

## AS 101 - The Solar System Syllabus - Spring term, 2000

**Course Perspective:** As advertised in the Bulletin, AS 101 surveys the historical development of astronomy, the motion of the planets, the formation of the solar system, the sun and its effects on the earth. In studying astronomy and the solar system, we will explore one of the most exciting endeavors in human history. Today, we find ourselves in a golden age of astronomical and planetary science, with new discoveries enhancing our understanding of the Cosmos on an almost weekly basis. In the first half of the class, AS 101 surveys the discovery and implications of some of the most fundamental and well established laws and theories ever made in science. In the second half, AS 101 surveys more recent discoveries and theories pertaining to the past, present and future solar system.

AS 101 fills the natural science distribution requirement of the College of Arts and Sciences. Hence, the primary purpose of AS 101 is not to teach a series of facts about the solar system, but to study the methods and tools with which scientists have unraveled and continue to explore the inner workings and composition of the solar system. These scientific methods enable us to go beyond simply describing the current state of the solar system, allowing deductions about its past predictions about its future.

As the great 16<sup>th</sup> century scientist, Galileo Galilei, stated, “The language of the universe is mathematics.” The physical sciences, (physics, astronomy, chemistry and related fields) rely on the predictive capabilities of mathematics. While the level of mathematics used in this class will not progress beyond high-school algebra, geometry and trigonometry (in other words, pre-17<sup>th</sup> century mathematics), one objective of this class is to illustrate the incredible utility of a mathematical description of the Universe. As it says on the cover of the *Hitchhikers Guide to the Galaxy*, “DON’T PANIC.” We will make every effort to make the math an aid rather than a hindrance in understanding the solar system. Please review Appendix A in the text book.

This introductory level course is intended for students from any college or school at any level. It has no requirements beyond high school level algebra. The Department of Astronomy also offers a series of courses more appropriate for prospective and active physical science majors, AS 202 – AS 203. This is followed by a series of advanced courses for majors. We also offer two additional courses designed for non-physical science majors, AS 109 and AS 117.

AS 101 moves quickly through a great deal of material and each topic builds on earlier material. If you fall behind, you may find it difficult to catch up. If you get stuck on a concept, move on and seek help from the Professor, teaching fellows, or your classmates. Also, read the section entitled, *How to succeed in your astronomy course* in your text book. We hope that the rewards of learning about the mysteries of the heavens and the solar system will make all the demands and requirements of AS 101 worthwhile.

**Instructor:** Professor Meers Oppenheim

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Office Hours: Mon: 2:00-3:30pm Tue: 11-11:30 & Thu: 11:00-12:00 or at other times through arrangement

**Teaching Fellows:** Ms. Jyoti Bhattacharjya: CAS Room 502, phone: 353-5611

Office Hours: Mon: 4:30-6:00, Wed: 12:30-2:00 e-mail: bhattac@bu.edu Mr. Casey Law - Office:

CAS Room 524, phone: 353-6554  
Office Hours: Tue: 2:00-3:30, Wed: 9:30-11:00:  
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**Contacting us:** E-mail is usually the easiest method of contacting the professor or teaching fellows. We all check our email daily - often hourly. Also, feel free to telephone us or stop by during office hours or at other times.

**Class Hours and Location:** Lectures (B1) - Tue & Thu: 9:30-11:00 am, CAS 522

**Required Texts:** *The Cosmic Perspective* by J. Bennett, et. al. The book and the lectures complement each other and students are responsible for the material in both. Students are expected to read the sections listed in the "Tentative Course Schedule" found below. *Solar System Laboratory Exercises*, AS 101 - Oppenheim <sup>1</sup>

**Class www site:** [astro.bu.edu/~meerso/AS101](http://astro.bu.edu/~meerso/AS101) - The course web site - many of the course handouts will be posted here.

**Books in Library Reserve:** <sup>2</sup>

1. *Norton's Star Atlas*, by Arthur P. Norton, published by Sky Publishing Corporation, Cambridge, MA.
2. *The New Solar System (3rd edition)* contains more detail on the solar system, edited by J. Kelly Beatty, Brian O'Leary, and Andrew Chaikin, published by Cambridge University Press and Sky Publishing Corporation, Cambridge, UK and MA, 1990.
3. *Introductory Astronomy and Astrophysics* by Zelick & Gregory is a sophomore/junior level text containing more mathematical detail and insight.

