RF IC DESIGN

Course Code	23EC6601	**Year**	III	**Semester**	II
Course Category	Honors	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Electronic devices and Circuits
Continuous Internal Evaluation	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		**BL**
CO1	Understand passive components at RF frequencies and required circuit theory	L2
CO2	Design high frequency amplifiers and low noise amplifiers	L3
CO3	compare different types of mixers	L3
CO4	Analyze oscillators and synthesizers at RF frequencies	L4

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3				3							3	
CO2	3	2			3							3	
CO3	3	2			3							3	
CO4	3	2	2		3							3	
Avg.,	3	2	2		3							3	

Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	**Characteristics of passive IC components at RF frequencies** – interconnects, resistors, capacitors, inductors and transformers – Transmission lines, noise models for active and passive components, Noise figure, Nonlinearity , cascaded stages, Sensitivity and dynamic range	CO1
2	**High frequency amplifier design** – zeros as bandwidth enhancers, shunt-series amplifier, fTdoublers, Low noise amplifier (LNA) topologies, Common-Source Stage with Resistive Feedback LNA, Common Gate LNA, Cascode CS Stage with Inductive Degeneration LNA, impedance matching, linearity.	CO2
3	**Mixers** – fundamentals of mixers, Downconversion mixer, upconversion mixers , Passive mixers, Active mixers ,Single-Balanced and Double-Balanced mixers, multiplier-based mixers, Gilbert cell mixer, diode based- mixer.	CO3
4	**Oscillators**– Feedback View of Oscillators , Colpitts oscillator, Hartley oscillator , tuned oscillators, ring oscillators, Ring based Voltage	CO4

	controlled oscillator, negative resistance oscillators.	
5	**Frequency Synthesizers**: Phase locked Loop(PLL), Basic Integer-N Synthesizer, synthesis with static moduli, combination synthesizers , phase noise considerations.	CO4

Learning Resources
Text Books
1. Thomas H. Lee, Cambridge, The Design of CMOS Radio-Frequency Integrated Circuits, UK: Cambridge University Press..
Reference Books
1. Behzad Razavi, RF Microelectronics, Prentice Hall.
E-Resources :
1. https://nptel.ac.in/courses/117104727