

# PHYSICS 1028 – PHYSICS FOR THE BIOLOGICAL SCIENCES I

## COURSE SYLLABUS

### 1. COURSE DESCRIPTION

*Physics 1028 – Physics for the Biological Sciences I* (3 lecture hours, 3 laboratory hours, 0.5 course): Fundamental physics concepts are introduced with examples of biological and medical applications. Topics include kinematics, forces, energy, linear momentum, collisions, rotational motion, torque and angular momentum, geometric optics and microscopes.

**Pre-requisites:** One of the following: Grade 12U Advanced Functions (MHF4U), Mathematics 0110A/B.

**Anti-requisites:** Physics 1021, 1301A/B, 1302A/B, 1401A/B, 1402A/B, 1501A/B, 1502A/B, the former Physics 1020, 1024, 1026.

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.

### 2. COURSE OBJECTIVES

- Develop basic understanding of fundamental physics concepts related to linear and rotational motion, work and conservation of energy, momentum, and geometric optics.
- Develop problem-solving and critical-thinking skills.
- Understand and apply various physics concepts in relation to biological models or processes.
- Engage in critical analysis of a problem individually and through team effort, effectively communicating your approach to others through lab reports, forums, and in-class peer instruction.

### 3. COURSE LEARNING OUTCOMES

By the end of the course, students will be expected to meet the specific learning outcomes identified in the course document *Learning Objectives and Outcomes*. Use the document as a checklist to ensure complete coverage and understanding of the required topics or skills.

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#### Land Acknowledgement

*Western University is situated on the traditional territories of the Anishinaabeg, Haudenosaunee, Lunaapeewak and Attawandaron peoples, who have longstanding relationships to the land and region of southwestern Ontario and the City of London. The local First Nation communities of this area include Chippewas of the Thames First Nation, Oneida Nation of the Thames, and Munsee Delaware Nation. In the region, there are eleven First Nation communities and a growing Indigenous urban population.*

*Western values the significant historical and contemporary contributions of local and regional First Nations and all of the Original peoples of Turtle Island (North America).*

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#### 4. INSTRUCTIONAL TEAM

<b>Instructors</b>	Dr. Tamie Poepping (Course Coordinator) Dr. Eugene Wong Dr. Robert Sica
<b>Office Hours</b>	Student Help Centre
<b>Course Administrator</b>	Dr. Maryam Tabeshian
<b>Contact Info</b>	Reach us at <a href="mailto:phys1028@uwo.ca">phys1028@uwo.ca</a> for <b>administrative issues</b> that can't be posted to the chat forum. Allow 2-3 working days for a response from the instructors or course administrator. Post all physics-related questions to the Help Centre or Perusall Chat forum so they can be answered once for the benefit of all. <ul style="list-style-type: none"><li>• Note: We will not respond to email from addresses other than your UWO email account (<b>@uwo.ca</b>) as we cannot ensure the legitimacy of the sender from other sources; also emails from other sources often won't make it through the UWO spam filter.</li></ul>
<b>Lab Instructor</b>	Dr. Shailesh Nene ( <a href="mailto:physlab1@uwo.ca">physlab1@uwo.ca</a> ) for all concerns related to the labs.

#### 5. COURSE DELIVERY

***All components of this course will be online for Fall 2020.***

**The Online Western Learning (OWL)** system at <http://owl.uwo.ca> will be the launching platform for all of the online components. Log in using your UWO username and password, then find the PHYSICS 1028A 001 FW20 OWL site. Key buttons to explore:

