UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Physics & Astronomy
Science B 605
403 220-5385
phasoffice@ucalgary.ca

COURSE OUTLINE

1. **Course:** PHYS 321, Harmonic Motion, Waves & Rotation - Winter 2019

   Lecture 01: MWF 09:00 - 09:50 in TISTUDIOAB

Instructor	Email	Phone	Office	Hours
Dr. Anna Harlick	anna.harlick@ucalgary.ca	403 220-8648	SB 533	Every Day, 10:00 am - 11:00 am

   Lecture Sections: L01: MWF 09:00-09:50 | TI STUDIO A/B

   Tutorials: L01: R 14:00 – 15:30 | TI STUDIO A/B

   Course Website: d2l.ucalgary.ca

   Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

   MasteringPhysics Course ID – **UOFCPHYS321W19**

   TopHat Course ID: W2019PHYS321, Join Code: **868610**

   Course Site:

   D2L: PHYS 321 L01-(Winter 2019)-Harmonic Motion, Waves & Rotation

   Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   Physics 211 or 221 and Mathematics 211 or 213 and Mathematics 267 or 277 or 253 or Applied Mathematics 217.

   Antirequisite(s):
   Credit for Physics 321 and 227 will not be allowed.

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Comments
Assignments (6)	15%	See schedule at the end of the outline for details. See section a) for the details
Mini Quizzes (4)	10%	See schedule at the end of the outline for details. See section b) for the details
Activities	10%	See section c) for the details
Presentation	5%	See section d) for details
Midterm Tests	25%	Midterm 1 - **February 11th**, 2019, IN CLASS Midterm 2 - **March 11th**, 2019, IN CLASS *Note: In final grade calculation the midterm with the higher score will be worth 15% and the midterm with lower score will be worth 10%.*
Final Exam	35%	To be scheduled by the Registrar's Office

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar.

The course grade expressed as a percentage is calculated from the percentage grades of the separate course components with weights indicated above. A table for the conversion of percentage grades for the course to letter grades is provided below. The percentage grade for the course must be equal to or larger than the stated value to obtain a certain letter grade, without rounding.

Any missed course component will be assigned a zero grade, unless a valid reason as described in the University Calendar is presented with appropriate documentation (for example a doctor's note).

This course has a registrar scheduled final exam.

a) Homework assignments: Six assignment due as listed in the schedule. Assignments will be done **online in Mastering Physics**. Students need to register in Mastering Physics (instructions below) **no later than Friday, January 18, 2019**. Detailed instructions are given below. Last-minute technical problems are not a valid excuse for missing the due date of any assignment.

b) Mini-Quizzes – approximately every second Monday, following a closing of an assignment, a mini-quiz (10 minutes, 1 question based on a previous assignment) will be administered in the beginning of the class. There will be 4 mini quizzes (see schedule for dates), worth 2.5% each for total of 10%. In case they are missed, their

weight gets automatically added to the final exam.

c) Activities The **marked** activities will commence on **Monday, January 21st, 2019.** All activities will be accessed through the same TopHat site (W2019PHYS321, Join Code: 868610). The grades for individual components will be posted on D2L at the end of the semester).

In class	Individual In-Class Assignments [2.5%]	Answers to variety of problems presented in class, both conceptual, qualitative and quantitative. Submitted using both TopHat system and on paper. The TopHat submissions are marked 50% for participation and 50% for correctness. Hand-written submissions are **not** marked for correctness.
	Group In-Class Assignments [2.5%]	Hand-written answers to variety of problems presented in class, both conceptual, qualitative, and quantitative; theoretical, experimental, and problem solving. Marked 50% for participation and 50% for correctness.
At home	Pre-Class Questions [2.5%]	Administered using TopHat. After a previous class a question regarding the material in the upcoming class will be posted. Marked 75% for participation and 25% for correctness.
	Post-class Questions [2.5%]	Administered using TopHat system. After each class a question regarding the material covered in class will be posted. The question will be available until the beginning of the next class. Marked 75% for correctness and 25% for participation.

d) Presentation – Students will be responsible for scheduling (preferably during office hours) a 10 minute slot for a 5 minute presentation on a topic relevant to the course (of student's choice). Presentation will be delivered without any aids other than a whiteboard. The presentation can be delivered during **February** and **March** only. Students who deliver a presentation in February and are not happy with their assessment can redo it in March with a possibility of improving their grade. If the second presentation is less successful, the higher of the grades will be awarded. As there are two months allowed to complete the presentation, there is **no option** to transfer the weight of the presentation into any other component of the course (e.g. final exam)

e) Tutorials/ Problem Solving Sessions - A tutorial is scheduled on Thursdays between 2:00 pm – 3:30 pm in TI STUDIO D/E. The tutorials will consist of problem solving session that will last approximately 1h. After that time, the students will be presented with an exam-style question followed by a solution presented by the instructor, while the students will correct their work and submit it. The work will not be marked for correctness, but participation in tutorials will be worth total of **2% bonus** marks which can be used to supplement marks for components described in sections a), b) and c).

