

1.	Title of the course	Communication Systems
2.	Course number	EE304L
3.	Structure of credits	3-1-0-4
4.	Offered to	UG
5.	New course/modification to	Modification To EE3107/8
6.	To be offered by	Department of Electrical Engineering
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	<b>Course Objective(s):</b> To introduce the fundamentals of communication systems including difference between analog and digital communication, signal processing techniques required for understanding communication signals, modulation techniques, noise modeling, and optimal demodulation.	
10.	<b>Course Content:</b> Signal processing for communication: review of LTI systems and Fourier transforms, baseband and passband signal representation, up-conversion and down-conversion; Amplitude modulation (AM): conventional AM, double-sideband suppressed carrier (DSB-SC), single-sideband (SSB), vestigial-sideband (VSB); Angle modulation: phase modulation (PM), frequency modulation (FM), superheterodyne receiver, basics of phase-locked loops; Digital modulation: signal constellations, power spectral density, bandwidth occupancy, Nyquist sampling theorem, Nyquist criterion for ISI avoidance, orthogonal and biorthogonal modulation; Noise modeling: review of basic probability, joint Gaussianity, stationarity and wide-sense stationarity, Gaussian random process; Optimal demodulation: ML and MAP decision rules, signal-space concepts, bit-error probability, link-budget analysis.	
11.	<b>Textbook(s):</b> 1. Madhow U, <i>Introduction to Communication Systems</i> , Cambridge University Press (2014).	
12.	<b>Reference(s):</b> 1. Haykin S, <i>Communication Systems</i> , Wiley (2016). 2. Lathi B P and Ding Z, <i>Modern Digital and Analog Communication Systems</i> , Oxford University Press (2009).	