SYLLABUS

AS 102 - The Astronomical Universe

Prof. Merav Opher - Fall 2013

Course Catalog Summary: The birth and death of stars; red giants, white dwarfs, black holes; our galaxy, the Milky Way, and other galaxies; the Big Bang and other cosmological theories of our expanding universe.

Instructor: Professor Merav Opher (Office: CAS 514B); 617.358.6385; mopher@bu.edu

Class Website: http://people.bu.edu/mopher/AS102_2013/Welcome_Page.html

Teaching Assistant: Mr. Jordan D. Montgomery; Email: montgojo@bu.edu

Office Hours:

Professor Opher: Monday 2-3PM, Wednesday 2-3PM, and by appointment

Mr. Montgomery: Monday 12:00-1:00pm; Thursday 10:00-11:00Am; Friday 12:00-1:00pm

Lecture Times: Mondays, Wednesdays, and Fridays, from 1-2pm, in CAS 522.

Daytime Laboratory Section Times: (all take place in CAS B4 – note that the Day Lab 5 "Stellar Spectral Classification" will be given at the CAS computer lab CAS 327)

A2: Thursday 2:00pm-3:30pm (class full)

A3: Monday 2:00pm-3:30pm (class full)

A4: Wednesday 11:00am-12:30pm (class full)

A5: Tuesday 12:30pm-2:00pm

Nighttime Laboratory Times:

Night Lab 1 will run Sept. 9 - Oct 24

Night Lab 2 will run Oct. 28 - Dec 10

All Night Labs begin at 8:30pm Monday, Tuesday, and Thursday.

Location: On the roof of the CAS building

Boston has terrible weather, so be sure you complete your night lab exercises EARLY

in the given half-semester. If you wait until the last available night and it turns out to be cloudy, you will receive a zero for that lab exercise! There is an answering machine with a recorded message telling whether for a given night the rooftop labs will be held or not. The phone number is **617.353.2630**, and the message is finalized at around 8pm. Finally, rooftop observatories are cold, windy places - DRESS WARMLY!

Textbook:

"21st Century Astronomy: Stars and Galaxies" - Fourth Edition - by Hester, Smith, Blumenthal, Kay, & Voss

http://books.wwnorton.com/books/detail.aspx?ID=4294969461

It is important to get the **4th Edition,** as problem numbers and other content will differ from previous editions.

Useful website for studying for the course:
http://www.wwnorton.com/college/astronomy/21st-century-astro3/

Laboratory Exercises: Written instructions and worksheets for the labs in this course are to be downloaded, printed, and brought to lab. Check our course website for links for the labs manuals.

Grading: The course grade will be computed by weighting your performance in the following areas by the percentages listed:

Laboratory (6 day labs and 2 night labs)	20%
Homework (5 assignments)	12%
Class Participation (weekly)	8%
Planetarium Visit	2%
Midterm Exams (2)	33%
Final Exam	25%
Total	100%

Synopsis of Course: This course is intended to be an introduction to Astronomy, and the physical sciences in general, for the non-major (Astronomy and Astronomy-and-Physics majors should be enrolled in AS202). We will show that from a few simple physical laws and principles many of the seemingly complex phenomena in stars, the galaxy, and the universe can be understood by almost everyone. This course has no prerequisites and we assume no prior knowledge of physics, astronomy, chemistry, or math (algebra we **do** require). We will present all of the basic foundation needed to understand why stars shine, how galaxies age, and how old and how big the universe is today.

The lab work is a very important element of this course. It consists of daytime

laboratory section meetings with the TAs, and two visits to the rooftop observatory during the semester. In the labs, you will gain experience in using the physical tools of astronomy and a practical knowledge of the night sky. Although the lab only makes up 20% of your course grade, there is a caveat to that percentage: ***I will not pass anyone who fails the lab portion of this class.*** That is, if your midterm exams and final exams are solid "A" work, but you decided you had better things to do than go to the lab sections, I will give you an "F" grade! But the opposite is also true - if your exam grades are suffering, doing well in the lab could bring your course grade up.

In addition to the regular daytime laboratory section meetings, you are expected to complete **two nighttime laboratory exercises** based on observations conducted from the roof of the CAS building.

