

Azusa Pacific University
College of Liberal Arts and Sciences; Department of Mathematics and Physics
Introduction to Astronomy (PHYC 140); 4 units (Lecture + Lab)
Spring 2012 Course Syllabus

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Textbook: The Essential Cosmic Perspective, 6th edition, Bennett et al, 2009; ISBN 978-0-321-58088-7.

APU Mission Statement

Azusa Pacific University is an evangelical Christian community of disciples & scholars who seek to advance the work of God in the world through academic excellence in liberal arts & professional programs of higher education that encourage students to develop a Christian perspective of truth & life.

Department of Mathematics & Physics Mission Statement

The Department of Mathematics & Physics at Azusa Pacific University 1) offers undergraduate degree programs in mathematics and physics, a single-subject waiver for a teaching credential in mathematics, and a pre-degree engineering program; 2) provides general education mathematics and science courses consistent with the outcomes of a liberal arts education; and 3) prepares students for graduate study or success in their chosen careers.

Student Learning Outcomes for PHYC 140:

Mastery of material in this course should enable students to:

1. Describe the structure of the solar system & the universe;
2. Explain the key physical properties of the universe;
3. Identify & define basic terms used in astronomy;
4. Describe fundamental physical principles associated with celestial objects;
5. Articulate areas of perceived conflicts between science & faith & understand key points & possible resolutions.

Course Description

This course introduces the history of astronomy, the solar system, the stellar systems, galactic systems, and cosmology. A lab is included. Introduction to Astronomy meets the general studies core requirement in Nature.

Course Format & Student Expectations

Class Participation - "...whatsoever things are true, whatsoever things are honest, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report; if there be any virtue, & if there be any praise, think on these things," *Philippians 4:8*. Please bring a positive attitude to class; it will make the entire experience more enjoyable for everyone! Students are expected to conduct themselves in class in a manner respectful of others & of the academic process. Overt student participation in class activities & discussions will count toward the final course grade. Each student in this course must be enrolled in the lab as well. Student attendance at each lecture & lab session is expected. Students should come to class having read the chapters indicated in the classroom schedule, & should be prepared to discuss the topics indicated when called upon in class.

Tests & Final Exam - Two tests & a final exam will be given for this course. Tests will generally be multiple-choice tests, but small portions of the tests may deviate from this format. In an effort to be good stewards of creation, tests will generally be projected onto a screen at the front of the classroom rather than printed on paper. The final exam will be comprehensive, including material covered throughout the course. No make-up tests will be permitted after the in-class test is administered. If for some unforeseen, unavoidable reason it becomes impossible for you to be in class for a test (e.g., death in family or serious illness), you must make every effort to get a message to the instructor before the designated test time notifying her of your absence & requesting arrangements to make up the test. PLEASE DON'T CONTACT ME AFTER THE TEST EXPECTING TO MAKE IT UP!

Projecettes - These are short exercises to be done during class. Projecettes will be assigned in class throughout the semester. Projecette dates will not typically be announced. Missed projecettes may not be done outside the original class period in which they are assigned. THEREFORE, PLEASE DON'T SKIP CLASS & EXPECT TO MAKE THEM UP LATER!

Laboratory - Your lab scores will count toward the 200 point lab portion of your grade for the semester. General neatness & organization of results will account for part of the lab write-up score. Student attendance & participation in each of the scheduled lab sessions are required. Tardiness to lab is unacceptable.

Assignments – The four major assignments for the course are outlined below. Assignments are considered late if not turned in during the class period in which they are due. Assignments will be penalized if they are late, & may not be accepted at all.

Assignment #1 – Astronomy Magazine Review. This assignment consists of reviewing an *astronomy periodical* (such as “*Astronomy*” or “*Sky & Telescope*”), commenting on overall content, contributors, advertisements, plus an in-depth review of at least one article. Target length: 4 pages. **Due date:** 2/15/12.

Assignment #2 – Astronomy News Report & Asterism Presentation. Each student will select a current astronomy news story, as well as a celestial asterism, & give a short (roughly 5-minute) report on them to the class, turning in a 2-page summary (1 page for news report + 1 page for asterism) in his/her own words, CITING ALL SOURCES. The asterism portion should focus on scientific & technical aspects, such as brightest stars, galaxies, & other features, location in the sky, best viewing times, and if it is within a zodiacal constellation, how the earth’s precession has affected the dates that the sun is “seen” within that constellation. A brief overview of the mythology is also acceptable. Make sure you cross check your news story to get a second perspective, and cite that source in your references as well. **Due date:** any scheduled classroom date up to & including the final day of class, one week prior to the final.

