SPST441

Course Summary

Course : SPST441 **Title :** Cosmology
Length of Course : 8 **Faculty :**
Prerequisites : N/A **Credit Hours :** 3

Description

Course Description:

This course covers the origins and evolution of the universe. It begins by describing the scale of the universe, both in size and in distance. It will take an in-depth look at the important eras in the history of the universe from the Big Bang to the expansion and inflationary periods. This course will analyze the possible future of the universe as a function of critical density, dark matter, and dark energy. It will consider observational evidence for these theories and also investigate the Steady State Theory and alternate cosmologies. (Prerequisite SPST440)

Course Scope:

Cosmology is the study of the beginnings, evolution, and future of the Universe. This course will cover the scale of the Universe, both in terms of size and distance. It will focus on the Big Bang theory and examining the key events in each of the time periods from that origin to the present day including the observational evidence and current research. The course will consider the roles of both dark matter and dark energy in relation to the critical density and possible futures for the Universe. It will explore the tenets of general relativity, the concept of fundamental forces, and some alternative theories such as Multiverse and String theory.

Objectives

The successful student will fulfill the following learning objectives:

1. Describe the scale of the universe, both in terms of distances and time. (CO1)
2. Analyze the different eras of the Universe from the Big Bang to the present time. (CO2)
3. Describe how expansion and inflation influence the current evolution of the universe. (CO3)
4. Examine the how the density of the universe dictates its future evolution. (CO4)
5. Analyze possible sources of dark energy and dark matter. (CO5)

6. Describe the different observational evidence for the Big Bang. (CO6)

7. Examine alternate theories such as the Steady State theory and alternate cosmologies. (CO7)

8. Analyze the theories of general relativity and string theory, and how these affect our understanding of the Universe. (CO8)

Outline

Week 1: Cosmology and General Relativity

Learning Objective

- Analyze the theories of general relativity and string theory, and how these affect our understanding of the Universe.

Reading Assignment

- Cosmology for the Curious- Chapter 4
- *Optional: Cosmology for the Curious- Chapters 1-3*

Assignments

- Welcome Discussion

Week 2: Introduction to the Universe

Learning Objective

- Describe the scale of the universe, both in terms of distances and time.
- Describe the different observational evidence for the Big Bang.
- Examine alternate theories such as the Steady State theory and alternate cosmologies.

Reading Assignment

- Cosmology for the Curious- Chapters 5-7

Assignments

- Discussion 2
- Final Paper: Topic Selection

Week 3: Dark Matter and Dark Energy

Learning Objective

- Examine the how the density of the universe dictates its future evolution.
- Analyze possible sources of dark energy and dark matter.

Reading Assignment

- Cosmology for the Curious- Chapters 8-10

Assignments

- Discussion 3
- Homework Week 3

Week 4: The CMB and Cosmic Structure

Learning Objective

- Describe the scale of the universe, both in terms of distances and time.
- Analyze the different eras of the Universe from the Big Bang to the present time.
- Analyze possible sources of dark energy and dark matter.
- Describe the different observational evidence for the Big Bang.

Reading Assignment

- Cosmology for the Curious- Chapters 11 and 12

Assignments

- Discussion 4
- Final Paper: Annotated Bibliography

Week 5: Epochs and Outputs

Learning Objective

- Analyze the different eras of the Universe from the Big Bang to the present time.
- Describe the different observational evidence for the Big Bang.

Reading Assignment

- Cosmology for the Curious- Chapters 13 and 14

Assignments

- Discussion 5
- Homework Week 5

Week 6: Problems and Solutions

Learning Objective

- Describe how expansion and inflation influence the current evolution of the universe.

Reading Assignment

- Cosmology for the Curious- Chapters 15-17

Assignments

- Discussion 6
- Final Paper: Draft

Week 7: Our Universe and a Few Others
Learning Objective

- Describe how expansion and inflation influence the current evolution of the universe.
- Examine alternate theories such as the Steady State theory and alternate cosmologies.
- Analyze the theories of general relativity and string theory, and how these affect our understanding of the Universe.

Reading Assignment

- Cosmology for the Curious- Chapters 18-20

Assignments

- Discussion 7
- Homework Week 7

Week 8: The Beginning and the End
Learning Objective

- Describe the scale of the universe, both in terms of distances and time.
- Analyze the different eras of the Universe from the Big Bang to the present time.
- Examine the how the density of the universe dictates its future evolution.
- Examine alternate theories such as the Steady State theory and alternate cosmologies.

Reading Assignment

- Cosmology for the Curious- Chapters 21-24

Assignments

- Discussion 8
- Final Paper: Submission

Evaluation

Discussions: A discussion forum is posted each week with various prompts on the topics covered in the class. Participation is mandatory and will count towards the course grade. You are expected to provide a substantial comment of several well-written paragraphs in each session and a similar comment or reflection in reply to peers. Statements such as “I agree” or

“good post” will not count as a reply. Full expectations are detailed in the Discussion Guidelines.

Homework Assignments: There are three homework assignments in this course, each covering topics assigned in the course readings, as well as outside research by the student. Information on homework assignments will be posted within the Assignments area of the classroom.

Final Paper: Specific information about the final paper and the assignments building up to the final paper are posted in the Assignment area of the classroom. Students can select a topic for their final paper from the list given in the assignment description or propose their own topic for instructor approval.

Grading:

Name	Grade %
Discussions	30.00 %
Week 1: Introduction	2.00 %
Week 2: Einstein and Who Else?	4.00 %
Week 3: Evidence for Dark Matter	4.00 %
Week 4: ΛCDM	4.00 %
Week 5: Universal Epochs	4.00 %
Week 6: Graphs and Diagrams	4.00 %
Week 7: Big Questions with Big Theories	4.00 %
Week 8: Papers and Feedback	4.00 %
Homework	21.00 %
Homework Week 3	7.00 %
Homework Week 5	7.00 %
Homework Week 7	7.00 %
Final Project	49.00 %
Topic Selection	5.00 %
Annotated Bibliography	15.00 %
Draft of Paper	9.00 %
Final Paper	20.00 %

Materials

Book Title: Cosmology for the Curious

Author: Delia Perlov and Alex Vilenkin

Publication Info: Springer International Publishing AG 2017

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- Tutor.com offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- The University encourages all work to be completed according to the course schedule. The University Late Work Policy can be found in the Student Handbook here.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the

assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Discussion

- Discussions are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the discussion. The purpose of the discussions is to actively participate in an on-going discussion about the assigned content.
- "Substantive" means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says "I agree" is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

Identity Verification & Live Proctoring

- Faculty may require students to provide proof of identity when submitting assignments or completing assessments in this course. Verification may be in the form of a photograph and/or video of the student's face together with a valid photo ID, depending on the assignment format.
- Faculty may require live proctoring when completing assessments in this course. Proctoring may include identity verification and continuous monitoring of the student by webcam and microphone during testing.

University Policies

Student Handbook

Drop/Withdrawal policy

Extension Requests

Academic Probation

Appeals

Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering

respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.