EC-410D	RADAR & NAVIGATIONAL AIDS (ELECTIVE - VI)	L T P C 4 - - 3

COURSE OBJECTIVES:

1. To understand the basic principles of radar communication .
2. Identification and detection of fixed and moving targets using different types of radars.
3. To understand different duplexer mechanisums and tracking systems of radar.
4. To understand various electronic warfare measures used in radars.
5. To understand the concepts of navigational aids.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand various types of radar equipments.
2. demonstrate and Distinguish the fixed and moving targets using different types of radar systems and also the working of tracking radar.
3. analyze the features of radar receiver's components and their usage in aerospace guidance.
4. summarize noise jamming and different electronic warfare techniques.
5. identify the different navigational aids..

UNIT I *Text Book - 1* **(10)**

Introduction to Radar concepts : Block Diagram of Pulse Radar, simple form of Radar equation, Detection of signals in noise, Receiver noise and signal to noise ratio, integration of Radar pulses, RCS of simple targets, RCS of multiple targets, PRF and Range Ambiguities, Doppler Effect, Limitations of CW Radar, FMCW Radar, Altimeter.

UNIT II *Text Book - 1,2* **(10)**

MTI Radar : MTI Radar, Clutter Attenuation, MTI improvement factor, Delay line cancellers, Frequency response of single delay line cancellers, N-pulse delay line canceller, Non recursive and Recursive filters, Staggered PRF, Doppler filter banks.

UNIT III *Text Book - 1,2* **(12)**

SUPER HETERODYNE RECEIVER : Receiver, types of Duplexers and receiver protectors, types of Displays, wall construction of Radomes.

TRACKING : Types of Tracking Radar Systems, Sequential lobing, conical scan and mono pulse tracking (amplitude comparison and phase comparison).

UNIT IV *Text Book - 1,2* **(10)**

ELECTRONIC WARFARE : Objectives an definitions, Noise jamming, Types of Electronic counter measures and Electronic counter to counter measures, Stealth applications.

UNIT V *Text Book - 2* **(13)**

ELEMENTARY IDEAS OF NAVIGATION AIDS : VOR, DME, DVOR, TACAN, ILS and MLS, GPS, Automatic Direction finder.

HYPERBOLIC NAVIGATIONAL AIDS : LORAN, DECA, OMEGA.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Merrill I Skolnik - Introduction to Radar Systems, 3rd Edition, TMH, 2003.
2. Dr AK Sen and Dr AB Bhattacharya - Radar Systems and Radio Aids to Navigation, 6th Edition, Khanna Publishers, 2009.

REFERENCE BOOK(s):

Peyton Z Peebles Jr, Radar Principles - John Wiley Inc., 2nd Edition, Prentice-Hall of India, 2004.

WEB RESOURCES:

1. http://nptel.iitm.ac.in/courses/
2. http://nptel.iitm.ac.in/courses.php?branch=Ece 2.
3. http://www.radartutorial.eu/07.waves/wa04.en.html