1) Find the Fourier Transform of aperiodic signals
2) Find the Fourier Transform of periodic signals
3) Find the Fourier Series of a periodic signal using the relationship between Fourier Transform and Fourier Series
   \[ x_p(t) = \sum_{k=-\infty}^{\infty} x(t - kT_0) = \sum_{n=-\infty}^{\infty} x_n e^{jn\omega_0 t} \]
   \[ x(t) \leftrightarrow X(\omega) \]
   \[ x_n = \frac{1}{T_0} X(n\omega_0) \]
4) Apply the Fourier Transform theorems and properties to find \( X(\omega) \)
5) Find signal energy using Parseval’s theorem for aperiodic signals
6) Determine the Transfer Function of linear time invariant systems - \( H(\omega) \)
   Finding \( H(\omega) \) from LCCDE
7) Find the amplitude and phase response of linear time invariant systems
8) Determine the output of a system given its input
9) Understand the concept of bandwidth and the inverse signal duration/bandwidth relationship
   - First zero definition
   - 3 dB definition
   - Inverse time duration-bandwidth relationship
10) Criteria for an ideal linear time invariant system – Ideal Filters
    a) Distortionless transmission \( y(t) = Kx(t-\tau) \) \( H(\omega) = Ke^{j\omega\tau} \) for all \( \omega \).
    b) ILPF \( H(\omega) = Ke^{j\omega T_0} \) over the signal bandwidth
    c) IBPF, IBRF, IHPF
    d) If \( B_{\text{System}} >> B_{\text{signal}} \) then minimal distortion, where \( B_{\text{System}} = \text{system bandwidth} \) and \( B_{\text{signal}} = \text{signal bandwidth} \)
16) Basic modulation: DSB-SC, DSB-LC (AM), and FDM: Transmitters and Receivers
17) Sampling
    a) Sampling Theorem
    b) Sampling rate \( f_s > 2B \) (Nyquist sampling rate = \( 2B \))
    c) Spectrum of a sampled signal
    d) Aliasing; causes and remedies
    e) Recovery of \( x(t) \) from \( x_s(t) \) using an LPF
18) Discrete Time Signals and Systems
   a) Discrete signal notation, e.g., \{a, b, c, d, \ldots\} then \ x[0]=c
   b) Discrete Time Signals \ x[n], u[n], \delta[n], \cos(\Omega n+\phi), p^n u[n] 
      where \ \Omega= the discrete-time angular frequency
   c) Discrete time LTI systems
      - Difference equations
      - ARMA format for difference equations
      - Block diagrams with delay blocks
      - Properties of Discrete Time Systems
        o Linearity
          - Scaling
          - Additivity
        o Time-invariance
        o Memoryless (static) vs Memory (dynamic)
        o BIBO stable
        o Casual
        o Discrete time impulse response, \ h[n] 
19) Discrete Time Convolution
20) z-transform
   a) Definition; finding \ X(z) \ given \ x[n] 
   b) Finding \ H(z) \ given 
      - The impulse response
      - Difference equation