Syllabus for EE1101 (EE and EP)

Modules:

1. Signals (continuous-time): Signal classification (analog-digital, energy-power, even-odd, periodic-aperiodic, deterministic-random etc.), standard signals (unit step, unit impulse, ramp, exponential, sinusoids), transformations of the independent variable. (4 classes)
2. Systems (continuous-time): System classification (memory, causal, stable, linear, time-invariant, invertible etc.). (2 classes)
3. Natural and forced response, zero-input and zero-state solutions, step response, system stability. (3 classes)
4. Impulse response of an LTI system, convolution integral, graphical convolution, system properties from impulse response, interconnection of LTI systems, evaluating impulse response from the step response. (4 classes)
5. Discrete-time signals and systems: Emphasize similarities and differences with continuous-time counterpart, transformations of signals, discrete-time convolution. (3 classes)
6. Continuous-time Fourier series: Periodic signals and their properties, complex exponential as eigenfunction of LTI systems, exponential and trigonometric FS representation of periodic signals, convergence, FS of standard periodic signals, salient properties of Fourier series, FS and LTI systems, some applications of FS (eg. filtering). (6 classes)
7. Continuous-time Fourier transform: Development of Fourier representation of aperiodic signals, convergence, FT of standard signals, FT of periodic signals, properties of FT, some applications of FT (eg. modulation). (6 classes)
8. Laplace transform: Unilateral and Bilateral transform, ROC, relation between Fourier and Laplace transform, properties, poles and zeros of rational transfer function, frequency response from pole zero locations, Bode plots, solution of ODEs using laplace transform, zero-state and zero-input response. (6 classes)
9. Sampling (Bridge continuous and discrete): Sampling theorem and signal reconstruction, notion of aliasing with examples, discrete-time processing of continuous-time signals, continuous-time processing of discrete-time signals. (5 classes)

Books:

Text book: Principles of Linear Systems and Signals: B.P. Lathi (2nd Edn)

Reference book: Signals and Systems: Oppenheim, Willsky and Nawab (2nd Edn).