

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

Expected Implementation in Academic Year	AY2023-2024
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Han Endao
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Course Title	Optics, Vibrations and Waves
Course Code	PH1105
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	Physics and Maths at A or H2 level, or equivalents
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to equip you with basic concepts and problem solving skills in optics and wave phenomena. You will develop physical intuition and basic analytical skills which are important for studying optical rays and wave propagation. Fundamental concepts are emphasized using the framework of phase and wavefronts. These knowledge and skills lay the foundation for subsequent higher level courses in optics, and are also critical in any other wave-related courses such as quantum mechanics and electrodynamics.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Recognize wave behaviour as fundamental to physical phenomena
ILO 2	Describe the nature of light; identify and apply the fundamental principles of geometric optics; apply geometric optics to explain how camera, telescope, and microscope work
ILO 3	Describe and explain simple harmonic oscillation, damped and driven oscillations; recognize and apply phase and phasor diagrams
ILO 4	Write down and solve wave equations; describe the characteristics of mechanical waves; describe concepts and phenomena such as wave attenuation, phase and group velocity, beats, standing waves, and Doppler effect; apply Huygen's principle and superposition
ILO 5	Describe and explain sound and hearing
ILO 6	Describe basic properties of electromagnetic waves; describe and explain interference and diffraction, including Young's double slits experiment, diffraction grating, limits of resolution, and interference in thin films; describe how Michelson's interferometer, spectrometer, and x-ray diffraction work
ILO 7	Explain matter waves

Course Content

Geometrical Optics

Basic properties of light; reflection, refraction and dispersion; lensmaker's equation; real and virtual images; cameras, telescope and microscope.

Oscillations

Simple Harmonic Motion; relative phases; pendulums; damped and driven oscillations; phasor diagrams.

Waves and Sound

Wave equation, characteristics of waves; wave attenuation; phase, group velocity; Huygen's principle, superposition and interference; sound waves and characteristics; beats; standing waves; Doppler effect.

Wave Optics

Electromagnetic waves; interference, diffraction; Young's slits and diffraction grating; Limits of resolution; Interference in thin films; Scattering of light; Michelson's interferometer; Spectrometer, X-ray diffraction, Bragg's equation; polarization; Brewster's angle.

Reading and References (if applicable)

1. University Physics with Modern Physics, 14th Edition, H. D. Young and R. A. Freedman, Pearson (2016) ISBN-13: 9780133975987
2. Physics for Scientists & Engineers with Modern Physics, 4th Edition, D. C. Giancoli, Pearson (2008) ISBN 13: 9780131495081
3. College Physics: A Strategic Approach Edition, 3rd Edition, R. D. Knight, B. Jones, S. Field, Pearson (2015) ISBN-13: 9780321879721

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction	1	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
2	Nature and propagation of light	2	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
3	Geometric optics	2	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
4	Periodic motion	3	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
5	Mechanical waves	4	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
6	Mechanical waves	4	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
7	Midterm test	1, 2, 3, 4			

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
8	Sound and hearing	5	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
9	Interference	6	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
10	Interference	6	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
11	Diffraction	6	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
12	Diffraction	6, 7	Lecture Notes		In-class Learning Catalytics Mastering Physics on-line assignment, Post-tutorial videos
13	Revision	All			

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Problem solving (tutorial and lecture)	Develop competence and perseverance in solving physics problems
Learning Catalytics (tutorial and lecture)	Provide immediate feedback to correct misconception
In-class demos and videos	Help to establish physics intuition based on experiment

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Summative Assessment (EXAM): Final exam(Final examination (2.5-hour written examination))	All		60		Individual	Analytic	Extended Abstract
2	Continuous Assessment (CA): Assignment(Continuous Assessment 1 (CA1): Online “MasteringPhysics” (weekly))	All		10		Individual	Analytic	Extended Abstract
3	Continuous Assessment (CA): Test/Quiz(CA2: Midterm test)	1, 2, 3, and 4		20		Individual	Analytic	Extended Abstract
4	Continuous Assessment (CA): Assignment(CA3: Learning Catalytics (weekly during lecture))	All		10		Individual	Analytic	Extended Abstract

