DAWSON COLLEGE

PHYSICS
Science
Astrophysics

203-BZA-05 (all sections)
Winter 2017

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Pre-requisites Calculus I (201-NYA-05), Mechanics (203-NYA-05), Waves, Optics & Modern Physics (203-NYC-05)

Co-requisites None

Ponderation 3-2-3 (3 hours of lecture, 2 hours of labs, and 3 hours of work outside class per week)

Course 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.

Detailed information regarding the objectives and standards for this course and the specific performance criteria is available at https://www.dawsoncollege.qc.ca/physics/program-documents/science/.

Course competencies This course will allow the student to fully achieve the competency:
OOUV: To analyze different physical situations and phenomena of interest to engineers and scientists using the fundamental laws of mechanics and to use computers to model various phenomena and to gather data in pertinent experiments.

1. To analyze a wide variety of rotational phenomena using the concepts of dynamics and energy
2. To analyze problems in fluid statics and dynamics
3. To analyze problems in static equilibrium in two- and three-dimensions.
4. To analyze the behavior of materials under tensile and compressive loads.
5. To analyze and solve problems involving beams under a variety of loading conditions
6. To analyze the internal stresses and strains in beams under a variety of loading conditions.
7. To gain enhanced proficiency in the use of computers in a scientific context.

This course also contributes to the partial achievement the competency:
OOUU: To apply what the students have learned to one or more subjects in the sciences.

1. To identify the scientific aspects of a given topic from an interdisciplinary perspective
2. To transfer what they have learned to situations requiring the contribution of more than one discipline
3. To apply systematically an experimental method
4. To solve problems
5. To use data processing technologies
6. To reason with rigor
7. To communicate clearly and precisely
8. To show evidence of independent learning in the choice of documentation or laboratory instruments
9. To work as members of a team
10. To make connections between science, technology and the evolution of society
11. To identify the underlying values underlying their treatment of a topic
12. To place scientific concepts used in a historical context
13. To show attitudes appropriate for scientific work
14. To apply acquired knowledge and skills to new situations

Evaluation 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 grievance. ISEP is available on the Dawson website.

The final exam is *optional*. If a student chooses to write the final exam, there are two grading schemes. **Your final grade will be the higher of the two schemes.**

Assignments, quizzes and class tests[†]	50%	30%
Laboratory activities	20%	20%
Final examination	30%	50%

[†]Your teacher will provide a detailed breakdown of these components and a tentative test schedule during the first week of class.

If a student chooses to not write the final exam, the final exam grade is incorporated into the assignment, quizzes and class test grade. In this case, there is only one grading scheme.

In order to pass the course, students must show a basic understanding of the course material at the level covered in the lectures and in the lab. This is achieved by attaining a final grade of at least 60%, calculated according to the evaluation scheme above. **Note: course work not submitted by the due date may be penalized at the teacher's discretion.**

Required materials

A coursepack is available at the Bookstore.

Teaching methods

The material will be presented using a mix of active learning activities, lectures, in-class problem solving, laboratory experiments and demonstrations. Laboratory periods will be used for experiments as well as class tests and lectures.

Attendance & participation

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 for all material covered or assigned during that class. **Attendance during laboratory experiments and for class tests is however compulsory.** In the rare event that a student for valid reason (*e.g.* due to an intensive course, illness, *etc.*) is or anticipates to be absent during a laboratory experiment or for a class test, the student **must**, where possible, inform the teacher and provide the necessary documents before the absence or, at the latest, on the day of their return. If the absence is excused, students will have the opportunity to complete the assessment.

All other assessments (readings, quizzes, lab activities, *etc.*) missed due to absence are:

- assigned a grade of zero where the absence is not excused;
- given zero weight in the calculation of the final grade where the absence is excused.

For additional information regarding attendance, students should refer to the Institutional Student Evaluation Policy (ISEP section IV-C).

Literacy standards

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

Laboratory work

Experimentation is an essential part of science. Students will be expected to perform experiments and report on their results. Your teacher will provide you with instructions for lab experiments and activities (there is no manual to purchase). **Students must be present during the entire lab activity to receive credit.**

Student conduct

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 (ISEP section II-D). 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's Services for disciplinary action. **Mutual respect is the key to a harmonious learning environment.**

Academic integrity

Cheating, copying, or any other form of academic dishonesty will not be tolerated. Students should acquaint themselves with the policy of the College on plagiarism and 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 (ISEP section V-C). 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 (under certain circumstances, even a first offence may be penalized by failure in the course). A second offence may result in the failure of the course. Students should note that using someone else's laboratory data without authorization from the student and the teacher is cheating.

Intensive course conflicts

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.

Policy on religious observance

Students who intend to observe religious holidays must inform their teachers in writing as prescribed in the ISEP Policy on Religious Observance (ISEP Section IV-D), within the first two weeks of the semester. Forms for this purpose are available from your teacher. Your teacher will inform you of any modifications to planned course activities resulting from the teacher's own religious commitments.

Course content

The material to be covered is contained in the following chapters and sections of the texts.

Weeks	Topics	Content
1–3	Evolution of Astronomical Thought	Greek astronomy; the Copernican revolution; the contributions of Kepler and Galileo
4–6	Universal Gravitation	The Newtonian synthesis; orbital mechanics and the motion of planets, comets and spacecraft; tides and precession
5–6	Earth, Moon, Sun and Sky	The seasons; time and the calendar; eclipses; celestial coordinate systems; navigation
7–8	Atoms and Starlight	The electromagnetic spectrum; blackbody radiation; spectral lines; the Doppler shift
9–10	Tools of the Astronomer	Visible-light telescopes and spectroscopes; radio, infrared, ultraviolet and X-ray astronomy
11–12	The Properties of Stars	The distances, motions, colours and brightnesses of the stars; stellar spectra, and what they can tell us; the Hertzsprung-Russell diagram; binary stars and stellar masses
13–14	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
15	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

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

Comprehensive examination

Second-year students can opt to complete the independent study portion of their comprehensive examination in this course. (This option is not available in continuing education courses.) The project will be evaluated on pass or fail basis independently from the course grade.

Questions outside class

- All regular day program teachers will be available in their respective offices to their students during posted office hours. In the first week, your teacher will inform you of their schedule and will post it outside their office.
- Room 7A.1 is the physics study room. At scheduled times, a teacher or peer tutor will be on duty there to answer your questions. The schedule of teachers and peer tutors will be posted outside of 7A.1 in the 2nd or 3rd week of term.