

RF IC DESIGN

Course Code	20EC6501A	Year	III	Semester	I
Course Category	HONORS	Branch	ECE	Course Type	Theory
Credits	4	L-T-P	3-1-0	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	
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(L4)
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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2				2					2			2	
CO2	2		2		2					2			2	
CO3		2			2					2			2	
CO4		3			3					3			3	
Average * (Rounded to nearest integer)	2	3	2		2					2			2	

Syllabus		
Unit No.	Contents	Mapped CO
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, Nonlinearity , cascaded stages, Sensitivity and dynamic range	CO1
II	High frequency amplifier design – zeros as bandwidth enhancers, shunt-series amplifier, fT doublers, Low noise amplifier design – LNA topologies, impedance matching, power constrained noise optimization, linearity and large signal performance	CO1, CO2
III	Mixers – fundamentals of mixers, multiplier-based mixers, sub sampling mixers, diode-ring mixers.	CO1, CO3

IV	Oscillators– Feedback View of Oscillators, Colpitts oscillator, Hartley oscillator, describing functions, tuned oscillators, negative resistance oscillators.	CO1, CO4
V	Synthesizers: Basic Integer-N Synthesizer, synthesis with static moduli, combination synthesizers, phases noise considerations.	CO1, CO4

Learning Resources	
Text Books	
<ol style="list-style-type: none"> 1. Thomas H. Lee, Cambridge, The Design of CMOS Radio-Frequency Integrated Circuits, UK: Cambridge University Press, 2004 2. Phillip E. Allen and Douglas R. Holberg- CMOS Analog Circuit Design Oxford University Press -3rd Ed., -2011 	
Reference Books	
<ol style="list-style-type: none"> 1. Behzad Razavi, RF Microelectronics, Prentice Hall, 1998. 2. Ludwig, Rf Circuit Design, 2nd Ed., Pearson 	
E-Resources	
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/117102012 	