



SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY

Accredited by National Board of Accreditation,
AICTE, New Delhi, Accredited by NAAC with "A" Grade - 3.32 CGPA
Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi.
Permanent Affiliation to JNTUK, Kakinada
SEETHARAMPURAM, W.G.D.T., NARSAPUR-534280, (Andhra Pradesh)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Academic Year	Semester commencement date
16EC7T03	Radar Engineering (R16)	VII	ECE	5	2021-2022	04-10-2021
COURSE OUTCOMES						
After completion of the course student are able to						
1	Describe the basic concepts of radar and analyze radar range equation. [K1 & K2]					
2	Demonstrate the operation and explains the applicability of CW radar. [K3 & K2]					
3	Summarize the operation and outlines the applicability of MTI and tracking and detection of radar. [K2 & K1]					
4	Illustrate the functioning of radar antennas and computes the noise performance of radar receivers. [K4 & K3]					

TEACHING PLAN

Unit No	Out Come/Bloom's Level	Topics/Activity	Reference Text book	Contact Periods	Delivery Method	
Unit-1. INTRODUCTION						
1	CO 1. Describe the basic concepts of radar and analyze radar range equation. [K1 & K2]	1.1	Introduction: Nature of Radar,	T1, T2, R1	1	Chalk & Talk, PPT, Active Learning & Tutorial
		1.2	Maximum Unambiguous Range, Radar Equation	T1, T2, R1	1	
		1.3	Radar Waveforms, Simple form of Radar Equation	T1, T2, R1	1	
		1.4	Radar Block Diagram and Operation,	T1, T2, R1	1	
		1.5	Radar Frequencies and Applications.	T1, T2, R1	1	
		1.6	Receiver Noise and SNR	T1, T2, R1	1	
		1.7	Integration of Radar Pulses,	T1, T2, R1	1	
		1.8	Radar Cross Section of Targets (simple targets - sphere, cone-sphere)		1	
		1.9	Transmitter power.	T1, T2, R1	1	
		1.10	Problems	T1	1	
TOTAL				10		
Unit-2 CW AND FM-CW RADAR						
2	CO 2. Demonstrate the operation and explains the applicability of CW radar. [K3 & K2]	2.1	PRF and Range Ambiguities.	T1, T2, R3	1	Chalk & Talk, PPT Tutorial, Smart Board
		2.2	System Losses (Qualitative treatment).	T1, T2, R3	1	
		2.3	CW and Frequency Modulated Radar: Doppler effect.	T1, T2, R3	1	
		2.4	CW Radar -Block Diagram Isolation between Transmitter and Receiver	T1, T2, R3	1	
		2.5	Non-zero IF Receiver.	T1, T2, R3	1	
		2.6	Receiver Bandwidth Requirement, Applications of CW radar	T1, T2, R3	1	
		2.7	FMCW Radar Range	T1, T2, R3	1	
		2.8	Doppler Measurement.	T1, T2, R3	1	
		2.9	Block Diagram and Characteristics (Approaching/ Receding Targets)	T1, T2, R3	1	



SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY

Accredited by National Board of Accreditation,
AICTE, New Delhi, Accredited by NAAC with "A" Grade - 3.32 CGPA
Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi.
Permanent Affiliation to JNTUK, Kakinda
SEETHARAMPURAM, W.G.D.T., NARSAPUR-534280, (Andhra Pradesh)