- **00 Getting Started:** This starting point will provide an introduction to the course and some of the platforms being used.
- **## Lesson Units:** Each unit has a corresponding tab in the menu bar (e.g. 01 Kinematics). There are 6 units, with each expected to span about 2 weeks.
- **Announcements:** important notices and reminders will be posted here. You can set your Preferences (menu beside your name in top banner) to send an email daily or for each posting.
- **Gradebook:** Grades for all course evaluation components will be posted here.
- **Help Centre:** This links to the course Student Help Centre OWL site where you have been assigned to a smaller tutorial group. Follow the instructions on the Help Centre OWL site to sign up to your group. You can post questions any time at your convenience onto the VoiceThread platform: Take a photo of the problem and your solution attempt, upload it to VoiceThread, share with your group, and a course TA will provide a response within 48 hours.
- **Labs:** Videos, worksheets, data, and lab quizzes can be accessed from here.
- **Mastering Physics:** Your physics-assignment platform for completing problems and course quizzes (except lab quizzes above on OWL).
- **Perusall:** Your e-book platform with collaborative annotation assignments is where you can read and collectively discuss the course material within a subgroup of 50 students as we progress through the course. Use the Chat board to post questions on textbook material, so that everyone can collectively benefit from (and contribute to) the discussion. Visit Western's Bookstore online to purchase the access code for your course textbook and the lab manuals, which will be redeemed on Perusall.

Students are responsible for checking OWL on a regular basis. All course material will be posted to OWL: <http://owl.uwo.ca>. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance on technical issues in OWL, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## 6. COURSE MATERIAL

Visit Western's online bookstore to find your course material (enter Physics 1028 in the search tool) and purchase both the e-book package (i.e. College Physics e-Text + Mastering Physics) and the laboratory manual, which will provide access codes for these online materials. To access these digital materials, you will need to follow the corresponding links in the course OWL site and then redeem the appropriate access codes.

- **E-book package:** This provides 2 access codes: one for your e-book (*Sears & Zemansky's College Physics, 11<sup>th</sup> ed.*, by Young & Adams) and one for the accompanying physics-assignment platform (Mastering Physics), and.
  - On OWL, follow the Perusall button for the e-book platform. Then in *Perusall*, the first time you click on the *College Physics* book in the Library or on a reading assignment from the book, you will be prompted to purchase the book. Click "Enter an access code" in the top bar, and then enter the access code you received from the bookstore. If you have issues, use the "? Help" button in the top banner in Perusall.
  - On OWL, follow the *Mastering Physics* button for the assignment and quiz platform. You will need to register using your Western email address, the course ID (poepping43995), and your purchased Mastering Physics access code. Follow the steps carefully in the PDF posted under *Getting Started* on OWL. Failure to use your Western email address will result in no grades given to your assignments and quizzes. If you have issues accessing Mastering Physics, contact Pearson Support on the Mastering Physics site or send an email to [phys1028@uwo.ca](mailto:phys1028@uwo.ca).
- **Lab Manual:** Be sure to purchase the correct course lab manual from the bookstore. The digital lab manual is also hosted on Perusall. On OWL, follow the Perusall button, and then in Perusall, select the *First Year Physics Laboratory Manual* under Library in the left sidebar. You will be prompted to enter the access code.

## 7. COURSE EVALUATION

Weekly Reading & Discussion Posts	10%	• Best 10 of 12 weeks counted; completed on Perusall.
Assignments	20%	• Best 5 of 6; completed on Mastering Physics.
Labs	8%	• 4 total; Follow Labs tab on OWL for further details.
Quizzes	40%	• 4 total; missed quiz requires a makeup quiz.
Final Examination	22%	• Date & time to be announced by Registrar's Office.

See the document ***Physics 1028 Course Schedule*** for details of timelines and deadlines.

***Weekly reading & discussion assignments on Perusall:*** Weekly assignments involve collaborative readings of the course e-book (or other posted text/video content) in Perusall, followed by posting comments and/or responses to stimulate discussion. Follow the Perusall link in OWL, and then find the Assignments in the left sidebar in Perusall. One of the first assignments is on 'How Perusall Works'.

***Assignments on Mastering Physics:*** 6 assignments are to be completed to help you gain deeper understanding of physics concepts and problem-solving. Your best 5 of 6 scores will be counted.

