

## ΟΠΤΙΚΗ ΕΠΙΣΤΗΜΗ & ΤΕΧΝΟΛΟΓΙΑ (ΕΑΡΙΝΟ 2024)

| Ημερομηνία  | Διδαχθείσα Ύλη   | Ώρες Διδασκαλίας | Σύνολο    |
|---|--|------------------|-----------|
| <b>13/02/2024</b><br><b>(Microsoft teams)</b>                 | Introductory material regarding course, History of Optics Review, Modern Optical Systems Examples. Light sources introduction. Light Sources, Incoherent and Coherent Sources. Blackbody radiation theory (introduction).  | <b>3</b>         | <b>3</b>  |
| <b>20/02/2024</b><br><b>(Microsoft teams)</b>                 | Light sources introduction. Light Sources, Incoherent and Coherent Sources. Blackbody radiation theory. Cosmic Microwave Background Radiation. Light sources spectra. Light Emitting Diodes. Radiative Processes, Einstein Coefficients.   | <b>3</b>         | <b>6</b>  |
| <b>27/02/2024</b><br><b>(Microsoft teams)</b>                 | Laser Fundamentals Review, 3- and 4-level systems, Laser examples. Review of laser fundamentals. Laser examples. Review of laser fundamentals. Spatial and Temporal Coherence, Coherence length. Temporal coherence, spatial coherence, temporal coherence function, power spectral density. Coherence area, Mutual coherence function, Mutual degree of coherence, Cittert-Zernike theorem. Gaussian Beams. Fundamental Gaussian Beam.                                  | <b>3</b>         | <b>9</b>  |
| <b>05/03/2024</b><br><b>(Microsoft teams)</b>                 | Fundamental Gaussian Beams (continue). Higher order Gaussian beams. Laguerre-Gaussians beams. Radiometry and Photometry introduction. Point source, Extended source, Lambertian source. Cosine 4th law. Luminance conservation laws. Vision and eye. Eye sensitivity. Luminous efficiencies of human eye.  | <b>3</b>         | <b>12</b> |
| <b>12/03/2024</b><br><b>(Microsoft teams)</b>                 | Luminous efficiencies of human eye. Luminous efficiency and efficacy of sources. Mesopic Vision. Colorimetry basics. RGB and XYZ color spaces. Radiometry and Photometry examples. Geometrical Optics introduction. Huygens Principle, Fermat Principle, Reflection and Refraction based on Fermat's Principle. Lens-Like Medium example (partially completed)   | <b>3</b>         | <b>15</b> |
| <b>19/03/2024</b>   | Lens-Like Medium example (continue). Spherical, Ellipsoidal, Hyperboloidal, mirrors. Paraboloidal mirrors. Dispersion, Dispersive Prisms. Reflecting Prisms. Imaging General. Reflecting surfaces for point imaging. Perfect refracting surfaces for point imaging. Spherical mirror equation -paraxial approximation.   | <b>3</b>         | <b>18</b> |
| <b>26/03/2024</b>   | Spherical mirror equation -paraxial approximation. Spherical refractive surface equation, magnification. Thin lens equation. Simple examples. Matrix method (ABCD), Basic matrices.  | <b>3</b>         | <b>21</b> |
| <b>02/04/2024</b>   | Meaning of A, B, C, and D elements. Thick lenses. Cardinal points and principal planes. Finding cardinal points of an optical system via the ABCD matrix. Simple imaging equation of an optical system under paraxial approximation. Example of a Nikon lens imaging. Example of a thick lens. Optical system of two thin Lenses example: solution with 3 methods. ABCD για Gaussian Beams and Example. Camera Basics, History of photography.                           | <b>3</b>         | <b>24</b> |
| <b>10/04/2024</b>   | Depth of focus, depth of field. Depth of Field review. CCD and CMOS detectors. Field of View. Magnifier, compound microscope. Microscopy types. Telescopes and telescope classification.   | <b>3</b>         | <b>27</b> |
| <b>17/04/2024</b><br><b>(Microsoft teams - Λόγω Απεργίας)</b> | Hubble Space Telescope -James Webb telescope. Aberrations, Spherical, Coma, Astigmatism, Field curvature, Distortion, Chromatic. Spherical aberration, exact, 3-order. Dependence of aberrations on, $h'$ , $r$ , $\theta$ . Exact parallel ray tracing for plano-convex and biconvex lenses. Qualitative Examples of all aberrations. Correction/mitigation methods. Review of Maxwell equations, boundary conditions, and constitutive relations. Review of e/m waves. | <b>3</b>         | <b>30</b> |

**24/04/2024**

Plane waves. Isotropic and anisotropic materials. Polarization and applications. Reflection and Refraction at planar boundary. Fresnel Equations. Critical Angle, Brewster Angle, Examples. Basics of Interference. Two-wave interference.

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