

**PHYSICS**  
**Science**  
**Waves, Optics & Modern Physics**  
203-NYC-05 (all sections)  
Winter 2014

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<b>Pre-requisites</b>	Mechanics (203-NYA-05), Calculus I (201-NYA-05)
<b>Co-requisites</b>	Calculus II (201-NYB-05)
<b>Ponderation</b>	3-2-3 (3 hours of lecture, 2 hours of labs, and 3 hours of work outside class per week)
<b>Course objectives</b>	<p>To analyze various situations or phenomena associated with waves, optics and modern physics using basic principles. This course is intended to introduce the student to a broad range of physical phenomena involving waves (mechanical waves, sound waves, and electromagnetic waves), geometrical and physical optics, matter waves, and quantum physics.</p> <p>For detailed information regarding the objectives of this course and the specific performance criteria see the Science Program folder on FirstClass.</p>
<b>Course competencies</b>	<p>This course will allow the student to fully achieve the competency:</p> <p>OOOT: To analyze various situations or phenomena associated with waves, optics and modern physics using basic principles.</p> <ol style="list-style-type: none"> <li>1. To apply the basic principles of physics to oscillations and to waves and their propagation .</li> <li>2. To apply the laws of geometrical optics.</li> <li>3. To apply the characteristics of waves to light phenomena (physical optics).</li> <li>4. To analyze a number of situations using concepts from modern physics: the development of quantum mechanics.</li> <li>5. To analyze a number of situations using concepts from modern physics: the physics of the nucleus and radioactivity.</li> <li>6. To verify experimentally some of the laws and principles associated with oscillatory motion, waves, optics and modern physics.</li> </ol> <p>This course also contributes to the partial achievement the competency:</p> <p>OOOU: To apply what the students have learned to one or more subjects in the sciences.</p> <ol style="list-style-type: none"> <li>1. To identify the scientific aspects of a given topic from an interdisciplinary perspective</li> <li>2. To transfer what they have learned to situations requiring the contribution of more than one discipline</li> <li>3. To apply systematically an experimental method</li> <li>4. To solve problems</li> <li>5. To use data processing technologies</li> <li>6. To reason with rigor</li> <li>7. To communicate clearly and precisely</li> <li>8. To show evidence of independent learning in the choice of documentation or laboratory instruments</li> <li>9. To work as members of a team</li> <li>10. To make connections between science, technology and the evolution of society</li> <li>11. To identify the underlying values underlying their treatment of a topic</li> <li>12. To place scientific concepts used in a historical context</li> <li>13. To show attitudes appropriate for scientific work</li> <li>14. To apply acquired knowledge and skills to new situations</li> </ol>

Evaluation	<p>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.</p> <p>There are two grading schemes. <b>Your final grade will be the higher of the two schemes.</b></p> <table><tr><td>Assignments, quizzes and class tests<sup>†</sup></td><td>55%</td><td>35%</td></tr><tr><td>Laboratory activities</td><td>15%</td><td>15%</td></tr><tr><td>Final examination</td><td>30%</td><td>50%</td></tr></table> <p><sup>†</sup>Your teacher will provide a detailed breakdown of these components and a tentative test schedule during the first week of class.</p> <p>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. <b>Note: course work not submitted by the due date may be penalized at the teacher's discretion.</b></p>	Assignments, quizzes and class tests <sup>†</sup>	55%	35%	Laboratory activities	15%	15%	Final examination	30%	50%
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Reference materials	<ol style="list-style-type: none"><li>1. <b>Physics for Scientists and Engineers (with Enhanced WebAssign) by Serway &amp; Jewett, 9th edition</b> or <b>University Physics (with Mastering Physics) by Young &amp; Freedman, 13th edition</b> or <b>Physics for Scientists and Engineers (with Mastering Physics) by Knight, 3rd edition</b>. Custom packages for Dawson College NYA are available at the bookstore which include an access code for the online homework system. Your teacher will tell you which textbook will be used in your section.</li><li>2. <b>Library copies:</b> Copies of the textbook are available on reserve in the Dawson Library.</li></ol>									
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. <b>Attendance at laboratory experiments and tests is compulsory.</b> Students must write the tests at the scheduled times except for unforeseen emergencies confirmed by proper documents. For additional information students should refer to the Institutional Student Evaluation Policy (ISEP section III-C) regarding attendance.									
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). Information about lab report formats is available in the Science Student Handbook which is available on FirstClass (see folder in 'student info' conference). <b>Students must be present during the entire lab activity to receive credit.</b>									
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. <b>Mutual respect is the key to a harmonious learning environment.</b>									
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 students grade (ISEP section IV-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 elses 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 III-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 **Physics for Scientists and Engineers by Serway & Jewett, 9th edition**.

