CC103: Evolution of the Universe and Life.

Lectures: Tuesday and Thursday 9:30-11:00 Room 522, CLA
Discussion Sections: see class schedule.
Laboratories: Monday 10-12, 12-2, 2-4, 6:30-8:30 Room B3, Metcalf Science Center, 590 Commonwealth Avenue, Basement.

FACULTY OFFICE HOURS
Bernard Chasan, Physics, Science Center, Rm 213; 3-2608 (Coordinator) M, T, TH
Thomas Bania, Astronomy, 725 Commonwealth, Rm 617, 3-3652
Edward Booth, Physics, Rm 379, PRB, T, W, 3-2611
Marvin Freedman, Mathematics, 111 Cummingston St. T, Th 8-9, W 10-11 3-9544
Standish Hartman, Chemistry, Rm 358, Science Center, M, F 10-11 3-2515
Wayne Snyder, Computer Science, 111 Cummingston St. 3-8719

The faculty members listed here will give the lectures in the course and will teach the discussion sections as well. You are encouraged to consult any core faculty member about any issue arising from the course. In addition Professor Gail Patt of the Biology Department, who will be a major participant in the second semester, and will track the first semester, will have office hours, Friday, 9-11, Rm 323 in 5 Cummingston St.

TEACHING FELLOWS.

Steven Bloom, Astronomy
George Mosialos, Chemistry, Rm 389 Science Center, Tues. 11-1
Nicholas Gross, Physics Rm B62 Science Center
ORGANIZATION OF THE COURSE.

Texts:

Joseph Silk: The Big Bang (Freeman)

Robert March: Physics For Poets (Contemporary)

Both books are available from the Boston University Bookstore. These books are invaluable resources and should be purchased by all students enrolled in this course. Assignments will be given from them. However, they do not cover all subjects in the course, and they will be supplemented by notes distributed in class, and readings put on the reserve shelves in Mugar and in the Science and Engineering Library.

The Lectures.

Lectures carry the main thrust of the course. The lecture schedule attached, although subject to change, gives an accurate account of the course content in outline. Lecturers will distribute course notes, reading assignments, and homework assignments well in advance of due date. You are encouraged and expected to keep up with the reading. The more you know about the subject of a lecture in advance, the more rewarding will the lecture be. The homework assigned in lecture will be due in discussion, but help on homework will be available in consultation hours scheduled by the teaching fellows. Any student may consult any teaching fellow associated with the course. Homework and lectures will be the basis of the three twenty-minute quizzes shown on the lecture schedule, as well as the final examination. Attendance is required.

Discussions

Discussions will be concerned with topics arising from the lecture material, as determined by the individual discussion instructors, who will often give supplementary assignments. If discussions work the way they should, the interests and concerns of the participating students should shape them as well.

Laboratory

It is possible to imagine a science course without a laboratory, but such a course
would be grievously incomplete. Measurement and experimentation are at the very heart of the scientific enterprise, and there is no way to appreciate their role without actually measuring and experimenting.

We have scheduled five experiments in the first semester, each designed to be completed in one laboratory period. In order to keep laboratory sections small, each experiment will be available for a two-week period, and students enrolled in each laboratory time period are correspondingly divided into two groups. All students should attend the first laboratory period on September 11. Experience shows that laboratories work best if all laboratory work is entered into a notebook. You will need a 5x5 Quadrille Ruled Dennison 43-591 notebook (with Boston University Logo) available in the stationery department of the Boston University Bookstore.

The Laboratory Schedule:

September 10: Orientation and organization.

17, 24: Spectroscopy and the Hubble Law.

October 1, 9*: Measurement of the Gravitational Acceleration.


November 5, 12: Waves.

November 26, December 3: The Rate of a Chemical Reaction.

How the course grade will be determined:

Quizzes 25%

Final Examination. 25%

Discussion. 25%

Laboratory 25%.

* Tuesday after Columbus Day follows Monday academic schedule.
SCIENCE CORE: SEMESTER I  LECTURE SCHEDULE

INTRODUCTION

Sept

4  Introduction; logistics  Chasan

6  Science and evolution

THE BIG BANG: THE CURRENT COSMOLOGICAL PERSPECTIVE. Bania

11  Cosmology: the study of the universe on the largest scales of space and time.

13  Cosmological evidence.

18  The Big Bang Model.

20  Philosophical Implications: Origin, Evolution, and Fate of the Universe.

RULES OF THE GAME. A. THE BASICS

25  Describing Motion  Booth

27  Newtonian mechanics I: inertia and interactions

October

2  Newtonian mechanics II: Applications; QUIZ 1

4  Heuristic calculus  Freedman

11  Work and Mechanical Energy.  Chasan

16  Conservation laws and their uses: energy and momentum

18  The evolution of a conservation law: heat as a form of energy.

23  From macro to micro: the perfect gas; temperature and energy.
25 Thermodynamics; the industrial science.
30 From engines to cosmos: the Second Law of Thermodynamics and Time's arrow.

November

1 Waves; the fundamentals. The electromagnetic spectrum.
6 Interference and diffraction; standing waves. QUIZ 2.
8 Quantum Rules: the Wave-particle duality and the Uncertainty Principle.
13 Elementary particles, the Early Universe, and the SSC Booth

RULES OF THE GAME B: THE STRUCTURE OF MATTER Hartman

15 Atoms
20 Molecules
27 Aggregates
29 Reactions; QUIZ 3

December

RULES OF THE GAME C: COMPLEXITY Freedman

4 Dynamical Systems
6 Chaos and Fractals
11 Summing up
18 FINAL EXAMINATION.