EEE.8-2.9 RF Design

Course contents: * Introduction. Electromagnetic spectrum, radio frequency (RF) frequencies, basic system architectures and RF transceivers. Media, reflections, maximum power transfer. * Lumped and distributed circuits. The electromagnetic resistance of the resistor, capacitor and inductor at high frequencies (RF). Resonance. Quality factor. Impedance Transformation. Smith Chart. * High frequency transistor models. Equivalent RF circuits, parameters S. Integrated circuits RF, MIC, MMIC. * Filter design. Filter categories. Passive and active filters. Design for a specific filter class. Microstrip filters.* Small signal amplifiers. Low noise amplifiers. Antenna noise temperature and circuit noise factor. Cascade topology noise figure. Tuned amplifiers and Stagger amplifiers.* Power amplifiers. Operating classes, 1 dB compression point, harmonic and intermodulation products. * Mixers and DAC/ADC. Gilbert cell, up and down frequency conversion, amplitude modulation. Mixers features. Sampling theorem. Analog-to-digital and digital-to-analog converters. * Oscillators. Oscillators using lumped elements. Negative feedback, Barkhausen criterion. Wien bridge oscillators, phase shift oscillators, crystal oscillators. Design oscillators using a Smith chart. Phased Locked Loop (PLL). Frequency synthesizers.* Two-way and multi-port networks. Resistance and conductivity matrices, ABCD, hybrid, and scattering matrices. * Measurement of scattering parameters. Microwave models and RF components for CAD software.* RF systems. Analysis and synthesis of RF systems using scattering parameters. Design using simulation software.