	2.10	FM-CW altimeter, Measurement Errors	T1, T2, R3	1		
	2.11	Multiple Frequency CW Radar.	T1, T2, R3	1		
	2.12	Problems	T1	1		
TOTAL				12		
Unit-3. MTI AND PULSE DOPPLER RADAR						
3	CO 3. Summarize the operation and outlines the applicability of MTI and tracking radar.[K2 & K1]	3.1	Introduction, Principle, MTIR Radar.	T1, T2, R1	1	Chalk & Talk, PPT, Tutorial, Smart board
		3.2	MTIR Radar -Power Amplifier Transmitter.	T1, T2, R1	1	
		3.3	MTIR Radar -Power Oscillator Transmitter.	T1, T2, R1	1	
		3.4	Delay Line Cancellers - Filter Characteristics	T1, T2, R1	1	
		3.5	Blind Speeds	T1, T2, R1	1	
		3.6	Double Cancellation staggered PRFs	T1, T2, R1	1	
		3.7	Range Gated Doppler Filters.	T1, T2, R1	1	
		3.8	MTI Radar Parameters	T1, T2, R1	1	
		3.9	Limitations to MTI Performance.	T1, T2, R1	1	
		3.10	Non-coherent MTI	T1, T2, R1	1	
		3.11	MTI versus Pulse Doppler Radar	T1, T2, R1	1	
		3.12	Problems	T1	1	
TOTAL				12		
Unit-4. TRACKING RADER						
4	CO 3. Summarize the operation and outlines the applicability of MTI and tracking radar.[K2 & K1]	4.1	Tracking with Rader	T1, T2, R3	1	Chalk & Talk, PPT & Tutorial, Smart board
		4.2	Sequential Lobing, Conical Scan		1	
		4.3	Monopulse Tracking Rader	T1, T2, R3	1	
		4.4	Amplitude comparison Monopulse-One coordinates		1	
		4.5	Amplitude comparison Monopulse Two coordinates		1	
		4.6	Phase comparison monopulse	T1, T2, R3	1	
		4.7	Tracking in range		1	
		4.8	Acquisition and scanning patterns	T1, T2, R3	1	
		4.9	Comparison of trackers.		1	
		4.10	Problems	T1	1	
TOTAL				10		
Unit 5. DETECTION OF RADAR SIGNALS IN NOISE						
5	CO 3. Summarize the operation and outlines the applicability of MTI and tracking and detection of radar.[K2 & K1]	5.1	Electronically Steered Phased Array Antennas	T1, T2, R3	1	Chalk & Talk, PPT, Smart Board
		5.2	Phase Shifters	T1, T2, R3	1	
		5.3	Frequency -scan Arrays, Radiation for Phased Array,	T1, T2, R3	1	
		5.4	Architecture for Phased Arrays	T1, T2, R3	1	
		5.5	Detection of Radar Signals in Noise	T1, T2, R3	1	
		5.6	Matched Filter Receiver -response Characteristics and Derivation,	T1, T2, R3	1	
		5.7	Detection Correlation, criteria, characteristics	T1, T2, R3	1	
		5.8	Automatic Detection, Constant False Alarm Rate Receiver	T1, T2, R3	1	
		5.9	Problems	T1	1	
TOTAL				9		



SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY

Accredited by National Board of Accreditation,
AICTE, New Delhi, Accredited by NAAC with "A" Grade - 3.32 CGPA
Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi.
Permanent Affiliation to JNTUK, Kakinada
SEETHARAMPURAM, W.G.DT., NARSAPUR-534280, (Andhra Pradesh)

6		Unit 6. RADAR ANTENNAS AND RADAR RECEIVER				
	CO 4.				Chalk & Talk, PPT Tutorial, Active Learning & Seminars	
	Illustrate the functioning of radar antennas and computes the noise performance of radar receivers. [K4 & K3]	6.1	Steered Phased Array Antennas	T1, T2, R1		1
		6.2	Phase Shifters	T1, T2, R1		1
		6.3	Radiation for Phased Array	T1, T2, R1		1
		6.4	Architecture for Phased Arrays	T1, T2, R1		1
		6.5	Radar Displays – types	T1, T2, R1		1
		6.6	Duplexer - Branch type and Balanced type	T1, T2, R1		1
		6.7	Radiation Pattern	T1, T2, R1		1
		6.8	Beam Steering and Beam Width changes	T1, T2, R1		1
		6.9	Series versus Parallel Feeds	T1, T2, R1		1
		6.10	Applications, Advantages and Limitations.	T1, T2, R1		1
		6.11	Problems	T1	1	
	Course syllabus	Beyond	Active electronically scanned arrays, conformal radar, digital array radar, MIMO architecture and integrated RF systems			

TOTAL

11

TOTAL NO. OF CLASSES PROPOSED PER PERIOD'S

64

Text Books:

S.No.	AUTHORS/BOOK TITLE/EDITION(latest)/PUBLISHER/YEAR OF PUBLICATION
1	Introduction to Radar Systems - Merrill I. Skolnik, 3 rd Ed, Tata McGraw - Hill, Jan 2014
2	Radar Engineering and fundamentals of Navigational Aids-G.S.N.Raju, I.K International, 2 nd Ed, 2008.

Reference Books:

S.No.	AUTHORS/BOOK TITLE/EDITION(latest)/PUBLISHER/YEAR OF PUBLICATION
1	Introduction to Radar Systems- Merrill I. Skolnik, 2 nd Ed, McGraw Hill, 2001.
2	Radar: Principles, Technologies, Applications- Byron Edde, Pearson Education. 2 nd Ed. 2012

Web Details

1	www.nptel.ac.in
2	www.slideshare.net
3	https://www.youtube.com/watch?v=R70ysC8nWol

	Name	Signature with Date
i.	Faculty	Mrs. M.RADHA RANI <i>Radha</i>
ii.	Course Coordinator	Mrs. M.RADHA RANI <i>Radha</i>
iii.	Module Coordinator	Dr. B.SADA SIVA RAO <i>B. Sada Siva Rao</i>
iv.	Programme Coordinator	Dr. B.S.RAO <i>B. Sada Siva Rao</i>

PRINCIPAL