The laboratory component will be computed based on the six daytime lab exercises and the two nighttime lab exercises. Passing the laboratory component consists of scoring at least 68% of the total points available. Failing the laboratory component, and hence failing the course, requires scoring less than 68% of the total lab points. Bring the manual for each lab printed. The TAs won't have extra copies and you will miss the lab!

Homework: There will be five homework assignments. As for the lab component, homework is a required component for passing this course. Students failing the homework component (i.e., scoring under 40%) will also fail the course. *I will drop the lowest score of HW's.*

Class Participation: There will be in-class weekly short exercises designed to assess how the material is being absorbed. It will count for 8% of your grades.

Exams: There will be two in-class, closed book, **Mid-term** exams. The first will be on **Wed, October 9th** and the second on **Friday, November 6th.** Exams will be of 50 minutes duration and consist of multiple choice and true- false questions.

Make-up exams will not normally be given to people with ordinary excuses (illness, family conflicts, plane tickets, etc.). Extraordinary excuses will be handled by oral exams. Oral exams will be of one hour duration, taken by appointment only, and must be completed within one week of the missed exam. Grading for oral exams is A, B, C, D, and F - there are no plus or minus grades for oral exams.

Final Exam: The final exam will be from **12:30-2:30pm on Wednesday, December 19th.** It will be closed book and cover all the material in the course. Note that the final exam is not at the usual class meeting time or day of the week. The final exam time and date cannot be changed for anyone. If you have a known schedule conflict, change it now or see me to withdraw from the course.

Visit to Planetarium: We will have a trip to the Planetarium at the Museum of Science http://www.mos.org/ on 9/30; 10/1 and 10/2 at 6:30pm. **The trip IS**

REQUIRED.

Attendance, Late Policy, Ethics: Attendance at all lectures, exams, and daytime laboratory section meetings is mandatory. **The Late Policy is simple: if you turn in an assignment late, it receives no credit.** This applies to homework and laboratory exercises. Do not copy from another student or from another student's work (including students not in this class). Students are reminded that their behavior is governed by the CAS Academic Conduct Code. Copies of the Code are available in CAS 105. I am required to state that cases of suspected academic misconduct will be referred to the Dean's Office.

Schedule/Calendar: The lecture and lab schedule/calendar will follow the development in the textbook, though the emphasis will be somewhat different. The lecture material may be adjusted to different dates to accommodate a varying lecture rate. Exam dates will not be changed, though exam coverage may change slightly.

Drop and W-Grade Dates: The last day to drop AS102 without a "W" grade is Tuesday, October 7th. The last day to drop AS102 (but receive a "W" grade) is Friday, November 8th.

SCHEDULE OF CLASSES:

Class 1 - Introduction; Why Learn Astronomy
Class 2 - Patterns in the Sky - part I
Class 3 - Patterns in the Sky -part II
Class 4 - Motions of Earth/Kepler's Law's
Class 5 - Kepler's Law's/Gravity
Class 6 - Gravity part II
Class 7 - Light
Class 8 - Light - part II
Class 9 - Measuring Stars
Class 10 - Taking the measure of Stars
Class 11 - Taking the measure of Stars - part II
Class 12 - Taking the measure of Stars - part III
Class 13 - Review for Mid Term/Measure of Stars
Class 14 - MID TERM
Class 15 - BINARY STARS
Class 16 - HR DIAGRAM/ The Sun
Class 17 - The Sun - part II
Class 18 - Sun and Space Weather
Class 19 - Space Weather: Coronal Mass Ejections
Class 20 - Interstellar Medium
Class 21 - Interstellar Medium - part II

Class 22 - Star Formation
Class 23 - Low Mass Stars
Class 24 - Low Mass Stars- part II
Class 25 - Review for Mid Term/ Evolution of Low Mass Stars
Class 26 - MID TERM
Class 27 - Our Expanding Universe
Class 28 - Our Expanding Universe -part II
Class 29 - Our Expanding Universe - part III
Class 30 - Galaxies
Class 31 - Galaxies - part II
Class 32 - Galaxies - part III
Class 33 - Active Galactic Nuclei and Supermassive Black Holes
Class 34 - Modern Cosmology
Class 35 - Modern Cosmology - part II
Class 36 - Large-scale Structure in the Universe
Class 37 - Review for Final

Active Galactic Nuclei and Supermassive Black Holes Mo