

Year & Sem:	Course Code: EC3602	Course Name: Radar Communication	No. of Credits: 4	L 2	T&PS 2	P 0
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UNIT - I: RADAR BASICS Introduction, Radar band designations, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets -sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT - II: CW AND FM RADAR Doppler Effect, CW Radar –Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT – III: MTI AND PULSE DOPPLER RADAR Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT – IV: TRACKING RADAR Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar–Amplitude Comparison Monopulse (one-and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT – V: DETECTION OF RADAR SIGNALS IN NOISE Introduction, Matched Filter Receiver –Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

UNIT – VI: PHASED ARRAY AND IMAGING RADAR Phased array principle and feed systems, conventional and adaptive beamforming techniques; Synthetic aperture radar (SAR): SAR fundamentals, cross-range resolution in radar, synthetic aperture viewpoint; SAR data characteristics: Stripmap SAR geometry, strip map SAR data set, strip map SAR image formation algorithm; Introduction to polarimetric and interferometric SAR

References/Text Books:

1. Merrill I. Skolnik, "Introduction to Radar Systems", 3rd Edition, Tata McGraw-Hill, 2001
2. Peebles, Jr., P.Z, "Radar Principles" Wiley, New York, 1998.
3. Byron Edde, "Radar Principles, Technology, Applications", Pearson Education, 2004
4. Hovanessian, S.A., "Radar System Design and Analysis", Artech House 1984.
5. Harger, R. O., Synthetic Aperture Radar Systems: Theory and Design, Academic Press,

NY (1970).

6. Schleher, D.C., "MTI and Pulse Doppler Radar", Artech House 1991

7. Richards, M.A., "Fundamental of Radar Signal Processing", Tata McGraw-hill. 2005

8. Sullivan, R.J., "Radar Foundations for Imaging and Advanced Concepts", Prentice-Hall of India. 2004

9. Mott, H., "Remote Sensing with Polarimetric Radar", IEEE Press. 2007

10. Nathanson, F.E., "Radar Design Principles", Scitech Publishing. 2002.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Video Lectures (Web Links):

1. <http://www.ll.mit.edu/workshops/education/videocourses/intro radar/index.html>

2. <http://aess.cs.unh.edu/radar%20se%20List%20of%20Lectures%20.html>

Study Materials (Web Links):

1.

2.

Problems & Solutions (Web Links):

1.

2.

Assignments (Web Links):

1.

2.