Assignment #3 – Faith Integration Assignment: Independent Observation Project & Log. Each student must complete one of the following projects, involving at least 8 hours of sky-watching (documented with drawings, diagrams, &/or photographs, and textual explanations), & at least 8 dated journal entries recording his/her personal reflections on what God has to do with astronomy. Include any challenges to your faith that may have arisen during this course & how you have tried to resolve them. These log entries should be subjective, & may originate from your own observations, philosophical or theological ponderings, scripture readings, research, or science journal reading. Your journal entries should include reflections on your denomination’s (if you don’t have a specific denomination, pick one for this assignment!) position statements relating to science in general (e.g., issues on origins, technology, ethics, etc.) and if possible, astronomy in particular. This is the “Capstone Project” for this course, & something you may want to add to or refer back to later in life, so get creative & put some effort into it! Target length: 12 pages. **Due date:** Last day of class, one week prior to the final.

- 1) **Moon-tracking:** Track & diagram the moon relative to other celestial objects (stars & planets) as it moves through the sky during a full month, noting times, dates, location & cardinal directions (make observations on at least 8 separate nights over a full month). Make sure you observe from the same vantage point for each observation. Could involve or include moon-rise/moon-set observations, similar to the sunrise/sunset project outlined below.
- 2) **Sunrise/sunset observations:** Observe & diagram the *precise* position on the horizon (relative to terrestrial landmarks such as hills, buildings, etc.) where the sun rises or sets, or both, once a week for 8 consecutive weeks, noting times, dates, location & cardinal directions, as well as any visible stars or planets. Make sure you observe from the same vantage point for each observation.
- 3) **Apparent motion of the stars:** Observe, diagram, and explain the apparent motions of 4 or more northern asterisms or constellations relative to Polaris (the North Star) during the course of 1 to 4 consecutive nights, noting times, dates, location, cardinal directions, & any visible planets. This should consist of at least 8 hours of observations. Make sure you observe from the same vantage point for each observation.
- 4) **Sky Journal:** Keep a journal of your observations of the sky, noting times, dates, location & cardinal directions. Keep a record of asterisms, constellations, & stars that you can identify, as well as locations & appearances of planets &/or meteors, including drawings, diagrams or photographs & brief descriptions. Organize your journal entries chronologically, and note changes in positions of celestial objects from one observation period to the next. Your journal should include observations on at least 8 separate occasions.

Assignment #4 - Research Project & Presentation. Each student will pair up with one other student, research a topic relating astronomy to one or both of their a/vocational interests, & together orally present their research to the class during a scheduled 15-minute period of class time. Examples of worthy topic categories include: the lives & discoveries of famous astronomers; the politics of space exploration; space commercialization; classes of stars or galaxies; new astronomical discoveries; new astronomy-related technologies; current cosmological theories; space travel; astronomy in the arts/media; lesson plans for teaching specific astronomy topics to K-12 students; etc. Consult the instructor for topic approval prior to beginning the research project. Do not lecture from the textbook, or cover information we've already gone over in class. Do not use any more than one carefully selected or prepared short video clip during your presentation.

Due date: An electronic PowerPoint file containing AT A MINIMUM the following specified elements must be emailed to the instructor *on or before the day of the in-class presentation, which may be any scheduled classroom date up to & including the final day of class, one week prior to the final:*

- 1. Title Page: topic, student names, date**
- 2. Content: thesis statement, evidence, arguments, conclusions**
- 3. Bibliography: in-print, internet, & expert interview (with credentials) references; peer reviewer name & date**

The presentation should include what you have learned about the topic in doing your research, your personal thoughts about the importance of the topic, & your ideas about what should be done in the future relative to your topic. The presentation must show depth of investigation, & communicate to the audience something about the topic that is not commonly known. Multiple sources must be cited, including AT A MINIMUM:

- one in-print, non-digital book, journal article, or other publication (not the textbook),
- one reliable internet source, &
- one personal interview with a non-peer expert on your topic, listing credentials (degree, job title, employer, etc.)
- (do NOT interview anyone from APU; get started on this early, as it may take some time to coordinate!)

Your bibliography should incorporate an accepted citation standard, as well as a notation as to where you found each reference. Include your expert interviewee's credentials (i.e., what makes him or her an expert?) & the date of the interview in your bibliography. Make sure to thoroughly proofread your document prior to handing it in.

