| 2021-2022 | Faculty of Engineering - TC | Year 1 - Sem. 1 |
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| PHYS101 | General Optics | Mandatory |
| ECTS: **3** | *Instructors:* Dr Saly Yaacoub, Dr Khattar Assaf, Dr. Fadia Taher, Dr. Abbas Mougharbel | *Language:* English/French |
| Total hours: **39 h** | *Period :* October-February | |

**Description:**

This course is designed to introduce geometrical and ray optics. It begins with the fundamental phenomena of geometric optics (reflection, refraction, total internal reflection) and notions of geometric optics (rectilinear propagation, ... Fermat's principle). These principles are then used to model simple optical systems (lenses and mirrors) and to study the association of centered optical systems. This course includes a lab component.

**Learning outcomes:**

Upon successful completion of the course, students must be able to:

- Distinguish between geometric and wave optics.
- Understand the fundamental phenomena of geometric optics.
- Understand the basic concepts in geometrical optics.
- Use of the principle of geometrical optics.
- Describe the structure, types and characteristics of optical system.
- Measure several parameters of spherical refracting surfaces.
- Understand the fundamentals of lens.
- Solve problems involving plane mirrors, thin lenses, and spherical mirrors.
- Given a problem assignment, prepare a neat, well-organized, handwritten solution for review by others.

**Content:**

- Introduction to geometrical optics, Basic concepts in geometrical optics (Rectilinear propagation, The principle of inverse return of light, The principle of the independence of light rays, The laws of reflection and refraction), Fermat's Principle (Principle of least time, Optical path length).

- Optical System, Centred OS, Stigmatism and the principle of Fermat (Perfect imaging, Approximate imaging, The conditions of Gauss), Real or Virtual Objects and Images, Aplanatic System, Plane Parallel Plate.

- Spherical Refracting surfaces, Focus, Focal lengths and Focal Planes, Converging and Diverging Spherical Refracting Surfaces, Aplanatic System, Ray tracing in a Spherical Refracting surface, Plane Mirrors, Spherical Mirrors, Ray tracing in a Spherical Mirror.

- Definition of a Lens, Converging Lens, Diverging Lens, Image Formed by a Thin Lens, Focal points, The Optical Center of a Thin Lens, Focal Planes-Secondary Focal Points, Thin Lenses Equations, Association of two thin lenses.

**References:**


- Introduction to optics, G. Chartier, Springer (2005).
- Physics for Scientists and Engineers (6th edition), R. A. Serway and J.W. Jewett (2014).
- Handbook of optoelectronics, Vol. 1, J.P.Dakin, R.G.W Brown (2nd edition), CRC Press (2017).


**Evaluation Method:**

Assessment in the following areas will be converted to points, to compute your final grade in this course:

- Mid-Term
- Final Exam
- Home Works

**Description du cours**

Ce cours a pour but d'introduire les domaines de l'optique géométrique. Il commence par une présentation des phénomènes (tels que la réflexion, la réfraction, la réflexion totale interne) et des notions fondamentales d'optique géométrique (propagation rectiligne, … principe de Fermat). Sur la base de ces phénomènes, l'optique géométrique permet aux étudiants de concevoir des systèmes optiques simples (lentilles et miroirs) et d'étudier l'association des systèmes optiques centrés. Ce cours est complété par des travaux pratiques d'optique.