Description of Assessment Components (if applicable)

Weekly Lecture Quizzes (10%)

You are expected to attend lectures and participate in the Learning Catalytics (LC) quizzes during lecture. This will earn valuable points for the CA. These quizzes are interactive in nature and are primarily meant for formative assessment and are usually not too hard. Scores will be given based on participation. There will be 11-12 such LC assessments, one in each lecture (except final lecture). Each quiz counts 1% of the final grade (1/10th) as we count 10 quizzes total. Should you miss a lecture due to illness, you can still achieve the maximum grade. There will be no make up quizzes for students who miss lectures. In the event that a student is on long term medical leave that makes him or her unable to attend lectures, the student should inform the lecturer as soon as possible.

Formative Feedback

You will receive formative feedback through discussion within tutorial lessons as well as interactive, computer-based hints and pointers in the Mastering Physics online assignment and resource system.

Formative feedback is also given via the student response application Learning Catalytics where you are required to answer on your mobile devices questions posted during lecture/tutorial.

Feedback is always provided for your response to each question.

Finally, feedback is also given after midterm test on the common mistakes and level of difficulty of the problems.

Past exam questions and examiner's report are also made available for you.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Creative Thinking	Advanced
Curiosity	Advanced
Problem Solving	Advanced
Self-Management	Advanced
Sense Making	Advanced

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

Policy (Absenteeism)

Students are expected to be present and punctual for all lectures, tutorial classes and examinations. This is in your own best interest given the LC online quiz during lecture time.

There will be no make up for students who miss LC quizzes. However, special consideration may be given for students who are on long-term medical leave.

Any absence must be accompanied by a Medical Certificate (MC), which are to be submitted online to the School. A picture of the MC should be taken and emailed to the Lecturers and/or Teaching Assistant of the tutorial class.

Policy (Others, if applicable)

Diversity and inclusion policy

Integrating a diverse set of experiences is important for a more comprehensive understanding of science.

It is our goal to create an inclusive and collaborative learning environment that supports a diversity of perspectives and learning experiences, and that honours your identities; including ethnicity, gender, socioeconomic status, sexual orientation, religion or ability.

To help accomplish this:

- If you are neuroatypical or neurodiverse, have dyslexia or ADHD (for example), or have a social anxiety disorder or social phobia;
- If you feel like your performance in the class is being impacted by your experiences outside of class;
- If something was said in class (by anyone, including the instructor) that made you feel uncomfortable;

Please speak to your teaching team, our school pastoral officer or a peer or senior (either in-person or via email) about how we can help facilitate your learning experience.

As a participant in course discussions, you should also strive to honour the diversity of your classmates. You can do this by: using preferred pronouns and names; being respectful of others opinions and actively making sure all voices are being heard; and refraining from the use of derogatory or demeaning speech or actions.

All members of the class are expected to adhere to the NTU anti-harassment policy. If you witness something that goes against this or have any other concerns, please speak to your instructors or a faculty member.

Expectations

Students are expected to be independent and self-directed.

As young adults learning at the University level, students are expected to take responsibility for their learning, be well prepared for and participate actively in class.

The University does not condone cheating or any form of plagiarism.

Policy on Collaboration

Discussion of course material and homework problems is permitted and encouraged. However, each student should work through the homework problems and submit her/his own solutions independently.

According to NTU's Honour Code, the following is NOT allowed:

Cheating: Bringing or having access to unauthorized books or materials (be it print or electronic) during an exam or assessment, or in any work to be used by the lecturer, tutor, instructor or examiner as a basis of grading.

Plagiarism: To use or pass off as one's own, the writings or ideas of another, without acknowledging or crediting the source from which the ideas are taken.

Collusion: Submitting an assignment, project or report completed by another person and passing it off as one's own; Preparing an assignment, project or report for a fellow student who submits the work as his or her own.