



Department of Physics

College of Education

Salahaddin University-Erbil

Subject: Optics II

Course Book – (Year 2)

Lecturer's name:

Assist. Prof. Dr. Saman Q. Mawlud

(PHD Nanoglass Materials Science)

Academic Year: 2023/2024

Course Book

1. Course name	Optics II
2. Lecturer in charge	Dr. Saman Qadir Mawlud
3. Department/ College	Physics/Science
4. Contact	e-mail: saman.mawlud@uor.edu.krd Tel:009647504789074
5. Time (in hours) per week	Theory: 2 Practical: 1
6. Office hours	Thursday from 9:00-11:00 AM or by an appointment
7. Course code	
8. Teacher's academic profile	https://academics.su.edu.krd/saman.mawlud
9. Keywords	Wave Optics, Concepts and theories Light Characteristics
<p>10. Course overview:</p> <p>This course is titled “Optics II” but could as well have been titled “Wave Optics”. It is an introductory course in optics, so in fact there is more “Optics II” in it. The chief purpose is for students to obtain a solid understanding of the basic principles of optics and to be familiar with the operation of most common optics branches. The course is taught in the classical approximation.</p>	
<p>11. Course objective:</p> <p>The goal of this course is to provide BSc. students with knowledge and understanding of fundamental aspects of wave optics. The course will give students a better understanding of a number of important phenomenon and topics in wave optics and will enable the students to:</p> <ol style="list-style-type: none"> 1- Provide a good foundation in Wave optics 2- Provide knowledge of the behaviour of light 3- Inspire interest for the knowledge of concepts in Wave optics 4- Be able to formulate reasonably complicated problems in Wave optics and provide solutions to the same 	
<p>12. Student's obligation</p> <p>A list of additional useful problems will be given to help the student further sharpen your understanding of the subject and your problem solving skills. The students are required to do these problems, although you may find it useful to do so. Because this subject is One course, so that the students are required to do at least two closed exams during this semester besides other assignments and each student must prepare full report at the end of the year. All exams have marks, full report also has marks, the classroom activities count marks and mark for attendance too.</p>	

13. Forms of teaching

Our lecture is depending directly on showing the strong point in the lecture via data show depending on the power point program... and solve problem on the white board with the students.

14. Assessment scheme

The final grade will be based upon the following criteria:

- Mid- semester exam: 10%
- Quiz: 5%
- Final Exam: 50%

15. Student learning outcome:

Wave optics plays a very important role in the physics field. During the years of experience of teaching wave optics, I have notices that students generally find it easier to learn its underlying ideas than to handle the practical aspects of the formalism. What is true is that the students at the Physics department who were all selected after a stiff entrance examination, and whose ambitions in life were diverse in science, in industry, in business, in high public office all had to follow this introductory physics course. As a consequence, the challenge was to try to get them interested in the field whatever their future goals were. Of course, wave optics is an ideal subject because one can be interested in it for a variety of reasons, such as the physics itself, the mathematical structure of the theory, its technological spinoffs, as well as its philosophical or cultural aspects. So, the task was basically to think about the pedagogical aspects, in order to satisfy audiences that went up to many students during the last 10 years.

16. Course Reading List and References:

Textbook: A Text book of Optics, N.S. Brijlal, S.Chand & Co. Ltd., New Delhi, 2009.

Books: There are many good introductory texts on Wave Optics, for example:

- Physical optics, A. K. Ghatak Tata McGraw Hill Publishing House Co. Ltd., New Delhi, 2006.
- Fundamentals of Optics by Jenkins A. Francis and White E. Harvey, McGraw Hill Inc. Magazines and review (internet)

17. The Topics:

CH1. Optical Instruments

Introduction; The Eye; Camera; Objective and Eyepiece; Kellner's Eyepiece; Huygens Eyepiece; Ramsden Eyepiece; Comparison of Ramsden Eyepiece with Huygens Eyepiece; Gauss Eyepiece; Telescopes; Reflecting Telescope; Constant Deviation Spectrometer; Pulfrich Refractometer

CH2. Velocity of Light

Introduction; Galileo's Experiment; Romer's Astronomical Method; Fizeau's Method; Michelson's Method (Rotating Mirror Null Method); Kerr Cell Method; Anderson's Method; Houston's Method (Piezoelectric Grating Method)

CH3. Interference

Introduction; Light Waves; Interference; Young's Double slit Experiment-Wavefront Division; Coherence; Conditions for Interference; Techniques of Obtaining Interference; Fresnel Biprism; Lloyd's Single Mirror; Fresnel's Double Mirror; Visibility of Fringes; Fringe Pattern with White Light; Interferometer, Newton's Rings; Michelson's Interferometer; Applications of Michelson Interferometer.