4. **Missed Components Of Term Work:**

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see Section N.1; for more information regarding the use of statuary declaration/medical notes, see FAQ). Absences must be reported within 48 hrs.

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize themselves with these regulations. See also Section E.3 of the University Calendar.

Any missed course component will be assigned a zero grade, unless a valid reason as described in the University Calendar is presented with appropriate documentation (for example a doctor's note).

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Recommended Textbook(s):

Randall A. Knight, *Physics for Scientists and Engineers*: Pearson.

Online Course Components:

Mastering Physics is used for assignments. Students must register in Mastering Physics to do the homework assignments. Do not wait until the due date of the first assignment to do this! Access to Mastering Physics is included with the purchase of a new textbook. **You may already have access if you used Mastering Physics in the Fall term or last year**. Please check this before proceeding. **If you choose to just access the MasteringPhysics assignments without purchasing access** to the study material please email Pearson at ucphysics.mastering@gmail.com to get an access code and registration instructions. You will be able to access only the assignments.

If you have a MasteringPhysics account, **Sign In** at http://www.masteringphysics.com and enter your Username and Password. If you cannot remember your username or your password, click Forgot your username or password? and enter the email address you used to register for MasteringPhysics. Your login name and password will be sent to your email.

If you have purchased the package with MasteringPhysics in the bookstore:

- Go to www.masteringphysics.com and click **Students** under **Register**.
- To register using the student access code above, Click **In US or Canada** under **Select Your Location**.
- Select **No, my course doesn't require an ID** Click **Next**.
- Select **Yes, I have an Access Code** Click **Next**.
- **License Agreement and Privacy Policy:** Click **I Accept** to indicate that you have read and agree to the license agreement and privacy policy.
- Select the appropriate option under "Do you have a Pearson Education account?" Continue to give the requested information until you complete the process. The **Confirmation & Summary** page confirms your registration. This information will also be emailed to you for your records. You can either click **Log In Now** or return to www.masteringphysics.com later.

Top Hat (tophat.com) is used for collecting responses to individual in-class assignments, completing pre-readings and post-class questions.

7. **Examination Policy:**

Miderm 1 covers material from the beginning of the semester **up to and including** material covered on February 4th, 2019.

Midterm 2 covers material from February 6th **up to and including** material covered on March 4th, 2019.

Final Exam is cumulative.

Use of books is not allowed on the exams. Use of a calculator is allowed and recommended. Use of electronic devices with a camera, mass storage, or wireless communication is not allowed on exams, except when determined a necessity for students. Calculator software on mobile phones or similar devices, and "smart watches" are not allowed on the exams. Use of a ruler is allowed, and may be recommended because exams can include problems with graphs.

Students should also read the Calendar, Section G, on Examinations.

All exams will include short-answer conceptual question and quantitative problems that could have multiple parts. Exam regulations as outlined in the university calendar are also applicable to the midterm exams.

Grading of exams will be based on clarity and completeness of the method used to derive the answer, and correctness of the answer including correct units. Illegible text will not be marked. Scratched-out sections of exam papers will not be marked.

Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

   There are no mandatory or optional course supplemental fees for this course

9. **Writing Across The Curriculum Statement:**

   For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

   Exams will be graded based on clarity and completeness of answers provided. Otherwise, there is no assessment of student's writing in this course. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:**

    Students will not participate as subjects or researchers in human studies.

    See also Section E.5 of the University Calendar.

    Students will not be asked to participate in or be subjects of any human studies. See also Section E.5 of the University Calendar.

11. **Reappraisal Of Grades:**

    A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

    a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections I.1 and I.2 of the University Calendar

    b. **Final Exam:** The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

    a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

    b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

    c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208 .

    d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if

it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples**.

e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at procedure-for-accommodations-for-students-with-disabilities.pdf.

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics & Astronomy, Dr. David Feder by email phas.ahugrd@ucalgary.ca or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See Section E.4 of the University Calendar.

g. **Safewalk:** Campus Security will escort individuals day or night (See the Campus Safewalk website). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

i. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: suvpaca@ucalgary.ca.

j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.

k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

l. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

a. ***cademic Misconduct: Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties.***

b. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the

information on assembly points.

c. **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics and Astronomy, Dr. David Feder, by email (dfeder@ucalgary.ca) or by phone (403.220.3638).

d. **Safewalk:** Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

e. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also http://www.ucalgary.ca/secretariat/privacy.

f. **Student Union Information:** VP Academic Phone: 220-3911 Email: suvpaca@ucagary.ca.