**Astronomy Web Sites:**

1. [www.astrospot.com](http://www.astrospot.com) - Site associated with the book contains chapter summaries with a hyper-linked glossary, practice quizzes, and resources including movies and animations.
2. [jersey.uoregon.edu/vlab/](http://jersey.uoregon.edu/vlab/) - JAVA applets designed to teach physics and astronomy.
3. [callisto.colorado.edu/solarsystem](http://callisto.colorado.edu/solarsystem) - JAVA applets designed to teach principles of astronomy: The Greenhouse Effect, Kepler's Laws, Space Weather, and The Scientific Method.
4. [super.colorado.edu/~astr1120/hypertext.html](http://super.colorado.edu/~astr1120/hypertext.html) - An AS102 hypertext course on the web.

**Grades:** The final course grade depends upon four course components:

The better of 2 in-class Exams	20%
Lab and Planetary Exercises (best 8 of 9 labs)	35%
Problem sets ((best 5 of 6)	20%
Final Exam	25%

The Lab and Planetarium Exercises grade will derive from 6 indoor lab exercises, 2 observing lab exercises and a planetarium exercise with the lowest grade dropped.

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<sup>1</sup>Texts will be available in the CAS Coursebook section of the Boston University Bookstore in Kenmore Square.

<sup>2</sup>These texts, and others suggested throughout the term as optional resources, will be available in the Astronomy Library located on the sixth floor of CAS above the astronomy department offices.

Any requests for grade corrections/changes need to be made **in writing** – exam grades to the professor, and lab and problem set grades to the teaching fellows.

**Exams and Final:** The exams and the final will test your knowledge of ideas discussed, simple problem solving skills, and, your ability to write brief essays about the history of Astronomy. We will hold review sessions and attempt to provide practice exams.

**Problem Sets:** Six problem sets will be handed out in class during the semester. Solutions to the problem sets will be handed out in class on the due-date so that students can immediately evaluate their understanding of the material. **The course policy is that NO late assignments will be accepted.**

We will only grade a random subset of problems in each problem set. (*Hint: Each exam will contain an almost verbatim problem from the problem set.*)

**Lab and Planetarium Exercises:** AS 101 is a laboratory course where lab participation and lab reports constitute a major part of your final grade. We will drop one grade from this set of 9 grades so if you are unable to complete one of the exercises, your grade will be unaffected. A second grade will **not** be dropped.

**Indoor Labs:** The indoor exercises will be performed in assigned sections. Indoor exercises will demonstrate a certain physical principle or elaborate on lecture material. **Each student must be enrolled in one of the lab sections (B2-9) in addition to the lecture (B1)!** Students unable to attend their scheduled lab should discuss possible substitutions with the teaching fellows at the earliest possible time.

**Every student must turn in a lab report for each lab completed during the semester and pass it in by the announced due date.** Typically, the lab report will be due one week after completion of the lab. The lab report should be organized as follows: (1) Begin with an introduction, explaining the purpose of the lab and the hypothesis being evaluated. (2) Describe the equipment and techniques used. (3) Report the **raw** data. (4) Include the analysis where the data is reduced and analyzed. (5) Conclude with a discussion of whether the hypothesis was or was not validated by the experiment performed and why or why not. The lab report must be typed or written very legibly.

**Observing Labs:** Observing the night sky is an essential part of astronomy and the observing exercises constitute an important part of AS 101. The J. B. Coit Observatory can be found on the roof of the CAS building, two floors above the astronomy department. The observatory has set of celestial pipes and telescopes. Each lab may be completed in an hour. Because of inclement weather, it is not uncommon to have an entire month with **no** clear nights. Hence, it is essential not to wait until the end of the possible observing sessions to observe. If you miss one of the two observing sessions because the last two weeks are cloudy, no make-up will be possible and you will receive a zero.

The observatory is outside, unheated, and often bitterly cold, so dress appropriately. We recommend over dressing.

To check if the observatory will be open on a given night, call 353-2630 for a recorded message after 5pm. Choose option #1 to see if the night lab will be held that night and option #2 for other night lab information.

**Planetarium Visit:** The Boston Museum of Science has a planetarium capable of displaying the night sky as seen from any point on Earth at any time of the year with a clarity we cannot match on the roof of the CAS building. We have reserved the planetarium on Jan 25 from 7:30 to 9:30 and set up a special program for AS 101 students, “A tour of the Night Sky.” After the program, you will turn in a simple set of questions for a grade. It is not possible for us to schedule a second planetarium visit. If you miss the planetarium program, you will receive a zero grade.

