

**Physics 2110A**  
***Oscillations and Waves***  
**Course Information: Fall 2013**

**Course Description** (from the UWO Calendar): A unified treatment of oscillatory and wave motion, with examples from mechanics, electromagnetism, optics and materials science. Topics include simple harmonic motion, forced oscillations and resonance, coupled oscillations, transverse waves on strings and in crystals, longitudinal waves in gases and solids, electromagnetic waves, Fourier methods, nonlinear oscillations and chaos.

*Prerequisites:* Physics 1301A/B or 1401A/B or 1501A/B with a minimum mark of 60% or Physics 1028A/B with a minimum mark of 80%; Physics 1302A/B or 1402A/B or 1502A/B with a minimum mark of 60% or Physics 1029A/B with a minimum mark of 80%, or a minimum mark of 60% in the former Physics 1020 or 1024 or 1026; a minimum mark of 60% in each of (Calculus 1000A/B or 1100A/B or 1500A/B) and (Calculus 1301A/B or 1501A/B), or in Applied Mathematics 1413.

*Pre- or corequisites:* Mathematics 1600A/B, or the former Linear Algebra 1600A/B.

3 lecture hours, 2 laboratory/tutorial hours, 0.5 course.

*Note:* Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

**Instructor:** Dr. John de Bruyn

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Phone: 519-661-2111 ext. 86430

Office: PAB 230

The simplest way to reach me outside of normal class hours is by email. Please contact me using your @uwo.ca email address. I cannot guarantee that I will either receive or respond to email messages that come from an off-campus address.

Office hours: T Th 10:30-11:30.

I will make every effort to be in my office during these office hours. In fact, though, I am usually in my office, and you are welcome to drop in to discuss the course – or anything else – any time I am free.

**Lecture times:** MWF 9:30-10:30, PAB 117

**Lab/tutorials:** T 3:30-5:30, SSC 1032

**Course website:** <http://www.physics.uwo.ca/~debruyn/phys2110/> (public website)

**Owl:** <https://owl.uwo.ca/portal> (log in with your UWO username and password)

I will be using Owl to post course materials, assignments, and grades. Please check the site often!

**Textbook:** *Vibrations and Waves* by George C. King (Wylie, Chichester, 2009)

This textbook can be purchased at the UWO Bookstore. I chose the paperback version to keep the cost down; just imagine what the hardcover edition would have cost!

Additional course materials will be distributed in class or made available on the course Owl site as needed.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any issues or questions regarding accommodation.

**Course Content:** Here is my best guess as to what we will cover (and in what order) over the term. Some of these topics are not covered in the course text, but supplementary readings will be provided as required.

- Review of simple harmonic motion
- Description of oscillations using complex numbers
- Damped oscillations
- Forced oscillations and resonance
- Nonlinear oscillations
- Coupled oscillations
- Travelling waves
- Standing waves
- Fourier methods
- Dispersion
- Quantum wave mechanics

In addition to learning about oscillations and waves, part of the aim of this course is that you become familiar with some important mathematical tools that are important in all areas of physics. You will thus encounter complex numbers, matrices, integrals, and Fourier transforms, to name a few. You will also learn quite a bit about using computers to solve physics problems numerically or graphically.

**Lab/tutorials:** This course will involve a combination of traditional lectures, experiments, computer exercises, small group discussions, and tutorials. The weekly lab/tutorial period is therefore an essential part of the course and your attendance there is expected, just as it is at the lectures. Note that 10% of your final grade will be based on your attendance and your active participation in the class. As part of the lab/tutorials you will learn how to use the Matlab software package to do calculations, analyze data, and plot data graphically. Some of the homework assignments will require the use of Matlab. Matlab is also used in several later Physics courses. You will also be doing some experiments, but they will be relatively simple experiments. You will have the opportunity to discuss them with your classmates and instructors, but you will not have to write up any lab reports. The tutorial periods will also provide you with an opportunity to discuss homework assignments with the course instructor and TAs.

**Evaluation:** Your final grade in this course will be based on your work over the term, and calculated as follows:

Assignments (6)	25%
Midterm test	25%
Final examination	40%
Participation	10%

Assignments will be posted online approximately every other week. Paper versions will be made available on request. Assignments not submitted by the due date will be docked marks unless the instructor is provided with a documented medical or other valid excuse at the time the assignment is submitted.