SU Faculty Rep: Phone: 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca

Student Ombuds Office: 403 220-6420

Email: ombuds@ucalgary.ca; http://ucalgary.ca/provost/students/ombuds

g. **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

h. **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

4. **OTHER COURSE RELATED INFORMATION:**

a. **Course Description**

Newtonian mechanics of rigid body rotation. Simple harmonic oscillations. Progressive waves in one dimension. Energy of a wave. Superposition. Standing waves. Static and dynamic fluids. Elasticity.

b. **Course Learning Outcomes**
   a. Students will be able to define and characterize rotational, oscillatory, wave and fluid motion.
   b. Students will be able to recognize and explain forces governing rotational, oscillatory and fluid motion as

well as forces acting on an object in fluids.

c. Students will be able to identify and mathematically describe rotational, oscillatory, wave, and fluid motion.
d. Students will be able to give examples of oscillations, waves, as well as statics and dynamics of rigid bodies and fluids in real systems.
e. Students will be able to apply calculus to solve quantitative and qualitative problems on rigid body rotation, oscillations, traveling and standing waves, and static and dynamic fluids.
f. Students will be able to analyze real systems and apply appropriate models to simplify and evaluate them.

c. **Course Learning Incomes**

a. Students can describe and analyze motion of a particle in one and two dimensions.
b. Students are able to define Newton's Laws and state conditions of static equilibrium.
c. Students are able to apply kinematic equations, Newton's Laws and conservation of momentum and mechanical energy principles to solve quantitative and qualitative problems.
d. Students are able to solve systems of algebraic equations.
e. Students are able to recognize and manipulate vectorial variables.
f. Students can apply calculus to solve quantitative problems.

Schedule:

Week	Dates	Topic	Important Items	Book Chapter
1	11-Jan-19	Introduction to course		
2	14-Jan-19	Rotational motion		10.1
	16-Jan-19	Rotation about the center of mass		10.2-10.3
	18-Jan-19	Rotational energy		10.4
3	21-Jan-19	Calculating moment of inertia		10.5
	23-Jan-19	Torque	Assignment 1 due 23:59 on Jan 27th	10.6
	25-Jan-19	Rotational dynamics		10.7
4	28-Jan-19	Work and rotational kinetic energy	Mini Quiz Jan 28th	10.8
	30-Jan-19	Static Equilibrium		12.1-12.2
	1-Feb-19	Rolling Motion		11.1-11.3
5	4-Feb-19	Vectorial Description of Rotational Motion		11.4
	6-Feb-19	Angular Momentum	Assignment 2 Due 23:59 on Feb 10th	11.5-11.9
	8-Feb-19	Angular Momentum		
6	11-Feb-19	**MIDTERM 1**		
	13-Feb-19	Simple harmonic motion		15.1
	15-Feb-19	Simple harmonic motion		15.1
7	18-Feb-19	Reading Week. No Lectures/Tutorials.		
	20-Feb-19			
	22-Feb-19			
8	25-Feb-19	Energy in simple harmonic motion		15.2
	27-Feb-19	Dynamics of simple harmonic motion	Assignment 3 Due 23:59 on March 3rd	Course Notes
	1-Mar-19	Vertical oscillations		Course Notes
9	4-Mar-19	Applications of Simple Harmonic Motion	Mini Quiz March 4th	Course Notes
	6-Mar-19	Pendulums		15.3-15.4
	8-Mar-19	Damped and Driven Oscillations		15.5-15.6
10	11-Mar-19	**MIDTERM 2**		
	13-Mar-19	Traveling Waves	Assignment 4 Due 23:59 on March 17th	16.1-16.3, 17.2
	15-Mar-19	Wave Equation		16.4
11	18-Mar-19	Sound intensity and intensity levels	Mini Quiz March 18th	17.1,17.4
	20-Mar-19	Doppler effect		17.7-17.8
	22-Mar-			

	19	Waves in 2D and 3D. Superposition.		Course Notes
12	25-Mar-19	Interference	Assignment 5 Due 23:59 on March 31st	16.5
	27-Mar-19	Standing Waves		16.7
	29-Mar-19	Fluids		14.1-14.2
13	1-Apr-19	Pressure. Measuring and using pressure.	Mini Quiz April 1st	14.3-14.4
	3-Apr-19	Buoyancy		14.5
	5-Apr-19	Buoyancy		14.5
14	8-Apr-19	Fluid dynamics	Assignment 6 Due 23:59 on April 12th (FRIDAY!)	14.6-14.7
	10-Apr-19	Fluid dynamics. Elasticity.		14.7,12.3
	12-Apr-19	Review Class (Pre-Final).		

Department Approval: Electronically Approved Date: 2019-01-03 12:22