Peer review: Please have one of your fellow students read & critique your document, & note his/her name in your bibliography. Make sure to allow adequate time to incorporate the results of this critique prior to turning it in.

The in-class presentation portion of this project will be evaluated by the audience (other course-enrolled students & the instructor) on each of the following areas:

- 1) Introduction (1-5 pts.): is the opening innovative? does the introduction grab the audience's attention?
- 2) Thesis (1-5 pts.): are the presenters clear about what they are trying to show? is it a significant thesis?
- 3) Evidence (1-5 pts.): how well does the evidence presented support their thesis?
- 4) Engagement/Interaction (1-5 pts.): how engaged/involved does the audience feel?
- 5) Conclusion (1-5 pts.): are the conclusions reasonable? is there a sense of closure? is the audience convinced?

The instructor reserves the right to discard evaluations that deviate significantly from her own.

The project will be graded on each of the following:

- 1) scientific content/technical analysis (as opposed to merely history, social commentary, trivia, etc.) (1-20 pts.);
- 2) depth of research (how many & what variety of sources do you use? how deep do you dig?) (1-20 pts.);
- 3) clarity (how clearly are you communicating your work? – visual aids are helpful!) (1-20 pts.);
- 4) creativity/originality of your work & its presentation (did you use a novel way to present an important aspect of your work?) (1-20 pts.);
- 5) thoughtfulness/insight (what does this research mean to you? to humanity in general?) (1-20 pts.);
- 6) documentation (are all elements listed above included? how well do you address each aspect above?) (1-25 pts.).

Plagiarism is a serious offense, & must be dealt with seriously. When writing, one must not take another's work & present it as one's own (this includes copying & pasting text from the internet). It is not acceptable to just change a few words from a passage then use it. If one desires to use another's work, one must quote & cite the passage, or explain & present the ideas in one's own words, & cite the original work.

(Indiana State University offers a nice on-line tutorial on avoiding plagiarism; check it out at this link:
<http://panther.indstate.edu/tutorials/plagiarism/introduction.html>.)

PLEASE NOTE: Meeting just the minimum requirements for any assignment will result in a minimally passing grade. I'm known to be a tough grader, so please put your best effort into your work for this class!

Extra Credit Opportunities

Several creative opportunities exist for students to earn extra credit points. These include the following:

- 1) In-class presentations of original science-related devotions
- 2) In-class presentations of "Scientific Fun Facts"
- 3) In-class science "Show & Tell" presentations
- 4) Written reports on special lectures identified by the instructor throughout the semester.

The in-class presentations must be scheduled ahead of time with the instructor. Points earned will be commensurate with the apparent effort applied (up to a maximum of 5 course points per **well-written page of your own, ORIGINAL work**). No extra credit, make-up, or any other work will be accepted after the last day of class.

Student Support Services

Student support services are available for students desiring additional support. Use of the support services is encouraged through the Learning Enrichment Center (LEC), libraries, Media Center, & computer & technology centers.

Disability Statement

Any student in this course who has a disability that may prevent him/her from fully demonstrating his/her abilities should meet with an advisor in the Learning Enrichment Center (ext. 3849) as soon as possible to initiate disability verification & discuss accommodations that may be necessary to enable his/her full participation in successful course completion.

Academic Integrity

The mission of Azusa Pacific University includes cultivating in each student not only the academic skills that are required for a university degree, but also the characteristics of academic integrity that are integral to a sound Christian education. It is therefore part of the mission of the university to nurture in each student a sense of moral responsibility consistent with the biblical teachings of honesty and accountability. Furthermore, a breach of academic integrity is viewed not merely as a private matter between the student and an instructor but rather as an act which is fundamentally inconsistent with the purpose and mission of the entire university. A complete copy of the Academic Integrity Policy is available in the Office of Student Life, the Office of the Vice Provost for Undergraduate Programs, and online.

Final Grade Factors

Class Participation	50
Midterm Tests (2 @ 50 each)	100
Final Exam	100
Projecettes	100
Laboratory Work	200
Assign. #1: Magazine Review	75
Assign. #2: News Report/Constellation	75
Assign. #3: Independent Observation Project & Log	150
Assign. #4: Research Project/Presentation	150
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TOTAL POINTS POSSIBLE	1000

Grading Scale

Points Earned Percent Letter Grade

920-1000	(92+%)	A
900-919	(90+%)	A-
880-899	(88+%)	B+
820-879	(82+%)	B
800-819	(80+%)	B-
780-799	(78+%)	C+
720-779	(72+%)	C
700-719	(70+%)	C-
660-699	(66+%)	D+
580-659	(58+%)	D
540-579	(54+%)	D-

Examples of grading criteria for assignments and final grade:

"A" work - Outstanding

"Above and beyond the requirements of the assignment; outstanding effort, significant achievement, and personal improvement are clearly evident. Some measure of remarkable skill, creativity, or energy is also evident."

