## RF IC DESIGN

**17ECMC2T6B** **Credits: 4**
**Lecture: 4 periods/week** **Internal assessment: 40 marks**
**Semester end examination: 60 marks**

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**Pre-requisites:**Analog Electronic Circuits

**Course Objectives**

- To impart knowledge on basics of IC design at RF frequencies

**Course Outcomes**

- Understanding passive components at RF frequencies and required circuit theory foranalysis
- Studying high frequency amplifier design techniques and low noise amplifier configurations
- distinguish between different types of mixers
- Understanding the design considerations of frequency synthesizers at RF frequencies.

**UNIT-I**
Characteristics of passive IC components at RF frequencies – interconnects, resistors, capacitors, inductors and transformers – Transmission lines Classical two-port noise theory, noise models for active and passive components, Noise figure, Friis equation, Nonlinearity and cascaded stages, Sensitivity and dynamic range, Passive impedance transformation.

**UNITII**
High frequency amplifier design – zeros as bandwidth enhancers, shunt-series amplifier, fTdoublers, neutralization and unilateralization Low noise amplifier design – LNA topologies, impedance matching, power constrained noise optimization, linearity and large signal performance, noise canceling LNAs, Constant gm biasing, current reusing technique.

**UNITIII**
Mixers – multiplier-based mixers, subsampling mixers, diode-ring mixers

**UNITIV**
Oscillators & synthesizers – describing functions, resonators, negative resistance oscillators, synthesis with static moduli, synthesis with dithering moduli, combination synthesizers – phase noise considerations.

**Text Books:**

1. Thomas H. Lee, Cambridge, The Design of CMOS Radio-Frequency Integrated Circuits, UK: Cambridge University Press, 2004.

2. BehzadRazavi, RF Microelectronics, Prentice Hall, 1998.