***Labs:*** Students are required to complete **all 4 labs**.

- Direct all lab-related questions to the lab instructor, Dr. Shailesh Nene ([physlab1@uwo.ca](mailto:physlab1@uwo.ca)).
- The complete lab manual is available for reading in your **Perusall** Library after you have redeemed the lab manual access code purchased from the Western Bookstore. The worksheets cannot be printed from Perusall but are available for downloading via the Labs tab on the course OWL site.
- All labs will be completed with pre-collected data to accommodate the pandemic restrictions.
- **Pre-lab quiz on OWL:** as a replacement for submitting the *pre-lab* worksheets, complete the corresponding OWL quiz before proceeding to complete the lab and lab worksheets. You need

a quiz score of >75%, but you have unlimited attempts to complete the pre-lab quiz. Failure to meet this requirement will lead to zero on the lab.

- **Lab worksheets:** download the lab worksheets from the OWL Labs tab. These can be completed electronically, or alternatively printed, completed, and scanned (or photographed), for submission via the Gradescope link on OWL. Visit the Labs tab on OWL for further details.
- The first **Measurements & Uncertainties Lab** is an exception – it involves a reading assignment on Perusall, followed by working through the exercises from the pre-lab *and* lab worksheets, and then completing an online OWL quiz in lieu of submitting any worksheets.
- Any student who has taken the physics course previously and is seeking **lab exemption**, please contact us as soon as possible at [phys1028@uwo.ca](mailto:phys1028@uwo.ca). We advise you not to miss any of your lab deadlines until you receive an email confirming laboratory exemption.

**Quizzes on Mastering Physics:** Your understanding of the course content will be assessed over the term through 4 quizzes available on Mastering Physics. Each will be available for a 6-hour window on the dates shown below. You will have a set time (1-3 hours as specified on Mastering Physics) to complete a quiz once you have started. *Do not open the quiz until you are ready to take the full quiz.* Communicating contents of the quizzes to others in any fashion (verbally, via social media, email, printouts, or any other means) is considered cheating; see 9.B below regarding cheating.

- **Quiz dates:** Wednesdays 9:00 a.m.–3:00 p.m.; Oct. 7, Oct. 28, Nov. 25, Dec. 9.

**Final examination:** The final exam will be online and monitored using ProctorTrack. The date and time will be determined and announced by the Office of the Registrar in November.

**Grades:** All scores will be posted in the Gradebook on the course OWL site. Any errors, or appeals to your scores, must be reported to your instructor (via [phys1028@uwo.ca](mailto:phys1028@uwo.ca)) *within two weeks* of their initial posting. *Please note:* a) your *final exam* mark will only be posted to OWL after the end of the exam period, b) your *final course grade* must come officially from the Registrar's Office and will not be posted on OWL, and c) *final course grades* may need to be adjusted in order to conform to department policy.

## 8. **ACCOMMODATION AND ACCESSIBILITY**

Please refer to the UWO Academic Policies [http://www.uwo.ca/univsec/academic\\_policies/](http://www.uwo.ca/univsec/academic_policies/) for further details on the policies in practice here.

**Accommodation Policies** — Students with disabilities should work with Western's Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

**Academic Consideration for Student Absence** — Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. *All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a **student's Home Faculty**.*

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

and for the Student Medical Certificate (SMC), see:

[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

**Religious Accommodation** — Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

## 9. **ACADEMIC POLICIES**

The website for Registrarial Services is [www.registrar.uwo.ca](http://www.registrar.uwo.ca). In accordance with policy, [www.uwo.ca/its/identity/activatenonstudent.html](http://www.uwo.ca/its/identity/activatenonstudent.html), the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