"B" work – Above Average

"Fulfills all aspects of the assignment and goes a bit beyond minimum competence to demonstrate extra effort, extra achievement or extra improvement."

"C" work - Average

"Fulfills all aspects of the assignment with obvious competence and grace. Assignments are completed exactly as assigned."

"D" work – Below Average

"Below average either because some aspect of the assignment has not been fulfilled or because a preponderance of errors (more than one or two per page) interferes with clear communication. A "D" may also indicate failure to follow directions, failure to follow specific recommendations, or failure to demonstrate personal effort and improvement."

"F" work – Not Acceptable

"Not acceptable, either because the student did not complete the assignment as directed, or because the level of performance is below an acceptable level for college work."

Course Bibliography of Recommended Reading, Supportive References, and Faith Integration Works

1. Carlson, R. (ed.) 2000. Science and Christianity: Four Views. InterVarsity Press. Downers Grove. 276 pgs.
2. Chittick, D. 1984. The Controversy. Multnomah Press. Oregon. 280 pgs.
3. Corey, M. 2002. Supernatural Agency and the Modern Scientific Method. Leadership U. www.leaderu.com/aip/docs/covey.html
4. Davis, J. 2002. The Frontiers of Science and Faith: Examining Questions from the Big Bang to the End of the Universe. InterVarsity Press. Downers Grove., 200 pgs.
5. Dembski, W. and J. Kishiner. (eds.) 2001. Signs of intelligence: Understanding Intelligent Design. Brazos Press. Grand Rapids. 224 pgs.
6. Easton, T. 1995. Taking Sides: Clashing Views on Controversial Issues in Science, Technology, and Society. Dushkin Pub. Group, Inc. Guilford, CT. 376 pgs.
7. Fischer, R. 1997. God Did It, But How? ASA Press. Ipswich, MA. 120 pgs.
8. Grun, B. 1979 The Timetables of History. Simon and Shuster, N.Y. 676 pgs.
9. Hanson, R., editor. 1986. Science and Creation. Macmillian Publishing Company. New York. 224 pgs.
10. Hsu, Kenneth. 1986. The Great Dying. Harcourt Brace Jovanovich, Publishers. New York. 292 pgs.
11. Hummel, C. 1986. The Galileo Connection. InterVarsity Press. Illinois. 293 pgs.
12. Johnson, Phillip. 2000. The Wedge of Truth. InterVarsity Press. Illinois. 192 pgs.
13. Kaiser, Christopher. 1991. Creation and the History of Science. W. B. Eerdmans Publishing. Grand Rapids. 316 pgs.
14. King, John, translator. 1948. Commentaries on the First Book of Moses Called Genesis by John Calvin. W.B. Eerdmans Publishing Co. Grand Rapids. 584 pgs.
15. Magruder, K. and M. Keas. 1998. Reflections on Science and Faith: Four Theses by Kerry Magruder and Mike Keas. Oklahoma Baptist University. www.okbu.edu/academics/natsci/us/general/sci_faith.htm
16. Marsch, G. 2004. Enlightened Hearts and Cynical Eyes: Why Christian Faith and Doctrine Are Critical Scientific Tools. CCCU. www.cccu.org/resourcecenter
17. Miller, K. (ed.) 2003. Perspectives on an Evolving Creation. Wm. B. Eerdmans Pub. Co. Grand Rapids. 528 pgs.
18. Moreland, J.P. 1989. Christianity and the Nature of Science. Baker Book House Co. Michigan. 270 pgs.
19. Morris, Henry. 1974. Scientific Creationism. Creation-Life Publishers. San Diego. 277 pgs.
20. Oppenheimer, J.R. 1962. On Science and Culture. Encounter Oct. 1962
21. Patten, Donald, editor. 1970, 1971, 1972, 1975. Symposium on Creation: Vols 2-5. Baker Book House.
22. Pearcey, N. and C. Thaxton. 1994. The Soul of Science: Christian Faith and Natural Philosophy. Crossway Books. Illinois. 298 pgs.
23. Ratzsch, Del. 1996. The Battle of Beginnings. InterVarsity Press. Downers Grove. 248 pgs.
24. Ratzsch, D. 2000. Science and Its Limits: The Natural Sciences in Christian Perspective. InterVarsity Press. Illinois. 191 pgs.
25. Ross, Hugh. 1991. The Fingerprint of God. Promise Publishing Co. Orange, CA.
26. Ross, Hugh. 1979. Genesis One: A Scientific Perspective. Wiseman Publications. Sierra Madre, CA. 23 pgs.
27. Sagan, Carl. 1980. Cosmos. Random House. 365 pgs.
28. Schaeffer, F. 1968. Escape from Reason. InterVarsity Press. England. 96 pgs.
29. Schaeffer, F. 1972. Genesis in Space and Time. InterVarsity Press. Illinois. 167 pgs.
30. Schaeffer, F. 1975. No Final Conflict. InterVarsity Press. Illinois. 35 pgs.
31. Schaeffer, F. 1976. How Should We Then Live? F.H. Revell Co. NJ. 288 pgs.
32. Schroeder, G. 1990. Genesis and the Big Bang. Bantam Books. New York. 212 pgs.
33. Thurman, D. 1978. How to Think About Evolution. InterVarsity Press. Illinois. 143 pgs.
34. Van Till, H., D. Young and C. Menninga. 1988. Science Held Hostage. InterVarsity Press. Illinois. 189 pgs.
35. Wells, J. 2000. Icons of Evolution: Science or Myth? Regnery. Washington, D.C. 338 pgs.
36. Whitcomb, J. 1986. The Early Earth. Baker Book House. Michigan. 174 pgs.
37. Whitehead, A.N. 1925. Science and the Modern World. Lowell Lectures. Harvard University.
38. Wood, W. 2004. Integrative Topics in Modern Physics. CCCU. www.cccu.org/resourcecenter
39. Wright, R. 2003. Biology Through the Eyes of Faith. Harper and Row, Publishers. San Francisco. 309 pgs.
40. Young, D. 1977. Creation and the Flood. Baker Book House. Michigan. 217 pgs.
41. Youngblood, R., editor. 1990. The Genesis Debate. Baker Book House. Michigan. 250 pgs.
42. Youngblood, R. 1991. The Book of Genesis. Baker Book House. Michigan. 311 pgs.