Weeks	Topics	Chapter & Section
1–2	Periodic motion	Ch.15: 1–5; 6, 7 qualitatively (quantitative optional)
2–4	Mechanical waves	Ch.16: 1–5 (6 optional)
4–6	Sound waves and hearing	Ch.17: 1; 2 qualitatively; 3, 4
6–7	Superposition and standing waves	Ch.18: 1–5, 7; 8 qualitatively
8	Electromagnetic waves	Ch.34: 7 (EM spectrum)
8	Nature and propagation of light	Ch.35: all; Ch.38: 6 qualitatively
9	Interference	Ch.37: 1–5
10	Diffraction	Ch.38: 1, 2 (intensity optional), 3, 4
11	Relativity	Ch.39: (1, 3, 4, 7, 8 optional)
12–13	Introduction to quantum mechanics	Ch.40: 1, 2, 4, 5, 7 (8 optional)
14	Atomic physics	Ch.42: 1–3 (9, 10 optional)
14–15	Nuclear physics	Ch.44: 1, 2, 4–6 (8 optional)
15	Applications of nuclear physics	Ch.45: (all optional)

The material to be covered is contained in the following chapters and sections of **University Physics by Young & Freedman, 13th edition**.

Weeks	Topics	Chapter & Section
1–2	Periodic motion	Ch.14: 1–5; 7, 8 qualitatively
3–5	Mechanical waves	Ch.15: all (derivation of wave equation optional)
5–7	Sound and hearing	Ch.16: 1 qualitatively, 3 (Decibel scale only), 4–6, 8 (Doppler effect for EM waves and 9 optional)
8	Electromagnetic waves	Ch.32: 1 qualitatively
8	Nature and propagation of light	Ch.33: 1–4 (5–7 optional)
9	Interference	Ch.35: 1–4 (5 optional)
10	Diffraction	Ch.36: 1, 2, 5, 7 (3, 4 optional)
11	Relativity	Ch.37: (all optional)
12	Photons: Light waves behaving as particles	Ch.38: 1, 4 (8 optional)
13	Particles behaving as waves	Ch.39: 1–3, 5 (6 optional)
14	Quantum mechanics	Ch.40: (all optional)
14–15	Nuclear physics	Ch.43: 1 (spins optional), 2 (excluding models), 3, 4, (5–8 optional)

The material to be covered is contained in the following chapters and sections of **Physics for Scientists and Engineers by Knight, 3rd edition**.

Weeks	Topics	Chapter & Section
1–2	Oscillations	Ch.14: 1–6 (Physical pendulum optional), 7–8 qualitatively
2–5	Traveling waves	Ch.20: all (Doppler effect for light waves optional)
5–7	Superposition	Ch.21: 1–7
7–9	Wave optics	Ch.22: 1–5 (6 optional)
10	Ray optics	Ch.23: 1–3, 5
11	Relativity	Ch.36: (all optional)
11	The foundations of modern physics	Ch.37: 1, 2 (3–8 qualitatively)
12	Quantization	Ch.38: all
13	Wave functions and uncertainty	Ch.39: 6
13	One-dimensional quantum mechanics	Ch.40: (all optional)
14–15	Nuclear physics	Ch.42: 1–3, 5, 6 (4 and 7 optional)

**Comprehensive assessment** Students can opt for an independent study project as part of their comprehensive evaluation. This would count for 10% of the student's final grade, while the usual course mark would count for 90%. Note however that only second-year students are eligible to do their comprehensive evaluation in this course and students who choose this option must notify their teachers by the due date. This option is not available in continuing education courses.

**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 a 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.
- Many teachers in the Science Program – including those from the Physics Department – will communicate with their students via FirstClass. This software allows teachers and students to share information, use email and much more. You can download the necessary (free) software at the following website:

<http://www.place.dawsoncollege.qc.ca>

An instruction manual is available at this website that details how to install and use the software. Also note that a FirstClass app is available for iPhone/iPad, Android, and BlackBerry.