**Lesson Plan**

**Subject : Optics & Waves**

**Lesson plan Duration :** **15 Weeks**

**Work load (lecture/Practical) per week (in hours**): Lectures: 3 hours

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| **Lecture No** | **Theory** |
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| 1 | Unit-1 **Waves:** Travelling waves, Characteristics of waves, Mathematical representation of travelling waves |
| 2 | General wave equation |
| 3 | Phase velocity, Light source emit wave packets |
| 4 | Wave packet and Bandwidth |
| 5 | Group velocity and real light waves. |
| 6 | **Propagation of light waves:** Maxwell’s equations, Electromagnetic waves and constitutive relations |
| 7 | Wave equation for free-space, Uniform plane waves |
| 8 | Wave polarization, Energy density, the pointing vector and intensity |
| 9 | Radiation pressure and momentum, Light waves at boundaries |
| 10 | Wave incident normally on boundary, Wave incident obliquely on boundary |
| 11 | law of reflection, Snell’s law and reflection coefficients.  |
| 12 | Unit-2 **Interference:** Principle of Superposition, Conditions for Sustained interference |
| 13 | Young’s double slit experiment, Division of wave-front: |
| 14 | Fresnel’s Biprism and its applications, Division of amplitude |
| 15 | Interference due to reflected and transmitted light, Wedge-shaped thin film |
| 16 | Newton’s rings and its applications |
| 17 | Michelson Interferometer and its applications |
| 18 | Unit-3 **Diffraction:** Types of diffraction, Fraunhofer diffraction at a single slit |
| 19 | Plane transmission diffraction grating: theory, secondary maxima and secondary minima |
| 20 | Width of principal maxima, absent spectra, overlapping of spectral lines |
| 21 | Determination of wavelength; |
| 22 | Dispersive power and resolving power of diffraction grating.  |
| 23 | **Polarization:** Polarization of transverse waves, Plane of polarization |
| 24 | Polarization by reflection, Double refraction |
| 25 | Nicol Prism, Quarter and half wave plate |
| 26 | Specific Rotation, Laurent ‘s half shade polarimeter |
| 27 | Biquartzpolarimeter. |
| 28 | Unit-4 **:**Stimulated Absorption, Spontaneous and Stimulated Emission |
| 29 | Einstein’s Coefficients and its derivation |
| 30 | Population Inversion |
| 31 | Direct and Indirect pumping  |
| 32 | Pumping schemes |
| 33 | Main components of Laser |
| 34 | Gas lasers (He-Ne, CO2) |
| 35 | Solid state lasers (Ruby, Neodymium, semiconductor) |
| 36 | Dye laser |
| 37 | Characteristics of Laser |
| 38 | Applications of Laser. |
| 39 | Revision and doubt discussion |
| 40 | Revision and doubt discussion |