Weekly Classroom Schedule

<u>Week</u>	<u>Chapters</u>	<u>Topics</u>
1	1	Course Intro/Outline; Christmas Star; Universal Address "Evidence for God"
2	2	Scientific Method; The Night Sky; Constellations; Scale; "Powers of Ten"
3		The Anthropic Principle; Origins & Genesis "Privileged Planet"
4	3	Historical Perspective; Early Astronomers; Copernican Revolution Retrograde Motion; Eclipses
5	1-3+	TEST #1 "Facts of Faith"
6	4	Newton: Motion, Energy, Mass, Gravity "Gravity of Genius" Magazine Review Due
7	5-6	Light & Atoms; EMR Spectrum; Spectroscopy; Telescopes
8	7-12	Solar System; Planetary Formation "Our Amazing Solar System"
9	7-12	Terrestrial & Jovian Planets; SS Walk (IEEE)
10	1-12+	TEST #2
11	14-15	Sun & Stars
12	16-18	Stellar Classification; HR Diagram
13	19-21	Galaxies "Cosmic Perspective"
14	24	Space Exploration; Space Physiology; Life in the Universe; "America in Space"
15	22-23	Cosmology; Final Review - LAST DAY TO TURN IN WORK (Finland)
	1-24+	FINAL EXAM

Student Score Sheet

1. Class Participation Score	_____	(50)
2. Midterm Tests		
Test #1 _____	(50)	
Test #2 _____	(50)	
Sum of Two Midterm Tests	_____	(100)
3. Final Exam Score	_____	(100)
4. Projecettes		
Projecette #1 _____	(25)	
Projecette #2 _____	(25)	
Projecette #3 _____	(25)	
Projecette #4 _____	(25)	
Projecette Total	_____	(100)
5. Labs		
Lab #1 _____	(20)	Lab #2 _____ (20)
Lab #3 _____	(20)	Lab #4 _____ (20)
Lab #5 _____	(20)	Lab #6 _____ (20)
Lab #7 _____	(20)	Lab #8 _____ (20)
Lab #9 _____	(20)	Lab #10 _____ (20)
Sum of Labs	_____	(200)
6. Magazine Review Score	_____	(75)
7. News Report/Constellation Score	_____	(75)
8. Independent Observation Project & Log Score	_____	(150)
9. Research Project/Presentation Score	_____	(150)
TOTAL	_____	(1000)