CH4. Thin Film

Introduction, Application of Thin Film, Phase Change Due to Reflection, Plane Parallel Film, Conditions for Maxima and Minima, Newton's Rings, Condition for Bright and Dark Rings, Radii of Dark Fringes, Michelson's interferometer, Circular Fringes, Applications of Michelson Interferometer.

CH5. Diffraction

Fresnel & Fraunhofer Diffraction

Introduction; Huygens-Fresnel Theory; Fresnel's Assumptions; Distinction between Interference and Diffraction; Fresnel Fraunhofer Types of Diffraction; Diffraction Pattern Due To a Straight Edge; Diffraction Pattern Due To a Narrow Slit; Diffraction Due To a Narrow Wire; Diffraction at a Straight Edge; Fraunhofer Diffraction at a Single Slit; Fraunhofer Diffraction at Double Slit; Interference and Diffraction; Fraunhofer Diffraction at N Slits; Plane Diffraction Grating.

CH6. Polarization

Introduction; Preferential Direction in a Wave; Polarized Light; Natural Light; Production of Linearly Polarized Light; Polarizer and Analyzer; Types of Polarized Light; Effect of Polarizer on Transmission of Polarized Light; Laurent's Half-Shade Polarimeter; Artificial Double Refraction; LCDs

18. Practical Topics (If there is any)

In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture

19. Examinations:

Q1| Choose the correct answer:

(16M.)

1- When the angle between two plane mirror is 30° the number of image will be:

(a) 12

(b) 10

(c) zero

(d) 11

2- For a concave mirror, when the object is lies on focal point the magnification is:

(a) $M=1$

(b) $M<1$

(c) $M=zero$

(d) $M=\infty$

3- In case of a convex surface:

(a) R is negative, f_1 is negative and f_2 is positive

(b) R is positive, f_1 is negative and f_2 is positive

(c) R is positive, f_1 is positive and f_2 is negative

(d) R is negative, f_1 is positive and f_2 is negative

Q2\ Answer the following:

(12M.)

A- Explain two of the following:

(8M.)

1- Why an eyepiece should consist of two lenses?

2- The reasons which make Fizeau's method not very accurate for measuring the light velocity.

3- The main Fresnel assumptions for diffraction phenomena.

B- Write the important applications of:

(4M.)

a. Zone plate

b. Thin film

Q3\ Answer the following:

(8M.)

A- Write the differences between each of the following:

(6M.)

1- Photopic and Scotopic.

2- Kellner's and Huygens eyepiece in terms of cross wire.

B- Draw a diagram for Coude's and Cassegrain's reflecting telescope.

(2M.)

20. Extra notes:

- Google Classroom Web site:

<https://classroom.google.com/c/MTU2NzQyNzAyMDcw?cjc=i4dkbuq>

This site will reflect latest changes and contain homework and reading assignments. Slides used for classes will be available for download before each class. If you want a hard copy of the slides, print them. You are required to read the notes prior to class.

- Per university policy and classroom etiquette;

1- mobile phones, iPods, etc. must be silenced during all classroom lectures. Those not heeding this rule will be asked to leave the classroom immediately so as to not disrupt the learning environment.

2- Please arrive on time for all class meetings.

- 3- Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

21. Peer review

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم كۆرسىۋوكە دەبىت لەلاپەن ھاۋەلىكى ئەكادىمىيە سەير بىكرىت و ناۋەرۆكى بابەتەكانى كۆرسەكە پەسەند بىكات و جەند
ووشەيەك بنوسىت لەسەر شىاۋى ناۋەرۆكى كۆرسەكە و واژوۋى لەسەر بىكات.
ھاۋەل ئەو كەسەيە كە زانىارى ھەبىت لەسەر كۆرسەكە و دەبىت پلەى زانستى لە مامۇستا كەمتر نەبىت.