RF CIRCUIT DESIGN
(ELECTIVE-II)

Course Code: 13EC2115

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Pre requisites: Electronics circuit design, Analog communications.

Course Educational Objectives:

1. Power amplifiers, low signal amplifiers design
2. Power amplifiers large signal amplifiers design
3. Mixers, oscillator, detector design

Course Outcomes:

1. Analysis, Synthesis and evaluating design aspects of RF Transmitters and Receivers.

2. Analysis of receiver signals in the noise environment.

UNIT-I
INTRODUCTION:

Reasons for using RF, Applications, RF Spectrum, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers. Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines.

UNIT-II
RF/MICROWAVE AMPLIFIERS:

Types of amplifiers-small signal amplifier design-design of different types of amplifiers-narrow band, high gain, maximum gain, low noise broad band amplifier design-Multistage small signal amplifier design, Minimum Noise Multistage amplifier design, Large signal design, High power amplifiers, Microwave power combining/dividing techniques, signal distortion due to intermodulation products, Multistage amplifiers large signal amplifiers design

UNIT-III
RF OSCILLATORS:

RF/Microwave oscillator design-Oscillator verses amplifier design-oscillations conditions, design of transistor oscillators, fixed frequency, Frequency tunable oscillators.

UNIT-IV

RF CONVERTERS AND MIXERS:

Rectifier design- detector design Formulation, Properties of S Parameters, Smith charts, applications on distributed circuit applications, lumped element circuit applications.

Mixer design- UP conversion, down conversion, Conversion loss for SSB Mixers, SSB verses DSB Mixers conversion loss, one diode mixers, two diode mixer

UNIT-V

RF MATCHING NETWORKS:

Design of matching networks using lumped elements, design rules for matching networks, Using distributed elements- using single stub matching Short or Open circuited stubs.

TEXT BOOKS:

[1] Matthew M Radmanesh, "*Radio Frequency and Microwave electronics*", Pearson Education Asia, 2001.

[2] Vendalin, "Microwave Circuit Design using Linear and Nonlinear Techniques", 2/e, Wiley, 2010.

REFERENCES:

[1] Joseph Carr., "*Secrets of RF Design*", 3rd Edition, Tab Electronics.

[2] Cotter W. Sawyer, "*Complete Wireless Design*", 2nd Edition, McGraw Hill.

[3] Less Besser and Rowan Gilmore, "*Practical RF Circuit Design for Modem Wireless Systems*", Vol.2.

[4] Reinhold Ludwing, PavelBretchko, "*RF circuit design: Theory and applications*", Pearson Education Asia Publication, New Delhi 2001.