NORTHWESTERN POLYTECHNIC

DEPARTMENT of Science

COURSE OUTLINE – Fall 2025

PC1300 (A2): Wave Motion, Optics and Sound – 3.8 (3-1-1.5) 82.5 Hours for 15 Weeks

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

INSTRUCTOR: *Glenda Delos Reyes, Ph.D* **PHONE:** *(780) 539-2985*
OFFICE: *J216* **E-MAIL:** gdelosreyes@nwpolytech.ca
OFFICE HOURS: *Monday 11:00 – 13:00 & Thursday 13:00 – 16:00 or drop-in whenever my office door is open.*

CALENDAR DESCRIPTION: *This course includes geometric optics, optical instruments, oscillations, waves, sound, interference, and diffraction.*

PREREQUISITE(S)/COREQUISITE: *Math 30-1 or equivalent, Math 31, and Physics 30/MA1000*

REQUIRED TEXT/RESOURCE MATERIALS:

Halliday & Resnick, Fundamentals of Physics, 12th Edition. Wiley.

An open source resource from the University of Alberta will be made available to students in pdf form. Any calculus- based physics text including OER may cover the syllabus of this course.

Lab Manual is required and available at the NWP bookstore.

Copyright © 2024, Northwestern Polytechnic and its licensors.

NORTHWESTERN POLYTECHNIC

DELIVERY MODE(S):

Lectures: Monday & Wednesday, 8:30 – 9:50am, E303
Seminar S1: Friday 8:30-9:20 am, E305
Seminar S2: Friday 10:00 – 10:50 am, E305
Laboratory: Tuesday 2:30 – 5:20 pm, J103

LEARNING OUTCOMES: *Upon successful completion, a student is expected to have:*

- *Reasonable understanding of the concepts of oscillatory motion, superposition of waves, sound and electromagnetic waves, geometrical and physical optics*
- *Experience with common mathematical and experimental tools, including problem solving for this course.*
- *Skills collecting and analyzing experimental data*

TRANSFERABILITY: *Please consult the Alberta Transfer Guide for more information. You may check the transferability of this course at the Alberta Transfer Guide main page http://www.transferalberta.alberta.ca.*

*** For courses with alpha (letter) grading, a grade of D or D+ may not be acceptable for transfer to other post-secondary institutions.* ***Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.***

EVALUATIONS:

Component	Weight	Comment
Seminars	*10%*	*Weekly, submitted in seminar*
Quizzes	*5%*	*Weekly, based on weekend videos and readings.*
Laboratory	*20%*	*Minimum 50% to pass the course*
Midterm Exam 1	*10-15%*	*TBD Likely 2nd week of October*
Midterm Exam 2	*10-15%*	*TBD Likely 3rd week of November*
Final Exam	*40%*	*TBA*

Note: *Highest midterm mark will be weighted as 15%, lowest will be weighted as 10% Each week you will be asked to prepare for class by working through the assigned material on your own as well as taking a short online quiz.*

- ***Weekly preparation:*** *Online videos and reading will be assigned on MyClass almost every weekend. After watching the videos you will complete a short, fairly simple online quiz before the start of lectures that week. Weekly video quizzes will be due at 11:59 pm on Sundays. There will be 11 weekly quizzes, and the quiz with the lowest mark will be dropped. Note: deadlines will never be extended.*

Copyright © 2024, Northwestern Polytechnic and its licensors.

- ***Lectures:*** *Tuesday and Thursday lectures will build on and add new material to that in the weekend videos and readings. Since the weekend preparation will cover the basics more time will be spent on challenging concepts and working through example problems.*

- ***Seminars:*** *The Friday seminars require completion of a set of seminar questions. The questions are due at the end of seminar and are graded. Students may work together but must submit their own work. Students may bring their notes and textbook, but may not use outside resources.*

GRADING CRITERIA: *Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.*

Alpha Grade	4-point Equivalent	Percentage Guidelines	Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	95-100	C+	2.3	67-69
A	4.0	85-94	C	2.0	63-66
A-	3.7	80-84	C-	1.7	60-62
B+	3.3	77-79	D+	1.3	55-59
B	3.0	73-76	D	1.0	50-54
B-	2.7	70-72	F	0.0	00-49

Grades for this course will be assigned as a percentage. The minimum passing grade is 60%.

COURSE SCHEDULE/TENTATIVE TIMELINE: *The course schedule is on MyClass and may be updated there if necessary. This schedule is preliminary but gives a good idea of which sections in the textbooks you should read to be caught up with the class lectures. This is meant to show the order of the course content, not necessarily the timeline.*

Week		Date	Topic	Details	Quiz Due Dates
1	L01	Sept 3		Introduction.	
	S01	Sep 5		Partial Derivatives/Excel/Word	

Copyright © 2024, Northwestern Polytechnic and its licensors.

