EC8651   TRANSMISSION LINES AND RF SYSTEM   L T P C   3 0 0 3

OBJECTIVES:

- To introduce the various types of transmission lines and to discuss the losses associated.

- To give thorough understanding about impedance transformation and matching.

- To impart technical knowledge in impedance matching using smith chart

- To introduce passive filters and basic knowledge of active RF components

- To get acquaintance with RF system transceiver design

UNIT I   TRANSMISSION LINE THEORY   **9**

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II   HIGH FREQUENCY TRANSMISSION LINES   **9**

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III   IMPEDANCE MATCHING IN HIGH FREQUENCY LINES   **9**

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV   WAVEGUIDES   **9**

General Wave behaviour along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides.

UNIT V   RF SYSTEM DESIGN CONCEPTS

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors Basic concepts of RF design, Mixers, Low noise amplifiers, voltage control oscillators, Power amplifiers, transducer power gain and stability considerations.

OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the characteristics of transmission lines and its losses

- Write about the standing wave ratio and input impedance in high frequency transmission lines

- Analyze impedance matching by stubs using smith charts

- Analyze the characteristics of TE and TM waves

- Design a RF transceiver system for wireless communication

TEXT BOOKS

1. John D Ryder, "Networks, lines and fields", 2nd Edition, Prentice Hall India, 2010.

2. Mathew M. Radmanesh, ―Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition,2002. (UNIT V)

REFERENCES

1. Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.

2. D. K. Misra, ―Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.

3. E.C.Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.

4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.