18ECPE702	RADAR COMMUNICATION	L	T	P	C
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Prerequisite:

1. Analog and Digital Communication, Signal Processing.

Course objective:

1. To understand the technologies used in RADAR.
2. To gain knowledge on different types of RADAR and its application
3. To learn about RADAR receivers.

Unit I	INTRODUCTION TO RADAR	9	+	0

Basics of RADAR - EM Waves and properties - Applications of RADAR - RADAR frequencies - RADAR block diagram - RADAR Coordinates - RADAR equation for hard targets and the SNR-radar cross section of targets - RADAR Resolution Elements – Pulse , CW and FMCW RADAR – Configurations - Transmitter power - Pulse repetition frequency - Duty Ratio - Pulse Compression – Coding - Detection of signals in noise and Radar signals.

Unit II	RADAR TRANSMITTER	9	+	0

Introduction- Types of Transmitters - linear-beam power tubes- solid-state RF power sources- magnetron- Klystron, crossed-filed amplifier – RADAR receiver - Receiver noise figure - Super Heterodyne receiver - Digital Receivers - Duplexers and receiver protectors - RADAR displays - Human Machine Interface (HMI).

Unit III	RADAR RECEIVER	9	+	0

RADAR receiver - Receiver noise figure - Super Heterodyne receiver - Digital Receivers - Duplexers and receiver protectors - RADAR displays - Human Machine Interface (HMI).

Unit IV	RADAR ANTENNA	9	+	0

Functions of RADAR antenna - Antenna parameters - Antenna radiation pattern and aperture illumination - Reflector antennas - Electronically steered phased array antennas - Phase shifters – Frequency - Scan arrays - Architectures for phased arrays - Radiators for phased arrays - Mechanically steered planar array antennas - Radiation pattern synthesis - Effect of errors on radiation patterns - Low side lobes antennas.

Unit V	MTI AND PULSE DOPPLER RADAR	9	+	0

Introduction to Doppler and MTI RADAR - Delay – Line cancellers - Staggered pulse repetition frequencies - Doppler filter banks - Digital MTI processing - Moving target detector - Limitations to MTI performance - Pulse Doppler RADAR - MTD - Tracking RADAR - Mono pulse tracking - Conical scan and sequential lobbing - Comparison of trackers - Tracking accuracy – low_angle tracking - Atmospheric and Weather RADAR: Precipitation Radars - Doppler Weather Radar - Polarimetric RADAR - Clear Air RADARs.

Total (L+T)= 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	Gain basic understanding on various types of RADARs
CO2	:	Analyze and design RADAR transmitter and receiver.
CO3	:	Design antenna for RADAR applications.
CO4		Utilize knowledge on RADARs for target detection and weather prediction based applications.

Text Books:

1. Merril I Skolnik,"Introduction to RADAR Systems", McGraw-Hill, 2008.
2. Richard J Doviak and Dusan S Zrnic, "Doppler RADAR and Weather Observations" , Dover Publications, 1993.

Reference Books:

1. Bringi V N and Chandrasekar V, "Polarimetric Doppler Weather RADAR", Cambridge University Press, 2001.
2. Richards M A, Scheer J A and Holm W A, "Principles of Modern RADAR", Yes Dee Publishing Pvt. Ltd., 2012.
3. Principles of morden RADAR by Mark A. Richards, James A. Scheer Scitech Publishing; 1st edition (May 10,
4. Introduction to Radar Systems by Merrill I. Skolnik, Third Edition,Published August 2000 by McGraw-Hill.

E-References:

1. http://www.radio-electronics.com/info/data/semicond/semiconductor/semiconductor-materials-types-list.php
2. http://911electronic.com/
3. http://www.electronics-tutorials.ws/