Instructional Objectives for Roberts Chapter 12 –
Continuous-Time Fourier Transform Analysis of Signals and Systems

12.2 Frequency Response

Find the overall system frequency response for series/parallel systems.
Determine the frequency response of low pass, high pass, band pass and band stop filters given their system block diagrams.
Sketch the frequency response of low pass, high pass, band pass and band stop filters (magnitude and phase).
Apply the convolution/multiplication duality to find system response using the Fourier transform.

12.3 Ideal Filters

Define *passband*, *stopband*, *bandlimited*, *strictly bandlimited*, *distortion*, *noise* and *gain*.
Sketch the frequency response for an ideal lowpass, highpass, bandpass and bandstop filter.
Classify a frequency filter given its frequency response.
Calculate the bandwidth of an ideal filter.
Describe the relationship between impulse response and causality.
Discuss how a frequency filter can be used to improve the signal-to-noise ratio.

12.4 Practical Passive Filters

Calculate the impedence of a resistor, capacitor and inductor.
Given an RLC circuit diagram, determine the frequency response using impedances.
Describe the effects on the frequency response of an RLC circuit of adjusting R, L and/or C.

12.5 Log-Magnitude Frequency-Response Graphs and Bode Diagrams

Given the equation for the frequency response of a system, determine the equation for the log magnitude in decibels.
Define what is meant by *poles* and *zeros* of a system, and describe how poles and zeros affect the log magnitude plot.
Given the frequency response for a system, calculate and sketch the Bode diagram for single and double pole and zero systems, including systems with complex pole and zero pairs.

12.6 Practical Active Filters

Given a diagram of a circuit that includes operational amplifiers, determine its frequency response.
Determine the Bode plots for circuits that contain practical active filters.
Given the specifications of a frequency response, design the corresponding circuit.

12.7 Communication Systems

Define *sideband*, *double sideband*, *single sideband*, *modulation*, *demodulation*.
Sketch the spectrum at various points in a communication system that uses amplitude modulation.
Sketch the spectrums for Double SideBand Transmitted Carrier (DSBTC) and Double SideBand Suppressed Carrier (DSBSC).
State the transmission bandwidth of various forms of amplitude modulation.

Describe how filters are used in amplitude modulation communication.

12.8 Impulse Sampling

State the sampling theorem.

Define what is meant by the *Nyquist rate*, *Nyquist frequency*, *undersampling*, *oversampling* and *aliasing*.

Use the sampling theorem to determine the Nyquist frequency and the Nyquist rate.

Sketch the resulting frequency spectrum when an analog signal is subjected to impulse sampling.