### **A. Make-up Policy:**

- a) *Assignments* – 6 assignments will be available online over the course term; the best 5 of 6 are counted, thus your lowest mark will be dropped, which allows you to miss 1 assignment without penalty – preserve and apply it wisely as no make-up assignments will be given.
- b) *Labs* – All labs are completed remotely, and thus all labs must be completed, and no makeup labs are offered. An incomplete lab will be recorded as a zero and included in your lab average score.
- c) *Weekly reading assignments* – As the weekly readings are to prepare for the week's material, no makeup content will be available. The best 10 of 12 weekly scores are counted, which allows you to miss 2 weeks of contributing to the reading discussions without penalty.
- d) *Quizzes* – All quizzes will be counted over the course term. A missed quiz requires completing a makeup quiz one week after the original; a missed make-up quiz will lead to a zero for that quiz.
- e) *Final Examination* – In accordance with Senate Policy, a Special Examination will be held within thirty days of the regular final examination for students who were 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 via an Academic Counsellor. Note that if you fail to write the 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 (e.g. the following December for this course).

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 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, see [http://www.uwo.ca/sci/undergrad/academic\\_counselling/](http://www.uwo.ca/sci/undergrad/academic_counselling/).

### **B. Cheating and Plagiarism**

*“Success (and failure) will come and go, but integrity is forever” - Amy Rees Anderson*

University Policy states that cheating, including plagiarism, is a major scholastic offence. Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following: [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

As per the UWO Academic Policies:

- 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.
- All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).
- 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.

### **C. Online Course Conduct & Netiquette:**

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Only students using their UWO credentials will be permitted to access the course elements. If, for privacy reasons, you wish to use a pseudonym, you must have the pseudonym pre-approved by the course coordinator before being allowed to participate in any online component.

If you are experiencing any online harassment or bullying through the course platforms, report the behaviour immediately to the course coordinator. Perusall has a built-in option to flag an inappropriate comment (look for the exclamation icon), with automatic notification sent to the instructors.

Anyone posting inappropriate content or abusing the option to flag inappropriate content will be banned from further interactions, which eliminates any further grades or marks related to the collaborative platforms.

General considerations of “netiquette”:

- Use your computer and/or laptop if possible (as opposed to a cell phone or tablet).
- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Use proper grammar and spelling. Cite the ideas of others appropriately.

**D. Remote Proctoring Software** Tests and examinations in this course will be conducted using the remote proctoring service, Proctortrack. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link: <https://www.proctortrack.com/tech-requirements/>

**E. 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 Affairs (for contact information see <http://www.physics.uwo.ca>).

## 10. SUPPORT SERVICES

**Accessibility** — Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

**Counseling** — Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

**Learning Skills** — Learning-skills counsellors at the Student Development Centre ([www.sdc.uwo.ca](http://www.sdc.uwo.ca)) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

**Mental Health** — Students who are in emotional/mental distress should refer to Mental Health@Western ([www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_health)) for a complete list of options about how to obtain help.

**Science Student Donation Fund** — This course gratefully acknowledges support from the Science Student Donation Fund. If you are a B.Sc. or B.M.Sc. student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you contribute to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of lab equipment integral to teaching this course. However, you may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Counselling site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the chair of the department or email the Science Students' Council at [ssc@uwo.ca](mailto:ssc@uwo.ca). In the front pages of your lab manual, you will find examples of some the lab equipment partially funded through the Science Student Donation Fund.

**Student Council** — Additional student-run support services are offered by the USC, [westernusc.ca/your-services/#studentservices](http://westernusc.ca/your-services/#studentservices).

