

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD535	Optical Signal Processing	3	0	0	3

Course Objective

The objective of the course is know about all-optical devices capable of processing high-speed optical signals in a lightwave technology.

Learning Outcomes

At the end of the course, students must be able to

- Understand basics of signal processing and optics
- Understand the detection process in Fourier domain
- Understand the basic Acousto-optic power spectrum analyzer.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Basics of signal processing and optics, Characterization of a General signal, examples of signals, Spatial signal. Basic laws of geometrical optics, Refractions by mirrors, the lens formulas, General Imaging conditions, the optical invariant, Optical Aberrations.	12	Student will be able to understand the concepts of signal processing and optics
2	Physical Optics, The Fresnel Transforms, the Fourier transform, Examples of Fourier transforms, the inverse Fourier transform, Extended Fourier transform analysis, Maximum information capacity and optimum packing density, System coherence. Spectrum Analysis and Spatial Filtering, Light sources, spatial light modulators.	12	Students will be able to understand the physical optics and applications of different transforms.
3	The detection process in Fourier domain, System performance parameters, Dynamic range. Some fundamentals of signal processing, Spatial Filters, Binary Spatial Filters, Magnitude Spatial Filters, Phase Spatial Filters, Real valued Spatial Filters, Interferometric techniques for constructing Spatial Filters.	10	Students will be able to apply the Fourier analysis and development of optical filters
4	Optical signal processor and filter generator, Applications for optical signal processing. Acousto-optic cell spatial light modulators, Applications of acousto-optic devices. Basic Acousto-optic power spectrum analyzer. Heterodyne systems: Interference between two waves, the optical Radio.	8	Students will be able to understand the design of optical signal processor and its performance.
Total		42	

Text Books:

1. Anthony Vanderlugt, "Optical signal processing", Wiley-Interscience
2. Hiroshi Ishikawa, "Ultrafast All-Optical Signal Processing Devices", Wiley and Sons

Reference Books:

1. D. Casasent, "Optical data processing-Applications", Springer-Verlag, Berlin,
2. H.J. Caulfield, "Handbook of holography", Academic Press New York 1979
3. P.M. Duffieux, "The Fourier Transform and its applications to Optics", John Wiley and sons