

Winter 2014

Dawson College- Physics Dept.

Instructors:

Course Outline

Astrophysics 203-BZA-05 (all sections)

Ponderation: 3-2-3

Prerequisites: Calculus I, Physics NYA, Physics NYC

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Textbook: Combined Text and Lab Manual, available at the bookstore.

Context: Astrophysics BZA is a Science Option course, part of the Science program.

Objectives: The primary objective is to give the Science student a comprehensive introduction to astronomy and astrophysics, from ancient times to the present. The course will emphasize the logic behind astronomical thinking, rather than the memorization of facts. Classical astronomy will be covered, but more emphasis will be placed on modern astrophysics. Mathematics will be calculus-level.

Learning activities in astrophysics will contribute to the attainment of objective 00UV (to apply a scientific or technological approach to a field in the sciences), and 00UU (to apply what students have learned to one or more subjects in the sciences). More specifically, the required course competencies include:

1. To apply previously acquired knowledge of physical and mathematical concepts to
 - a) the study of astronomy from the ancient Greeks to the 19th century, with particular emphasis on solar-system objects.
 - b) the measurement of the properties of stars.
 - c) the study of the evolution of stars.
 - d) the study of cosmology.
2. To verify experimentally some of the laws and principles associated with astronomy and astrophysics.

Teaching methods: The material will be presented in lecture format. There will be regular homework assignments. Laboratory exercises will be performed, and there will be optional evening meetings to observe the sky with a telescope from our observing deck in the 4H wing.

Topics (in order of presentation):

1. Evolution of astronomical thought: Greek astronomy; the Copernican revolution; the contributions of Kepler and Galileo.
2. Universal Gravitation: The Newtonian synthesis; orbital mechanics and the motion of planets, comets and spacecraft; tides and precession. *(Test #1: Week 6 or 7)*
3. Earth, Moon, Sun and Sky: The seasons; time and the calendar; eclipses; celestial coordinate systems; navigation.
4. Atoms and Starlight: Brief review of topics from Physics NYC: the electromagnetic spectrum; blackbody radiation; spectral lines; the Doppler shift.
5. Tools of the Astronomer: Visible-light telescopes and spectroscopes; radio, infrared, ultraviolet and X-ray astronomy.
6. The Properties of Stars: The distances, motions, colors and brightnesses of the stars; stellar spectra, and what they can tell us; the Hertzsprung-Russell diagram; binary stars and stellar masses. *(Test #2: Week 11 or 12)*
7. The Evolution of Stars; Exotic Objects: How stars are born; the sources of energy in the stars; star clusters and their H-R diagrams; how stars die; red giants, white dwarfs, neutron stars and black holes.
8. Galaxies, Quasars and Cosmology: Our Milky Way Galaxy; a Universe of galaxies; the expanding Universe and the Hubble law; the age of the Universe; the primordial fireball; dark matter and dark energy; cosmological models; the ultimate fate of the Universe. *(Test #3: Week 15 or 16)*

Laboratory work: Some of the following labs will be performed:

1. Determining the orbit of Mars by Kepler's method.
2. The constellations – finding your way around the sky.
3. Measuring the Moon's diameter at a lunar eclipse.
4. Finding the distance to the Crab Nebula.
5. Hubble's constant and the expansion of the Universe.
6. Classifying stellar spectra.

Evaluation: There will be three class tests. Your teacher will announce planned test dates during the first week of class. The final course grade will be calculated as follows:

<u>Tests, quizzes and assignments:</u>	80%
<u>Labs:</u>	20%

There will be an optional final exam. If a student chooses to write the final, this final exam must be written at the regularly scheduled time, except in the case of unforeseen emergencies such as illness, accident, etc., confirmed by proper documents. If the student writes the final exam, the course grade will be calculated as follows:

<u>Tests, quizzes and assignments:</u>	50%	30%	(Whichever results in a higher grade)
<u>Final exam:</u>	30%	<u>or</u>	50%
<u>Labs:</u>	20%		20%

Note 1: The usual penalty for late assignments and lab reports is 5%/day.

Note 2: If a student does his/her Comprehensive Assessment in Astrophysics, the grade on the Comprehensive Assessment will count for 10% of the student's final course grade, while the grade as calculated above will count for 90%.

Note 3: The minimum overall passing grade for the course is 60%.

Teacher Accessibility: Teachers will be available for consultation in their offices, during posted office hours.

ISEP Statement: The Institutional Student Evaluation Policy (ISEP) is designed to promote equitable and effective evaluation of student learning and is therefore a crucial policy to read and understand. The policy describes the rights and obligations of students, faculty, departments, programs, and the College administration with regard to evaluation in all your courses, including grade reviews and resolution of academic grievances. ISEP is available on the Dawson website.

Attendance: Although class attendance is not compulsory, students should make every effort to attend all classes.

In the event that a class is missed, the student is responsible to know everything covered in class.

Attendance at tests and laboratory experiments is compulsory. Students should be aware that lectures will sometimes cover material that is not in the text; this makes regular attendance even more essential. Students should refer to the Institutional Student Evaluation Policy (ISEP section III-C) regarding attendance.

Religious Holidays: Students who intend to observe religious holidays, must inform their teachers in writing as prescribed in the ISEP Policy on Religious Observances. Students should then abide by the decision of the teacher regarding alternative times for tests and labs., which may be either earlier or later than the regularly scheduled times.

Conflicts with Intensive Courses If a student is attending an intensive course, the student must inform the teacher, within the first two weeks of class, of the specific dates of any anticipated absences.

Literacy: It is expected that students will be able to comprehend course material and express themselves appropriately as a normal part of their academic performance in a course. Marks may be deducted for inadequate linguistic skills.

Academic Dishonesty: Students should acquaint themselves with the College policy on plagiarism and cheating.

The usual penalty for the first instance of cheating will be a grade of zero for the piece of work in question to all parties involved. A second offense will result in failure in the course. However, under certain circumstances, even a first offense may be penalized by failure in the course. Note that using someone else's laboratory data without authorization is cheating. According to ISEP, the teacher is required to report to the Sector Dean all cases of cheating and plagiarism affecting a student's grade.

Classroom Behavior: Students are expected to maintain proper decorum in the classroom and laboratory. Disruptions or excessive noise will not be tolerated. Students who do not comply with these rules will be asked to leave the class and may be referred to Student Services for disciplinary action. Everyone has the right to a safe and non-violent environment. Students are obliged to conduct themselves as stated in the Student Code of Conduct and in the ISEP section on the roles and responsibilities of students. Remember that mutual respect is the key to a harmonious learning environment.

Cell phones and pagers: During class time, students are expected to give their full attention to the course material. Therefore, cell phones, pagers and equivalent devices must be switched off throughout class time.