**Labs/Discussion Section:**

Sections	Day	Time	Location
B2	Mon.	11:00 am - 12:30 pm	CAS Room 521
B5	Tue.	3:30 pm - 5:00 pm	CAS Room 521
B6	Wed.	11:00 am - 12:30 pm	CAS Room 521
B7	Thu.	11:00 am - 12:30 pm	CAS Room 521
B8	Thu.	12:30 pm - 2:00 pm	CAS Room 521
<b>Night labs</b>			
N1: Constellations	Mon, Tue or Thu, Jan 18 – Mar 2	6:30 or 7:30 pm	Observatory
N1: Constellations	Wed, Jan 18 – Mar 2	6:30 pm	Observatory
N2: Telescopes	Mon, Tue or Thu, Mar 13 – Apr 27	7:30 - 8:30 pm	Observatory
P1	Tue, Jan 25	6:00 - 8:00 pm	Planetarium show

Note: N1 Lab report due Mar 9 and N2 Lab report due May 2. Bribe: 10% extra credit for turning in N1 or N2 report two or more weeks before due date.

Further Note: sections B3, B4, and B9 have been cancelled!

**Special Dates:**

First class:	Jan 11
No Class (Mon classes held on Tue):	Feb 22
Deadline for adding class:	Jan 24
Deadline for dropping class:	Feb 14
Exam 1 (in class):	Feb 15
Spring Recess (no class):	Mar 6 – Mar 12
Exam 2 (in class):	Apr 4
Deadline for withdrawing from class:	Apr 20
Last day of classes:	May 3
Final (9am - 11am):	May 9

**Indoor lab schedule:**

Start Date	End Date	Lab Name	Due
Jan 10	Jan 14	Orientation	
Jan 18	Jan 31	Planetary Motions	1 week after your Lab
Feb 1	Feb 4	No Lab	
Feb 7	Feb 11	Review for Exam 1	
Feb 14	Feb 25	Optics and Telescopes	1 week after your Lab
Feb 28	Mar 17	Spectroscopy	1 week after your Lab
Mar 20	Mar 31	Galilean Satellites	1 week after your Lab
Apr 3	Apr 14	Planetary Topography	1 week after your Lab
Apr 18	May 1	Solar Rotation	Last class or 1 week after your Lab

### Tentative Course Schedule:

Lecture	Chapter	General Topic	Lecture Topic
1	1	Introduction	Introduction to AS 101 & Astronomy
2	2	Introduction	Science and the scale of the Universe
3	3	Introduction	Scale of Solar System and Planetary Motion
4	3	Introduction	The Moon, Eclipses and Meteors
5	S1	The Night Sky	Constellations, Celestial Sphere & Navigation
6	4	Fundamental Principles	Ancient Astronomy
7	4	Fundamental Principles	Motion of the Planets
8	6	Dynamics	From Copernicus to Newton
9	6	Dynamics	Kepler's Laws explained
10	6	Dynamics	Newtonian Mechanics
11	5	Energy	Energy: conservation, sources & sinks
12	7	Light & Optics	Electromagnetic radiation I
13	7 S2	Light & Optics	Telescopes & Spacecraft
14	8	Solar System	Overview & Origins
15	8	Solar System	Planetesimals, Impacts and Age
16	14	Space Physics	Sun & Solar wind
17	9	Geology of Terrestrial planets	Geo II
18	9	Geology of Terrestrial planets	Geo III
19	10	Atmospheres of Terrestrial planets	Atmos I
20	10	Atmospheres of Terrestrial planets	Atmos II
21	11	Gas Giants	Interiors
22	11	Gas Giants	Atmospheres & Magnetosphere
23	11	Gas Giants	Satellites & Rings
24	12	Asteroids, Comets and Pluto	Asteroids, Meteorites & Comets
25	12	Asteroids, Comets and Pluto	Pluto & collisions
26	13	Earth	Geology & Life
27	13	Earth	Atmosphere & Life
28	S6	Life	Life in the Universe

**Important Note on Academic Conduct:** Students are encouraged to collaborate with each other when solving the problem sets and/or laboratory exercises. However, each student must independently write-up the problem sets and the labs. If two assignments are overwhelmingly similar or identical, then that will be considered a form of academic misconduct. Boston University takes a very hard stand on any form of academic misconduct and is prepared to act swiftly and seriously. Accordingly, in instances where you have worked with another student on an assignment, make it painfully clear that the written solutions represent your own understanding of the problem.