

Analysis of lossless two-wire transmission line with distributed L and C. derivation of the wave equation. Phase velocity, power flow, and characteristic impedance. Terminated lines, reflection coefficient, standing wave ratio, matching. Calculation of input impedance. Use of the Smith chart. Effect of losses and dispersion. Electromagnetic theory. Wave equation. Plane wave propagation. Waves in free space. Reflection of plane waves from dielectric interfaces. Wave propagation in conductive media. Insulators and conductors. Reflection by conductors. Guided wave propagation. Waveguide modes. TEM, TE, TM. Parallel plates - rectangular waveguide. Hollow pipe waveguide, TE and TM modes. Power flow, losses and attenuation. Rectangular waveguide. Basic antenna definitions: Gain, directivity, efficiency, effective area and length, directional patterns and polarization. Antenna theory. Arrays and electronic beam control. Reflector and lens antennas including the feed systems. Antenna measurements and anechoic chambers. Horn antennas, printed and helical antennas and slot antennas. Propagation principles: atmospheric effects, fading types and statistics, propagation models in mobile communications

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Fields and waves in communication electronics
Microwave engineering
Modern antenna design

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