# Course Schedule

Week	DATE	Unit	CHAPTER	TOPIC	READING ON PERUSALL (Young & Adams) (weekly prep reading due start of week, Monday noon)	Phys 1028 LABS (due Sunday 23:55)	ASSIGNMENT (due end of week, Sunday 23:55)	QUIZ / EXAM
<b>Sept 9, 2020</b>		<b>Welcome - Course Intro Video</b>			<i>Syllabus, How Perusall Works</i>			
	Sept 11				1.1-1.4			
1	Sept 14-18	1.1	Kinematics: 1-D Motion	Position, Displacement, Velocity, Acceleration  Constant Acceleration & Kinematic Equations	2.1-2.3  2.4-2.6 (excl. 2.7)	Measurements & Uncertainties Lab (via Perusall & OWL quiz)	Assign #1 (due Sunday Sept 27, 23:55) - Kinematics	
2	Sept 21-25	1.2	Kinematics: 2-D Motion	Vectors 2-D velocity, Acceleration Projectile motion uniform circular motion	1.5-1.8 3.1-3.2 3.3 3.4 (excl. 3.5)			
3	Sept 28-Oct 2	2.1	Dynamics: Newton's Laws of Motion	Forces & Newton's 1st Law  Newton's 2nd Law Newton's 3rd Law	4.1-4.4  4.5-4.6		Assign #2 (due Oct 4, 23:55) - Dynamics (Ch. 4)	
4	Oct 5-9	2.2	Dynamics: Applications of Newton's Laws	Friction  Elastic Forces	5.1-5.3  5.4			Quiz #1 (Wed Oct 7) on Assign 1-2
			Dynamics: Circular Motion	Circular Motion	6.1 only			
5	Oct 12	<b>THANKSGIVING</b>						
	Oct 13-16	3.1	Work & Energy	Work, Kinetic Energy, & Work-energy theorem  Potential Energy, Conservation of Energy	7.1-7.4  7.5-7.8	Work & Energy lab	Assign #3 (due Oct 25, 23:55) - Work & Energy	
6	Oct 19-23	4.1	Work & Energy Momentum	Conservative & non-conservative forces Momentum, Conservation of Momentum	7.7 8.1-8.2			
7	Oct 26-30	4.2	Momentum	Inelastic collisions  Elastic collisions  Impulse  2D example + one more problem/demo	8.3  8.4  8.5 (8.6-8.7 in Wk 9) (excl. 8.8 rocket)		Assign #4 (due Nov 1, 23:55) - Momentum	Quiz #2 (Wed Oct 28) on Assign 1-3
8	Nov 2-8	<b>FALL READING WEEK</b>						
9	Nov 9-13	5.1	Rotational Motion	Angular quantities, Constant angular acceleration  Rotational KE - Moment of Inertia  Rotation about moving axis, Centre of Mass	9.1, 9.3 (excl. 9.2)  9.4  9.5, 8.6, 8.7		Assign #5 (due Nov 22, 23:55) - Rotation	
	(Nov 12: course drop deadline)							
10	Nov 16-20	5.2	Dynamics of Rotational Motion	Torque, vectors  Angular Momentum	10.1- 10.2 (excl. 10.3 Work & Power) 10.4, 10.5, 10.7			
11	Nov 23-27	5.3 6.1	Dynamics of Rotational Motion Electromagnetic Waves	Equilibrium  Reflection, Refraction, Total Internal Reflection	10.6  23.1-23.3, 23.6-23.8	Equilibrium lab	Assign #6 (due Dec 6, 23:55) - Optics	Quiz #3 (Wed Nov 25) on Assign 4-5
				Dispersion	23.9			
12	Nov 30-Dec 4	6.2	Geometric Optics	Mirrors  Lenses  Optical Instruments	24.1, 24.2, 24.3 (skip 24.4)  24.5, 24.6  25.2	Microscope lab		
13	Dec 7-9	6.3	Optical Instruments Physical Optics	Magnifier, Microscope Interference, two slits, thin film  Diffraction	25.3, 25.4 26.1, 26.2, 26.3  26.4, 26.5, 26.6	(due Wed Dec 9)		Quiz #4 (Wed Dec 9) on Assign 6
	Dec 10	<b>UWO Study Day</b>			<b>No Classes / No Exams</b>			
	Dec 11-22	<b>Exam period</b>						Final Exam (date TBA)