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|  | **Mutah University**  **Detailed Syllabus Form** | Description: C:\Users\lamasat.lamasat-PC\Pictures\Picture1.png |

**First :** Course Information**:**

|  |  |
| --- | --- |
| * Course Number: 281 | * Course Title: Optics |
| * Credit Hours: 3 | * College: Science |
| * Pre-requisite GP1, GP2 | * Department: Physics |
| * Instructor: Dr Ali Qudah | * Semester & Academic Year:   1st term 2016/2017 |
| * the time of the lecture:   12:30 - 2:00 Monday, Wednsday | * Office Hours: 9-11 Mon , Wed   10-2 Tuesday |

**Second :** General Course Description

**Introductory course in nature of light and its interaction with surfaces and interfaces,**

**Third :** Course Objectives

* 1. Comment on basic concepts and principles of geometrical, physical and modern optics.
* 2. Discuss the nature of light, its propagation and interaction with surfaces and interfaces.
* 3. Describe basic optical phenomena.
* 4. Discuss the Maxwell’s electromagnetic theory of light and derive simple relations from the basic optics laws.
* 5. Interpreting light interference, diffraction, and polarization depending on the electromagnetic theory of light.

**Fourth:** Expected Learning Outcomes

* Students are expected to understand ray-based optical system analysis,
* Understand of simple optical instruments.
* Understand that light is an electromagnetic wave
* Understand properties of light caused by the wave nature such as polarization, interference and diffraction, and their applications**.**

**Fifth :** Course Plan Distribution & Learning Resources

|  |  |  |  |
| --- | --- | --- | --- |
| Week | Lecture | Date | Lecture Material |
| W1 | L1 | 26/9/2016 Mon | Chapter 1 WAVE MOTION 1  1.1 Introduction 1  1.2 The Differential Wave Equation 1  1.3 Sinusoidal Waves 3  1.4 Phase and Phase Velocity 6    1.5 Complex Number Representation 8  1.6 Three-Dimensional Waves 11  1.7 Wave fronts 15 |
| L2 | 28/9/2016 Wed |
| W2 | L3 | 3/10/2016 Mon |
| L4 | 5/10/2016 Wed |
| W3 | L5 | 10/10/2016 Mon | Chapter 2 ELECTROMAGNETIC WAVES AND PHOTONS 20  2.1 Maxwell's Equations and Electromagnetic Waves 20  2.2 The Index of Refraction 23      2.3 Irradiance 24  2.4 Photons — Energy and Momentum 26  2.5 The Electromagnetic-Photon Spectrum 27 |
| L6 | 12/10/2016 Wed |
| W4 | L7 | 17/10/2016 Mon |
| L8 | 19/10/2016 Wed |
| W5 | L9 | 24/10/2016 Mon | Chapter 3 REFLECTION AND TRANSMISSION 32  3.1 Introduction 32  3.2 The Laws of Reflection and Refraction 32 |
| L10 | 26/10/2016 Wed |
| W6 | ***L11*** | ***31/10/2016 Mon*** | ***First exam, 25%, Monday 31/10/2016.*** |
| L12 | 2/11/2016 Wed | 3.3 Fermat's Principle 36  3.4 The Fresnel Equations 40  3.5 The Critical Angle 46 |
| W7 | L13 | 7/11/2016 Mon | Chapter 4 GEOMETRICAL OPTICS 51  4.1 Introduction 51  4.2 Aspherical Refracting Surfaces 51  4.3 Spherical Refracting Surfaces 54  4.4 The Thin Lens Equation 57    4.5 Simple Thin Lens Imagery 62  4.6 Compound Thin Lenses 68  4.7 Thick Lenses 72  4.8 Lens Combinations 76  4.9 Planar, Aspherical and Spherical Mirrors 79 |
| L14 | 9/11/2016 Wed |
| W8 | L15 | 14/11/2016 Mon |
| L16 | 16/11/2016 Wed |
| W9 | L17 | 21/11/2016 Mon | Chapter 5 POLARIZATION 93  5.1 Introduction 93  5.2 Plane Polarization 93  5.3 Circular Polarization 96    5.4 Elliptical Polarization 99  5.5 Natural and Partially Polarized Light 102  5.7 Polarization by Reflection 108 |
| L18 | 23/11/2016 Wed |
| W10 | L19 | 28/11/2016 Mon |
| L20 | 30/11/2016 Wed |
| W11 | L21 | 5/12/2016 Mon | Chapter 6 INTERFERENCE AND COHERENCE 123  6.1 Introduction 123  6.2 Interference of Two Waves 123  6.3 Wave front-Splitting Interferometers 128 |
| L22 | 7/12/2016 Wed |
| W12 | *L23* | ***12/12/2016 Mon*** | ***Second Exam 25%, Monday 12/12/2016.*** |
| L24 | 14/2/2016 Wed | 6.4 Amplitude Splitting by Thin Films 135  6.5 Amplitude-Splitting Interferometers 142  6.6 Coherence 148 |
| W13 | L25 | 19/12/2016 Mon | Chapter 7 DIFFRACTION 159  7.1 Introduction 159  7.2 Radiation from a Coherent Line Source 159  7.3 Fraunhofer Diffraction by One and Two Narrow Slits 164  7.4 Multiple Narrow Slits - The Diffraction Grating 170 |
| L26 | 21/12/2016 Wed |
| W14 | L27 | 26/12/2016 Mon |
| L28 | 28/12/2016 Wed |
| W15  &  W16 | L29  &  L30 | (1 – 14) /1/2017  Final Exams | *University Final Exams (Sunday 1/1/2017) to (Saturday 14/1/2017)* |

**Sixth :** Teaching Strategies and Methods

|  |  |
| --- | --- |
| **Teaching Strategies and Methods** | No |
| Lectures | **1** |
| There is a separate lab for this course | **2** |
| Computer demonstration of some figures and applets | **3** |
|  | **4** |
|  | **5** |

**Seventh :** Methods of Assessment

|  |  |  |  |
| --- | --- | --- | --- |
| **Proportion of Final Evaluation** | **Evaluation Methods of** | **Week & Date** | **No.** |
| **25%** | First Exam | Week 6, 31/10/2016 | **1.** |
| **25%** | Second Exam | Week12,  12/12/2016 | **2.** |
| **50%** | Final Exam | To be announced by university later | **3.** |
|  |  |  | **4.** |
|  |  |  | **5** |
|  |  |  | **6** |
| **(100%)** |  | **Total** | |

**Eighth :** Required Textbooks

**- Primary Textbook:**

* *optics, 4th Edition, Eugene Hecht*

**-** **Secondary References**

* **Theory and problems in Optics, Schaum's outline series.**

**Ninth :** General Instructions

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| **Additional Notes, Office hours, Incomplete Exams, Reports, Papers, …etc** | **No** |
| Monday and Wednesday 9 - 11 AM, Tuesday 10 AM - 2 PM | **1** |
|  | **2** |
|  | **3** |
|  | **4** |
|  | **5** |