MANGALORE UNIVERSITY

Department of Physics

MSc Physics

PHS 557 : ELECTRONICS IV

(52 Hrs.)

Course outcome

CO1 Good understanding of optic fibre communication.

CO2 Good understanding of optical sources.

CO3 Good knowledge of digital signal processing.

CO4 Good knowledge of Discrete Fourier transform (DFT).

Unit I Optic fibre communication

Relevance and advantages of OFC, description of a simple OFC link, types of optical fibres, Ray theory of light guiding in optical fibres, modal analysis of optical fibres (qualitative), single mode fibres, graded index fibres, signal attenuation and dispersion in optical fibres. Optical source to fibre coupling (basics), optical fibre splicing and connectors (basics). [13 hrs]

Unit II Optical sources

Structure and working of a laser diode. Single mode lasers (basic). Output characteristics and modulation characteristics of LED & laser diodes.

Optical detectors: Structure and working of PIN diode and avalanche photodiode. Quantum efficiency, responsivity and response speed of photodiodes. Noise characteristics of photo diodes. Optical receiver systems, digital and analog transmission systems. Power and rise time budget analysis. [13 hrs]

Unit III Digital Signal Processing

Classification of signals, properties of discrete time signals and systems – linearity, stability and causality concepts. LTI systems – convolution. Fourier analysis of discrete time signals and systems. Sampling and modulation principles, aliasing effect, sampling theorem.

Z-transforms - transfer function – properties of Z-transform, pole-zero plot, inverse Z-transforms (partial fraction method and long division method [13 hrs]

Unit IV Discrete Fourier transform (DFT) and IDFT. Circular convolution – properties of DFT, FFT algorithms (Radix 2) – flow charts.

Discrete system realization: IIR structures - direct form I & II, CSOS and PSOS structures. Finite impulse response (FIR) structures: direct form and cascade structures. IIR filter design: qualitative analysis of impulse invariance and bilinear transformation methods. FIR filters - linear phase FIR design using window functions, Gibbs' phenomenon. [13 hrs]

Reference Books:

1. Keiser G, 'Optical Fibre Communications', III Edn. (McGraw Hill ISE, 2000)
2. Senior J M, 'Optical Fibre Communication', II Edn. (PHI, 1996)
3. Ghatak A &Thyagarajan K, 'Introduction to Fibre Optics' (Cambridge University Press, 1999)
4. Haykin S, 'Signals and Systems' (John Wiley, 1998)
5. Oppenheim A V, Willsky A S and Nawab S H, 'Signals and Systems', II Edn. (PHI, 1997)
6. Proakis J G and Manolakis D G, 'Digital Signal Processing', III Edn., (PHI, 1992)
7. Salivahanan S, Vallavaraj A &Gannapriya G, 'Digital Signal Processing', (Tata McGraw Hill, 2001)
8. Mitra S K, 'Digital Signal Processing' (Tata McGraw Hill, 1998)
9. Oppenheim A V and Schafer R W, 'Discrete-Time Signal Processing' (PHI, 1992)
10. Roman Kuc, 'Introduction to Digital Signal Processing' (McGraw Hill, 1988).