ECE113  Circuits and Signals

Goals
To develop skills for representation of time-based signals in the frequency domain and to introduce the methods of frequency-based analysis and design.

Specific Educational Outcomes

1. Understand distinction between time- and frequency domains for signal representation.
2. Manipulate and interpret phasor voltages and currents.
3. Understand the concepts of impedance and admittance and use them properly.
4. Convert any simple RLC network with embedded voltage or current into a Thevenin or Norton equivalent.
5. Become adept at using high-and low-frequency limits of parallel and series RC and RL pairs to estimate the behavior of circuits containing these elements.
6. Analyze simple non-linear circuits using graphic techniques or the method of assumed states.
7. Use poles and zeroes of system functions to determine the forced and natural responses of linear systems.
8. Use poles and zeroes to estimate the behavior of simple amplifiers and filters.
9. Represent frequency dependence data for amplifiers and filters in Bode plot form.
10. Determine the bandwidth and the circuit Q of filters from Bode plots.
11. Understand the basic frequency-dependent behavior of series and parallel LC circuits.
12. Manipulate simple circuits into two-port network realizations.
13. Perform Fourier series of simple periodic functions, including square and triangle wave functions.
14. Estimate from visual inspection the most significant harmonic components of periodic functions.
15. Use Laplace transforms to solve simple transient circuit problems with given initial conditions.
16. In the laboratory, characterize simple linear and non-linear networks to ascertain their i-v characteristics.
17. Design, assemble, and test simple op-amp realizations of voltage amplifiers and active filters.
18. Write clear, concise technical descriptions of laboratory work and problem-solving procedures in grammatically correct English.