Course Specification

Program(s) on which is given: Physics (Major) & Physics and Laser Sciences(Major)
Department Offering the Program : Physics
Academic Year / Level : 2
Date of specification approval : (2012)

A - Basic Information

Title : Physical optics
Course Code : P 248
Credit hours : Lecture (2 h./ week), Tutorial : (2h./week)
Total : (3 Credit hours / week)

B - Professional Information

1- Overall Aims of the Course :

By the end of this course, the student should be able to:-

- **understand the wave nature of light,**
- **know the fundamentals of the phenomena: Interference , Diffraction and polarization of light.**
- **Determine the wave length of light.**
- **Determine the refractive index of thin films of transparent Materials.**
- **Calculate the specific rotation of optically active materials.**

2- Intended Learning Outcomes of the Course (ILOS)

a- Knowledge and Understanding

The student should know and understand the main ideas and action of:

a.1 The Young`s and Newton experiments as well as the well-known interferometers, e.g., Michelson and Jamine interferometers.

a.2 Diffraction patterns due to different obstacles , apertures and gratings.

a.3 Different methods of obtaining polarized light, optical activity , and polaroids.

b- Intellectual Skills

The student should be able to:

b.1 Obtain the different patterns of interference fringes by the different interferometers.

b.2 Obtain the diffraction fringes at different obstacles, e.g., straight edge , aperture , disc and grating.

b.3 Obtain polarized light for a natural one.

c- Professional and Practical Skills

The student should be able to:

c.1 Establish model experiments for interference patterns and determine the wavelength of light used , or small thicknesses of different transparent materials.

c.2 Use the diffraction grating idea in studying the crystallographic parameters of different crystal structures.

c.3 Determine the specific rotation of active material by using the polarimeter.

d- General and Transferable Skills

The student will also be :

d.1 Enhanced in using PC and Internet to search for topics related to course materials.

d.2 Enhanced his writing ability of assigned reports about subjects of course materials.

d.3 Enhanced his oral communication during presenting his own written report.

3- Content:

Topic	Number of hours	Number of lectures

1st Week : Registration Addition & Withdrawal		
2nd week: Addition & Withdrawal		
Wave nature of light - Principles of wave superposition	**3**	**1**
Interference of light waves- conditions of permanent interference pattern -Young`s experiment of interference– Conditions of constructive and destructive interference fringes - Displacement of interference fringes. Solved examples.	**3**	**1**
Fresnel`s biprism - Interference of thin films (parallel and wedge-shaped)	**3**	**1**
Newton`s rings - The Michelson and Jamin interferometers – Applications- Solved examples.	**3**	**1**
Fresnel`diffraction at: a straight edge – Wide and Narrow obstacles apertures (rectangular and circular) – Small and big circular discs).	**3**	**1**
Fraunhoffer`s diffraction at a narrow rectangular and circular apertures -	**3**	**1**
Mid-term Exam	**3**	**1**
Theory of diffraction grating	**3**	**1**

- Absent spectra in a grating – Dispersive power of the grating.		
Polarized light - Methods of producing a plane polarized light : Selection and absorption , Reflection, Refraction (piles of plates) .	**3**	**1**
Brewster`s law – Intensity of polarized light - Huygens` theory of double refraction - positive and negative crystals – Quarter and half wave plates .	**3**	**1**
Quarter wave plate and plane polarized light – Elliptically polarized light- circularly polarized light. Solved examples,	**3**	**1**
Plane polarized light and half wave plate – Conversion of elliptically polarized light into circularly polarized light.	**3**	**1**
Nicol prism – polarimeter – Optical activity - Solves examples.	**3**	**1**
Fresnel`s theory and Optical rotation - Polaroides – Applications of polarized light.	**3**	**1**
Final term Exams	**2**	

4- <u>Teaching and Learning Methods</u>

4.1 Course Notes

4.2 Oral presentations

5- Assessments

A- Student Assessment:

5.1 Reports: To assess skill of collecting data and ability of team work. (1 report / 3 weeks).

5.2 Oral exam : To assess skill of discussing and The report (every three weeks).

5.3 Mid- term exam : To assess understanding and memorizing Skills (the 8th Week).

5.4 Final-term exam : To assess overall performance (the 16th & 17th Weeks) .

B - Weighting Assessment:

Mid-term examination :	**20 %**
Final-term examination :	**60 %**
Oral examination :	**10 %**
Other types of assessment :	**10 %**
Total :	**100 %**

6- List of Textbooks & References:

6.1 Lecture Notes:

prepared in the form of a book , authorized by the department

6.2 Essential Books:

A Text Book of Engineering Physics by B.L. Theraja (1973)

Published by S,Chand & Co. (Pvt.) Ram Nagar , New-Delhi-55

7- Facilities required for teaching and learning:

7.1 Writing board

7.2 General Library in the building of the faculty

7.3 Internet Room

Course Coordinator: Prof. Abd El-Mageed Hamid Khafagy

Head of Department: Prof.Dr. Sana Maize

Date: / /