

- 1) Complex numbers
- 2) Classification of signals
 - a) Periodic
 - b) Aperiodic
 - c) Energy
 - d) Power
 - e) Continuous time
 - f) Discrete time
 - g) Deterministic
 - h) Random
- 3) Time scaling, $x(at)$, and time shifting $x(t \pm T)$ signals
- 4) Phasor representation of $\cos(2\pi f_0 t)$ & Spectral plots for $A\cos(\omega_0 t + \phi)$ or $A\cos(2\pi f_0 t + \phi)$ and $\sum A_n \cos(2\pi n f_0 t + \phi_n) = \sum A_n \cos(n\omega_0 t + \phi_n)$
- 5) Calculation of the Energy and Power of Signals & Power in $A\cos(\omega_0 t + \phi)$ or $A\cos(2\pi f_0 t + \phi)$
- 6) Special functions
 - a) $\delta(t)$
 - b) $\text{tri}(t)$
 - c) $u(t)$
 - d) $\text{rect}(t)$
 - e) $r(t)$
- 7) Classification of Systems
 - a) Linear/Nonlinear
 - b) Time Varying/Time invariant
 - c) Causal/Noncausal
 - d) Continuous time/ Discrete time
 - e) BIBO stable
 - f) Linear and Time Invariant (LTI) System
- 8) Convolution & its properties in continuous time
- 9) Impulse response $h(t)$
- 10) Step response $y_{\text{step}}(t)$
- 11) Impulse response of cascaded linear time invariant systems
- 12) Bounded input/Bounded output (BIBO) stability and the impulse response - $h(t)$
- 13) Causality and the impulse response - $h(t)$
- 14) Transfer Function of linear time invariant systems – $H(\omega)$ or $H(f)$
- 15) Response of a linear time invariant systems with Transfer Function $H(\omega)$ or $H(f)$ to an input signal of $A\cos(\omega_0 t + \phi)$ or $A\cos(2\pi f_0 t + \phi)$ or $\sum A_n \cos(n\omega_0 t + \phi_n)$
- 16) Model periodic signals using Fourier Series
 - a) Complex exponential form, x_n 's
 - b) Sine/Cosine form, a_n 's and b_n 's
 - c) Cosine form c_n 's
 - d) Determine the fundamental frequency of periodic signals
 - e) Determine DC (average value, x_0 , a_0 , c_0) of periodic signal
 - f) Apply signal symmetry properties to simplify finding a_n 's, b_n 's, c_n 's, x_n 's
 - g) Time $\rightarrow$ Frequency & Frequency $\rightarrow$ Time; $x(t) \rightarrow$ Magnitude and two-sided spectral plots and Magnitude and two-sided spectral plots $\rightarrow x(t)$
 - h) $\sum x((t-kT_0)/\tau)$ the spectral lines separated by $1/T_0$ and the envelope is related to τ .