so other arrangements can be made.

Final Exam

Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on the Traditional Undergraduate Records: Final Exam Schedules site. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

Incomplete Grade

A grade of incomplete will only be assigned in extremely unusual circumstances. If you believe that your particular circumstances qualify, be in clear communication with the professor as soon as you are able.

Artificial Intelligence (AI) Policy

You are allowed to use Large Language Models (like ChatGPT, NotebookLM, Claude, etc.) as a study tool, but not on any exams. Work that utilizes AI-based tools should be identified as such, including the tool used. Specific use cases will be clarified in class.

PLNU Academic Accommodations Policy

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities in accordance with the Americans with Disabilities Act (ADA). Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center, by email or phone at 619-849-2533. Once a student's eligibility for an accommodation has been determined, the EAC will work with the student to create an Accommodation Plan (AP) that outlines approved accommodations. Professors are able to view a student's approved accommodations through Accommodate.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their approved accommodations in that particular course. Accommodations are not retroactive; as such, clarifying with the professor at the outset is one of the best ways to promote positive academic outcomes.

Students who need accommodations for a disability-related need should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. In

accordance with ADA, accommodations cannot constitute a fundamental alteration to course outcomes; therefore, planning ahead is vital in establishing appropriate accommodations for equal access to this course. It is the student's responsibility to make the first contact with the EAC. Students cannot assume that because they had accommodations in the past, their eligibility at PLNU is automatic. All determinations at PLNU must go through the EAC eligibility process. This is to protect the privacy of students with disabilities who may not want to disclose this information and are not asking for any accommodations.

Additional Course Information

Additional PLNU policies and practices that apply to this course can be found at the following link: https://docs.google.com/document/d/1SoL5YMfCv_5cobhBwrDjbcZJzNKKTCfM/edit?usp=sharing&ouid=104297418648613020764&rtpof=true&sd=true

LomaBooks Instructions for Students

This course is part of our course material delivery program, LomaBooks. The bookstore will provide each student with a convenient package containing all required physical materials; all digitally delivered materials will be integrated into Canvas.

You should have received an email from the bookstore confirming the list of materials that will be provided for each of your courses and asking you to select how you would like to receive any printed components (in-store pick up or home delivery). If you have not done so already, please confirm your fulfillment preference so the bookstore can prepare your LomaBooks materials.

Class Meeting Calendar

Date	Topic	Reading
8/31	Introductions	
9/02	Our Place in the Universe	1.1–1.3
9/04	Patterns in the Sky: The Earth and Sky	2.1
9/09	Patterns in the Sky: Seasons	2.2
9/11	Patterns in the Sky: the Moon	2.3–2.4
9/14	Kepler and Galileo	3.1
9/16	Galileo, Newton, and Gravity	3.2–3.4
9/18	Gravity and Orbits	3.5
9/21	Light and Telescopes	4.1–4.3
9/23	Diffraction and Resolving Power	4.3
9/25	**Test Section 1: Introduction to Astronomy**	
9/28	Molecular Clouds to Protostar	5.1–5.3
9/30	Disks, Planets, and Exoplanets	5.4–5.6
10/02	Impacts and Interiors	6.1–6.3
10/05	Volcanism, Wind, and Water	6.4–6.5
10/07	Atmospheres I	7.1–7.3
10/09	Atmospheres II	7.3–7.5
10/12	Giant Planets I	8.1–8.3
10/14	Giant Planets II	8.3–8.5
10/16	Dwarf Planets, Moons, Asteroids	9.1–9.3
10/19	Comets and Meteorites	9.4–9.6
10/21	**Test Section 2: The Solar System**	
10/26	Luminosity and Stellar Spectra	10.1–10.2
10/28	Binary Stars and the H–R Diagram	10.3–10.4
10/30	Solar Structure and Energy Transport	11.1–11.2
11/02	The Solar Atmosphere	11.3–11.4
11/04	Main Sequence to Red Giant	12.1–12.3
11/06	White Dwarfs and Star Clusters	12.4–12.6

Date	Topic	Reading
11/09	Core Collapse and Supernovae	13.1–13.3
11/11	High Mass Stars and Black Holes	13.4–13.6
11/13	Black Holes cont, wrap-up	13.4–13.6
11/16	**Test Section 3: The Stars**	
11/18	Galaxy Shapes and Distances	14.1–14.2
11/20	The Expanding Universe	14.3–14.4
11/23	Evidence for Dark Matter	15.1–15.2
11/30	The Milky Way's Structure	15.3–15.4
12/02	The Big Bang and the CMB	16.1–16.3
12/04	Inflation and Other Universes	16.4–16.6
12/07	Current Topics and into the Future	
12/09	Life in the Universe	
12/11	Wrap up	
12/14	**Final Exam at 1:30**	