PRINCIPLES AND TECHNIQUES OF MODERN RADAR SYSTEMS

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PRE-REQUISITES : Basic Knowledge of Electromagnetic Theory and Microwave Engineering is required. Following NPTEL courses are suggested: (a) Electromagnetic Theory (b) Basic Tools in Microwave Engineering (c) Basic Building Blocks of Microwave Engineering (d) Analysis and Design Principles of Microwave Antennas

INTENDED AUDIENCE : BE/B.Tech Electronics Engineering/Electronics and Communication Engineering/ ME/M.Tech/MS students belonging to RF and Microwave Engineering, PhD fellows having research area of Radar system design

INDUSTRIES APPLICABLE TO : Radar Industry, Space Industry, Avionics industry, Defense Industry,Internal Security Industry, Mining industry, Geo-exploration Industry.

COURSE OUTLINE :

The course “Principles and Techniques of Modern Radar Systems” covers a broad spectrum of the radar system design and analysis, starting with the basic concepts of microwave radar principles. The modern trend of close sensing of targets with ground penetrating radar is next introduced along with the topic of radar tomography to give the course students a thrill of various modern civil, industrial and mining applications of radar technology. This trend of radar technology evolution from defence applications to civilian applications is emphasized at the end of the course.

ABOUT INSTRUCTOR :

Prof. Amitabha Bhattacharya received his B.Tech, (E&ECE) Degree from IIT Kharagpur in 1986, M.E. E&CE from Jadavpur University in 1994 and PhD (E. & ECE) from IIT Kharagpur in 1998. He started his professional career in 1986 by joining as Junior Research Engineer in an ISRO-sponsored Research Project at IIT Kharagpur and continued thereafter as a Senior Research Assistant in a DRDO sponsored Research Project till 1991. In 1997, he joined SAMEER, Mumbai and then Defence Lab, Jodhpur as a Research Scientist.

COURSE PLAN :

Week 1: Basic Principles: Radar Equation, Radar Cross section

Week 2: CW Radar, FMCW Radar

Week 3: Pulsed Radar Principles

Week 4: Clutter Analysis, MTI Improvement Factor, Pulsed Doppler Radar,

Week 5: Tracking Radar, Angular resolution, Monopulse Technique

Week 6: Detection Theory: Match Filtering, Radar Ambiguity Function

Week 7: Imaging Radar: Resolution Concept, Pulse Compression

Week 8: Synthetic Aperture Processing, ISAR Imaging

Week 9: Probability of False Alarm and Detection, Modified Radar Range Equation with Swerling Models

Week 10: Ground Penetrating Radar for close sensing

Week 11: Radar Tomography and Radar based Microwave Imaging

Week 12: Emerging and Modern Applications of Radar Principles