

University of Pretoria Yearbook 2022

Linear systems 220 (ELI 220)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module credits	16.00
NQF Level	06
Programmes	BEng (Computer Engineering) BEng (Computer Engineering) ENGAGE BEng (Electrical Engineering) BEng (Electrical Engineering) ENGAGE BEng (Electronic Engineering) BEng (Electronic Engineering) ENGAGE
Prerequisites	EIR 211/221 GS
Contact time	1 practical per week, 1 tutorial per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 2

Module content

This module presents an introduction to linear systems (classification of signals, elementary signal properties, signal operations and system equations), time-domain models of linear systems (impulse response, LTI responses, convolution of continuous-time signals and related properties), Fourier series (exponential and trigonometric Fourier series, Euler, amplitude and phase spectra, bandwidth, Gibbs phenomenon, Parseval's theorem and Dirichlet condition), the Fourier transform (Fourier transform and its inverse, properties, introduction to modulation systems (amplitude modulation), energy and power spectral density of continuous-time signals), the Laplace transform (relationship with Fourier, properties, transform pairs, integro-differential equations of RC, RL and RLC circuits, block diagrams, poles and zeros, Bode plots, second-order system properties, stability, final and initial value theorems, natural frequency, natural and forced response, step response and sinusoidal input analysis), filter design (ideal filters and practical filter design (lowpass, highpass, bandpass and bandstop) and Butterworth and other filter designs), and sampling and quantisation (sampling theorem and Nyquist criteria, aliasing, introduction to anti-aliasing filters and digital systems).

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