Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NECD542	RF Power Amplifier and Transmitter Design	3	0	0	3

Course Objective
To develop a basic understanding of various RF techniques in the design of RF power amplifiers and transmitters used in wireless communication systems.
Learning Outcomes
Upon successful completion of the course, students will: • be able to understand the architectures of RF Transmitters • be able to understand different Power Amplifier architectures • be able to design RF Power Amplifier

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Design specifications and requirements of Wireless Transmitters, homodyne, heterodyne, and digital -IF architectures; frequency generation techniques, Direct digital synthesizers.	6	Overview of Wireless Transmitters
2	Review of transmission lines and s-parameters; review of Smith chart and matching networks; basics of RF amplifier design based on s-parameters; power match condition for power amplifiers. CAD design problems.	7	Review of Transmission line theory and Introduction of RF Power Amplifier Design
3	Design parameters for power amplifiers; distortions parameters; devices for power amplifier; Basic classes of operation: linear and reduced conduction angle mode (A, B, AB, C); tuned load architecture, Switch mode Power Amplifiers: Class E, Class F, inverse Class F, harmonic matching techniques.	9	Fundamentals of Power Amplifier:
4	Load-pull, basics of device modeling (FET, HBT, HEMT), non-linear vector network analyzer, and PA design based on model extraction.	6	Measurement techniques in Power amplifier Design:
5	Load modulation, Doherty Power amplifier, Out-phasing techniques, Envelope elimination and restoration, Envelope tracking, and power combination techniques.	8	Efficiency Enhancement Techniques
6	Nonlinear distortion and mitigation: intermodulation distortion, feed-forward cancellation, digital and analog pre-distortion for PA.	6	Architectural solutions for Linearized transmitters:
	Total	**42**	

Text Books:

1. Cripps, S., "RF Power Amplifiers for Wireless Communications", 2nd Ed., Artech House, 2006.
2. Paolo Colantonio, Franco Giannini, and Ernesto Limiti, "High Efficiency RF and Microwave Solid State Power Amplifiers",1st Ed., John Wiley & Sons, Ltd., 2009.
3. Gonzalez, G., "Microwave Transistor Amplifiers Analysis and Design" 2nd Ed.", Prentice Hall, 1994.

Reference Books:

1. K.Rawat, P.Roblin, and S. K. Koul, "Bandwidth and Efficiency Enhancement in Radio Frequency Power Amplifiers for Wireless Transmitters", Springer Nature, 2020.
2. Andrei Grebennikov, Nathan O. Sokal, Marc J Franco, "Switchmode RF and Microwave Power Amplifiers," Second Ed., Academic Press, 2012.