

ASTRONOMY 155, The Big Bang Fall '22 – Syllabus

John Perry, john.perry@uvm.edu

Office Hours: Innovation 203- T, Th 10:30-11:30, 1:15-2:30

Keep checking UVM Blackboard (Bb) for course updates.

Purpose: Cosmology concerns the origin and evolution of our universe, and the best theory today is the so-called Big Bang model. Recent evidence particularly supports the Inflationary version of the Big Bang. This course will familiarize you with the theories and questions in a mostly non-mathematical context. Pertinent topics briefly mentioned in Astr 005 will be first reviewed and then explored in far greater detail.

Prerequisites: Astronomy 005; Math 10 (or permission)

Classes - Topics: (not necessarily in order)

- 1 - Intro, “centers” definition, and log relations
- 3 - A brief review of pertinent topics from Astr 005
- 2 - Review of relativity theory
- 1 - The Cosmological Principle and its implications
- 1 - The Friedmann equation and the Steady State and “Big Bang” solutions
- 1 - The Hubble Law, how it evolved and what it really means
- 1 - Speaking in redshifts
- 1 - Review of quantum theory
- 2 - The Horizon Problem & and the Flatness Problem
- 2 - Dark energy and dark matter
- 1 - The Inflationary version of the Big Bang
- 1 - CMB anisotropy, WMAP and Planck
- 1 - The Hubble Deep Field projects – JWST results if available
- 1 - LIGO and gravity wave detections – implications for cosmology
- 1 - The “Lyman Alpha forest” and why do we care?
- 1 - The Anthropic Principle: “fine tuning” the parameters of our universe
- 1 - Planck units
- 1 - The Multiverse
- 1 - Holographic Universe and Branes
- 1 - Exobiology and the Drake Equations (time permitting)
- 2 - In-class exams

Recommended Text Material: Web. Class slides will be posted on Bb the day after each class.

Grade Structure: Six biweekly open-book assignments worth 10% each, plus three 60-minute closed-book exams in class worth 13.3% each. Some assignment answers may be explicit in the lectures, and others you will have to figure out. You are invited to ask me for pointers, but otherwise work alone on all of them. I’ll post the format of assignments and exams soon.