2	Weekly Videos		**Simple Harmonic Motion I**	Period, (angular) frequency, amplitude, phase • Equation of motion for horizontal mass-spring system	Sept 7
	L02	Sept 8		• Characteristics of Simple Harmonic Motion • Vertical Mass spring system	
	Lab1	Sept 9		Spring Constant Experiment	
	L03	Sept 10		• Amplitude & Phase from simple initial conditions	
	S02	Sept 12		• Seminar	
3	Weekly Videos		**Simple Harmonic Motion II**	• Velocity and acceleration for mass-on-spring • Energy of Simple Harmonic Oscillator (SHM)	Sept 14
	L04	Sept 15		• The Pendulum • Amplitude and phase from initial conditions	
	L05	Sept 17		• Damping examples: pendulum decay • resonance	
	S03	Sept 19		• Seminar	
4	Weekly Videos		**Damped and Driven Oscillators**	• Damped Oscillators • Types of Damping • Driven oscillators	Sep 21
	L06	Sept 22			
	Lab2	Sept 23		• Transient vs. Steady state solutions	
	L07	Sept 24		• Solutions to the wave equation • Phase and medium velocities	
	S04	Sept 26		• Seminar	
5	Weekly Videos		**The Wave Equation**	• Period, wavelength, wavenumber, phase velocity • Partial derivatives • Deriving the wave equation	Sept 28
	L08	Sept 29		Reconciliation Day	
	Lab2	Sept 30		Spring Constant	
	L09	Oct 1		• Low amplitude transverse waves on a string	
	S05	Oct 3		• Seminar	
6	Weekly Videos		**Acoustic Waves and Superposition**	• Bulk modulus, pressure and density • Acoustic wave equation • Principles of superposition	Oct 5
	L10	Oct 6			
	Lab 3	Oct 7		• Wave intensity • Decibal scale	
	L11	Oct 8		• Interference pattern from two point sources • Beats	
	S06	Oct 10		• Seminar	
7	Weekly Videos				Oct 12
		Oct 13	**Thanksgiving Day**		
	Lab3	Oct 14		Spring Constant	
		Oct 15	**MIDTERM #1 EXAM**		
	S07	Oct 17		• Doppler effect • Shockwaves, sonic boom • Review for Exam	
8	Weekly Videos		**Physics of Music**	• Reflection at a boundary • Standing waves on strings	Oct 19
	L12	Oct 20			

Copyright © 2024, Northwestern Polytechnic and its licensors.

				• Standing waves on pipes	
	Lab4	Oct 21		• Harmonics of standing waves	
	L13	Oct 22		• Harmonics and physics of music	
	S08	Oct 24		• Seminar	
9	Weekly Videos		**Geometric Optics**	• Reflection of light waves and images • Refraction and Snell's law	Oct 26
	L14	Oct 27		• Curved mirrors and image formation	
	Lab4	Oct 28		• Harmonics of standing waves	
	L15	Oct 29		• Thin Lenses	
	S09	Oct 31		• Seminar	
10	Weekly Videos		**Optical Instruments**	• Lensmaker equation • Spherical and chromatic aberrations	Nov 2
	L16	Nov 3		• Magnifying glass • Microscope	
		Nov 4		No LAB	
	L17	Nov 5		• Refracting and reflecting telescopes	
	S10	Nov 7		• Seminar	
11					
		Nov 10	**Reading Week**		
		Nov 11			
		Nov 12			
12	Weekly Videos		**Huygens' Principle, Polarization, Dispersion**	• Polarization • Brewster's Angle • Dispersion	Nov 16
		Nov 17	**MIDTERM #2 EXAM**		
		Nov 18		NO LAB	
	L18	Nov 19		• Examples of polarization • Huygen's principle and refraction • Dispersion examples • Rainbows	
	S11	Nov 21		• Seminar	
13	Weekly Videos		**Interference of light**	• Interference in thin films • Newton's rings	Nov 23
	L19	Nov 24		• Thin wedge interference • Anti-reflective coating and optical filters	
	Lab5	Nov 25			
	L20	Nov 26		• Interferometers • Detecting gravitational waves	
	S12	Nov 28		• Seminar	
14	Weekly Videos		**Diffraction**	• Diffraction - intro with water waves • Single slit diffraction • Double slit diffraction	Nov 30
	L21	Dec 1		• Diffraction - double wide slits	
	Lab5	Dec 2			
	L22	Dec 3		• Circular aperture • Resolving power of telescopes	
	S13	Dec 5		• Seminar	

Copyright © 2024, Northwestern Polytechnic and its licensors.

15	Weekly Videos		**Diffraction Cont'd**	• Diffraction gratings •Resolving power for diffraction grating	Dec 7
	L23	Dec 8			
		Dec 9		NO LAB	
	L24	Dec 10		Conclusion/Wrap up	

STUDENT RESPONSIBILITIES: *YOU MUST PASS THE LABORATORY SECTION (minimum 50 % average) TO PASS THE COURSE. All students are expected to come to the laboratory well prepared for the experiment that is to be performed and on time. Students are expected to attend all laboratory periods. Absences due to illness must be substantiated by presenting suitable evidence to the Instructor within three business days of missing the lab. An opportunity to make up a lab will be given only for* ***excused absences****.*

The laboratory experiments are designed to allow a well-prepared student to finish all the work within the allotted time. Formal lab reports should be type-written using the format provided to you by the instructor.

CALCULATOR POLICY: *Any calculator without communications features that is approved by UAlberta Engineering faculty (e.g.* ***TI-36XPro*** */* ***TI-30XII****) may be used during PC1300 examinations. Smartphones, Blackberries, Tablets/Laptop computers etc. are prohibited. Cellular phones must be shut off during exams. All calculators with removable covers must have the covers removed and stored elsewhere during the exam.*

Final Exam Period: *The final exam period for Engineering will follow a modified schedule this year. Students in Engineering will have an exam period that is one (1) day longer than the official final exam period for NWP students.*

STATEMENT ON ACADEMIC MISCONDUCT:

Academic Misconduct will not be tolerated. For a more precise definition of academic misconduct and its consequences, refer to the Student Rights and Responsibilities policy available https://www.nwpolytech.ca/about/polytechnic-leadership/policies-directory.

***Note: all Academic and Administrative policies are available on the same page.*

Additional Information: *Submitting late work is not allowed. Late work will be given a grade of zero and will not be marked.*

Copyright © 2024, Northwestern Polytechnic and its licensors.