Wave Optics

1. **Course number and name:** 020OPTNI3 Wave Optics

2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours

3. **Name(s) of instructor(s) or course coordinator(s):** Pascale Abboud, Rana Nassif, Elias Mechref, Aicha El Cheikh, Abbas Mgharbel

4. **Instructional materials:** PowerPoint slides, in-class problems.

5. **Specific course information**
   a. **Catalog description:**
   This course covers the key concepts of the wave theory of light. It begins with the definition of spherical and plane waves, accompanied by a comprehensive exploration of key principles associated with them, such as optical path length, wave intensity, wavefront, wave trains, and coherence length. Special attention is given to light interference through wavefront division (Young's double-slit experiment). The impact of extended and narrow-spectrum light sources is also examined.

   b. **Prerequisites:** 020SPHNI1 Physical Signals

   c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   - Understand the fundamental principles of the wave nature of light.
   - Define and differentiate between spherical and plane waves in the context of light.
   - Explain the fundamental concepts related to wave optics, including optical path length, wave intensity, wavefront, wave trains and coherence length.
   - Describe and analyze the phenomenon of light interference produced by coherent sources.
   - Describing and analyzing Young's double-slit experiment.
   - Examine the effect and implications of using extended and narrow-spectrum light sources in interference phenomenon.

   b. **PI addressed by the course:**

PI	1.2	1.3
Covered	x	x
Assessed	x	x

7. **Brief list of topics to be covered**
   - Scalar theory of light: Monochromatic light, Optical path length, Wavefront, Spherical and plane wave. (4 lectures)
   - Interference of two light waves: Coherence conditions, coherence length. (3 lectures)
   - Young's double-slit experiment: Interference pattern, Fraunhofer diffraction setup. (3 lectures)
   - Utilization of two point sources of different wavelengths, utilization of an extended source, Influence of spectral width. (2 lectures)