The midterm test will be a one-hour written exam. It is tentatively scheduled for Monday, October 28, during the normal class time (9:30-10:30 A.M.), either in the normal lecture room (PAB 117) or nearby. The content and format of the test will be discussed in class.

The final exam will be a three-hour exam held during the winter exam period. It will cover the entire course. The format of the exam will be discussed in class.

The exam time will be posted on the course web site when it becomes available. Students needing to make travel arrangements are advised to book a travel date *after the end* of the examination period. *No makeup exams will be given to accommodate travel!*

The midterm and final exam may involve some multiple-choice questions. Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

The use of hand-held calculators during the test and exam is permitted (and in fact will likely be necessary). The use of cell phones, laptop computers, iPods, MP3 players, etc., or devices with networking capability is not permitted during tests and exams.

Frequently during the lectures and lab/tutorials, you will be expected to take part in small group discussions with your classmates or to participate in classroom experiments or demonstrations, or to otherwise contribute actively to the course. Your participation grade will be based on the frequency and quality of your contributions.

Test and homework grades will be posted regularly on the class Owl site. Any errors or appeals of your grades must be reported to your instructor within two weeks of their initial posting.

### **Accommodations for Religious Holidays**

When scheduling unavoidably conflicts with religious holidays which a) require an absence from the University or b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate department chair and, if necessary,

the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

A student who, for either of the situations outlined in paragraph one above (a or b), is unable to write examinations and term tests on a Sabbath or Holy Day in a particular term shall give notice of this fact in writing to his or her Dean as early as possible, but not later than November 15 for mid-year examinations and March 1 for final examinations, i.e., approximately two weeks after the posting of the mid-year and final examination schedule respectively. In the case of mid-term tests, such notification is to be given in writing to the instructor within 48 hours of the announcement of the date of the mid-term test. If a Special Examination is offered as an alternative means to satisfy the academic requirements, the instructor(s) in the case of mid-term tests and the dean in the case of mid-year and Spring final examinations will arrange for special examination(s) to be written at another time. In the case of mid-year and Spring final examinations, the accommodation must occur no later than one month after the end of the examination period involved. It is mandatory that students seeking accommodations under this policy give notification before the deadlines and that the Faculty accommodate these requests.

For purposes of this policy the University has approved a list of dates which are recognized religious holidays which require members of those religions to be absent from the University; this list is updated annually and is available at Departmental, Deans' and Faculty advising offices.

### **Make-up Policy**

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

[http://www.uwo.ca/univsec/handbook/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf)

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

<http://www.uwo.ca/univsec/handbook/appeals/medicalform.pdf>

Unless the instructor is informed in advance, there will be no provision made for making up assignments or tests missed for reasons other than the above.

### **Support Services**

Registrar's Office: <http://www.registrar.uwo.ca/>

Western Student Services: <https://studentservices.uwo.ca/secure/index.cfm>

USC Student Support Services: <http://westernusc.ca/services/>

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

### **Final Examination**

In accordance with Senate Policy, a Special Examination will be held within thirty days of the regular final examination for students who are unable to write the regular examination for medical or other documented reasons. Requests for such a Special Examination must be made to the Associate Dean, Faculty of Science.

Note that if you fail to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

### **Cheating (Scholastic Offenses)**

Scholastic offenses are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offense, at the following Web site:

[http://www.uwo.ca/univsec/handbook/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf)

### **Plagiarism**

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

I encourage students to work together on assignments, etc., but each student must write up their own assignment independently. If you have collaborated extensively with a colleague on an assignment, say so on the submitted work. This will not be held against you, and is far better than being accused of copying!

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

### **Classroom Conduct**

Disruptive behaviour will not be tolerated in class. Please respect the rights of your classmates to benefit from the lecture by limiting your conversations to those essential to the class. Students who persist in loud or rude behaviour will be asked to leave.

### **Complaints and Suggestions**

If you have a concern about something, please let us know. We rely on your feedback. Please contact initially the person most directly concerned; this will usually be your instructor. If that is not satisfactory, or if there is something more general bothering you, talk it over with the Physics & Astronomy Department Chair or the Associate Chair of Undergraduate Studies (for contact information see <http://www.physics.uwo.ca>).