**Syllabus**

# Customized Course (online) on

**Concept of Basic Radar Concept for CAAB personnel**

## CHAPTER 1: Introduction to RADAR

* Introduction to RADAR
* Radar Frequencies
* Frequency Selection criterion
* Normal radar functions

## CHAPTER 2: CLASSIFICATION OF RADARS

* Classification of Radars
* Applications of Radar in Civil Aviation
* Radars Used for Air Traffic Control Services
* General Applications of Radar other than aviation
* Limitations of a Radar

## CHAPTER 3: GENERAL TERMS USED IN RADAR

* Radar Clutter
* Sea Clutter
* Noise
* Noise Factor (F)
* Noise Figure (NF)
* Radar Range calculation
* Radar Cross Section (RCS)
* Pulse characteristics
* Radar Mile
* Maximum Unambiguous Range
* Range resolution
* Azimuth resolution
* Radar Accuracy
* Rate of scan

## CHAPTER 4: BASIC PULSE RADAR SYSTEM CHAPTER 5: RADAR ANTENNA

* + Function of Antenna
  + Antenna beam
  + Omnidirectional Antenna
  + Directivity of an antenna
  + Antenna Gain
  + Antenna Pattern
  + Beam Width
  + Cone of silence
  + Types of Antennas
  + Antenna with Cosecant Squared Radiation Pattern
  + Polarization
  + Antenna drive system
  + Azimuth encoding
  + Beam Switch

## CHAPTER 6: RADAR RANGE EQUATION CHAPTER 7: RADAR TRANSMITTER

* + - Basic characteristics of a transmitter
    - General block diagram of a radar
    - RADAR Transmitter Types
    - Choices of microwave amplifying devices
    - Frequency diversity and Frequency agility

## CHAPTER 8: RECEIVER PROTECTORS & MICROWAVE DEVICES

* + - Receiver Protectors
      * Duplexer
      * Diplexer
      * RF Limiters
      * T/R Tube
      * Pre-TR Tube
      * Sensitivity Time Control (STC)
* Why Wave guides are used in PSR but not in MSSR
* Directional Couplers

## CHAPTER 9: RADAR RECEIVER

* General Description
  + Minimum Detectable Signal (MDS)
  + Low Noise Amplifier (LNA)
  + RF Amplifier
  + Automatic Gain Control (AGC)
  + Mixer
  + Intermediate Frequency (IF)
  + IF Amplifier
  + Instantaneous Automatic Gain Control (IAGC)
  + Logarithmic Amplifier
* Dynamic Range of an Rx
* Pulse Compression
  + Need of Pulse Compression
  + Pulse Compressor
  + Advantages & Disadvantages of Pulse Compression
  + Methods of Pulse Compression
  + Modulations involved in Pulse compression
* Matched Filter
  + Properties of a Matched Filter
  + Application of Matched Filter in Radar

## CHAPTER 10: RADAR SIGNAL PROCESSING

* INTRODUCTION TO DOPPLER AND MTI RADAR
  + General
  + MTI Radar and Pulse Doppler Radar
  + Doppler Frequency Shift
  + Simple CW Doppler Radar
  + MTI Radar Block Diagram Description
  + Pulse Radar that Extracts the Doppler Frequency-Shifted
  + Echo Signal
  + Sweep-to-Sweep Subtraction and the Delay-Line Canceler
* DELAY-LINE CANCELERS
  + Frequency Response of the Single Delay-Line Canceller
  + Blind Speeds
  + Block Diagram
  + Blind Phases, I and Q Channels
* Block Diagram of an Adaptive MTD Processer
* Threshold
* Probability of Detection (PD)
* False targets
* False Alarm
  + Constant False Alarm Rate (CFAR)
  + Cell Averaging CFAR or CA CFAR
  + Clutter Map
  + Difference between CW Radar and MTI Radar
  + Difference between MTI and MTD Radars

## CHAPTER-11: TARGET PROCESSING-Plots and Tracks

* + - Track Initiation
    - Track Smoothing
    - Plot Combiner

## Annexure

**RADAR GLOSSARY REFERENCES**