PHY 14669 OPTICAL SYSTEMS

1] Diffraction of Light

- Fourier Transform and Convolution.
- Spatial Frequency Transfer Function.
- Fresnel Diffraction Formula.
- Fraunhofer Diffraction Formula.
- Applications.

2] Polarization of Light

- Definition.
- Types.
- Malu Law of Polarization.
- Matrix Representation of Polarization Devices.
- Polarizers.
    - Polarization by selective absorption.
    - Polarization by selective reflection.
    - Polarization by selective refraction.

3] Optical Devices

- Tunable Optical Filters.
    - Fabry- Perot tunable filter.
    - Tunable Fabry-Perot interferometer based on fiber Bragg grating.
- Directional Couplers.
    - Scattering matrix.
    - Wavelength division multiplexer.
    - Wavelength division demultiplexer.

4] Nonlinear Optics

- Concept of Nonlinearity.
- Susceptibility and Nonlinearity in Optical Materials.
    - Second order nonlinearity.
    - Third order nonlinearity.
- Applications on Second Order Nonlinearity.
    - Sum and difference frequency generation.
    - Second harmonic generation.
- Applications on Third Order Nonlinearity.
    - Soliton.
    - Four wave mixing.
    - Stimulated Raman scattering.

5] Nanotechnology in Optoelectronics

- Structure of Nanomaterials.
  - Quantum well.
  - Quantum line.
  - Quantum dot.
- Applications on Quantum Dot nanostructure.
  - Quantum dot laser.
  - Quantum dot infrared photodetector.