



Course Specification

(Bachelor)

Course Title:	Geometrical optics
Course Code:	APOP1201
Program:	Optician Diploma
Department:	
College:	Applied Collage
Institution:	Umm Al-Qura University, Makkah, Saudi Arabia
Version:	Course Specification Version Number
Last Revision Date:	Pick Revision Date.



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A. General information about the course:

1. Course Identification

1. Credit hours: (2h)

2 h

2. Course type

- | | | | | | |
|----|--|----------------------------------|--|--------------------------------|---------------------------------|
| A. | <input type="checkbox"/> University | <input type="checkbox"/> College | <input checked="" type="checkbox"/> Department | <input type="checkbox"/> Track | <input type="checkbox"/> Others |
| B. | <input checked="" type="checkbox"/> Required | | <input type="checkbox"/> Elective | | |

3. Level/year at which this course is offered: (.....)

4. Course General Description:

Geometrical optics aims to elucidate the principles of reflection and refraction while enhancing the image formation capabilities of both plane and curved surfaces. Additionally, it encompasses the description of various forms of converging and diverging lenses, as well as the prismatic representation of these lenses. The course emphasizes the behavior of light energy as it traverses different mediums such as air, plastic, glass, and water, with a particular focus on the modifications induced by prisms and the surfaces of curved lenses. These optical principles are pertinent to ophthalmic devices, particularly in the correction of vision impairments and the design of ophthalmic instruments. The course will define key terms including front vertex, back vertex, optical axis (or principal axis), center thickness of a lens, and the radii of curvature of both the front and back surfaces, as well as the centers of curvature for these surfaces. Furthermore, the term optical center will be defined. The curriculum will also include the derivation of the conjugate foci formula for a single thin lens, the equation that expresses the power of a thin lens in air in relation to its surface curvatures, and an expression for linear magnification for a single thin lens.

5. Pre-requirements for this course (if any):

NA

6. Co-requisites for this course (if any):

NA

7. Course Main Objective(s):

- 1- Understanding Geometrical optics
- 2- Elucidate the principles of reflection and refraction
- 3- the image formation capabilities of both plane and curved surfaces.
- 4- the description of various forms of converging and diverging lenses, as well as the prismatic representation of these lenses.
- 5- The behavior of light energy as it traverses different mediums
- 6- The design of ophthalmic instruments.
- 7- definition keys such as; front vertex, back vertex, optical axis (or principal axis), and center thickness of a lens.
- 8- definition of the radii of curvature of both the front and back surfaces, focal length , power of the lens and magnification for a single thin lens.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	3
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Understand and explain the law of reflection, refraction, total internal reflection, dispersion, Huygens's principle and polarization.	K1	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.2	Recognize the role of lenses in modifying light paths to correct visual deficiencies	K3	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.3	Identify different types of lenses used by opticians.	K2	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
2.0	Skills			
2.1	Calculate the light energy through a medium like air, plastic, glass and water	S1	Interactive Discussions	Written Exams (Mid-Term and



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
				Final Exams), Quizzes
2.2	Measure the errors of vision by using appropriate ophthalmic devices.	S3	Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes
3.2	Choose suitable materials and coatings for specific patient lifestyles and environments	S1	Interactive Discussions	Written Exams (Mid-Term and Final Exams),
3.0	Values, autonomy, and responsibility			
3.1	Work cooperatively in a small group environment	V1	Individual and Group Presentations	Presentations

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Geometrical Optical Physics	2
2.	Illustrate laws of reflection	2
3.	Explain the image formation produced by plane and curved mirrors	2
4.	Illustrate laws of refraction	2
5.	Explain refraction at plane and curved surfaces	2
6.	Explain thin lens equation	2
7.	Explain lens maker's equation	2
8.	Describe various converging lens forms and diverging lens forms	2
9.	Explain the prismatic representation of converging and diverging lenses	2
10.	Define the terms front vertex, back vertex, optical axis (or principal axis), center thickness of a lens and radii of curvature of front and back surfaces, centers of curvature of front and back surface	2
11.	Define the term optical center	2
12.	Derive the conjugate foci formula for a single thin lens	2





13.	Derive the equation giving the power of a thin lens in the air in terms of its surface curvatures or radii of curvature	2
14.	Derive an expression for linear magnification for a single thin lens	2
15.	Explain the optical principles of telescopes, microscopes, and cameras	2
Total		30

C.2 Experimental Content

No	List of Topics	Contact Hours
1.	Spherometer	4
2.	Liquid lens	4
3.	Convex and Concave lens	4
4.	Reflection and Refraction with the Ray Box	4
5.	Determination of The power of lenses	4
6.	Determination of The Focal Length of Lenses	4
7.	Determination of The refractive index of prism	4
8.	Determination of The refractive index of slab	4
9.	Determination of The Radii of curvature	4
10.	Verification of Thin lens equation	4
11.	Verification of Lens Maker's equation	4
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	5	10
2.	Mid-Term Exam	8	20
3.	Presentations	12	10
4.	Homework	All weeks	10
5.	Final Exam	16	50

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	"Principles of Ophthalmic Lenses" by M. Jalie
Supportive References	





Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, , exhibition rooms
Technology equipment (Projector, smart board, software)	Projector
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students and Faculty	Direct
Effectiveness of students' assessment	Faculty and Program Leaders	Direct
Quality of learning resources	Students, Faculty and Program Leaders	Indirect
The extent to which CLOs have been achieved	Faculty and Program Leaders	Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190386
DATE	1446/11/22

