Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD538	Radar Signal Processing	3	0	0	3

Course Objective

This course is designed to familiarize the students with the different kinds of radar systems and their operations. It will also provide different concepts related to radar detection and radar signal processing to the students. At the end of the course the students will be able to understand the operation of radar systems and they will be able to work on more complex modern radar systems.

Learning Outcomes

At the end of this module, students are expected to be able to

- Acquired knowledge about Radar and Radar Equations.
- Understanding the working principle of MTI and Pulse Doppler Radar.
- Foster ability to work using Detection of Signals in Noise and Radio Direction Finding.
- Foster ability to work using Instrument Landing System

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Radar fundamentals, Derivation of range equation, the search radar equation, Jamming and radar range with jamming, Radar clutter and radar range with clutter, Radar range with combined interferences sources. Noise and false alarms, Detection of one sample of signal with noise, Integration of pulse trains, Detection of fluctuating targets, CFAR, Optimum and matched filter Theory, Loss factors in detection. Definition of radar cross section, Radar cross section of simple and complex objects, spatial distribution of cross section, Bistatic cross section.	11	Understanding of fundamental of Radar and Radar Equations. Also familiar with the concept of RCS and its analysis.
2	CW and FM Radar: Doppler Effect, CW and FMCW Radar, Airborne Doppler Navigation, Multi frequency CW Radar. Delay lines and line cancellors, Subclutter Visibility. MTI using range gates and filters, Pulse Doppler radar, Non-coherent MTI radar.	10	This unit will help student in understanding the working principal of MTI, Pulse Doppler and other types of Radar.
3	Application of Digital signal processing to radar system. Different types of tracking techniques, tracking in range, tracking in Doppler, Search Acquisition radar, Comparison of Trackers. Height finding radars, Air traffic control Radars and data handling, Atmospheric effects of radar, Electromagnetic compatibility aspects, Airborne Radars, Synthetic Aperture Radar, Secondary surveillance Radars, LTIR.	11	Students will able to understand different tracking techniques along with various kind of real world applications of RADAR technology.
4	Matched filter receiver, detection criteria, detectors, integrators, constant-false-alarm rate receiver, basic radar measurement, ambiguity diagram, pulse compression, target recognition, surface-clutter, land clutter, sea clutter, weather clutter, detection of targets in clutter, ECM and ECCM.	10	Student will familiarize the reciver operations and understanding of relevant mathematical analysis along with measurement.
	Total	**42**	

Text Book:

1. Modern Radar System Analysis, By David Barton .K - Artech House, 1st edition, 1988..

Reference Books:

1. Radar Design Principles Signal Processing and The Environment, By Fred NathansonMcgraw Hill, 1969.
2. Introduction to Radar systems, By Skolnik - Mcgraw Hill, 3rd edition, 2002.
3. Radar Fundamentals, By Ian Faulconbridge, Argos Press Hill, 1st edition, 2002.