Department of ECE
M. Tech COMMUNICATION & RADAR
Description of Course Outcomes
2021-2023

S.NO	COURSE CODE	COURSE NAME	Cos	COURSE OUTCOME
1	21 EC 5101	MODERN DIGITAL AND WIRELESS COMMUNICATION	1	Classify digital communication systems and modulation schemes.
			2	Understand the importance of wireless communication technologies.
			3	Design mobile radio wave propagation models.
			4	Evaluate equalization and diversity techniques and 4G and 5G technological importance.
			5	Design digital communication and wireless transceiver and channel models.
2	21 EC 5102	MICROWAVE AND MILLIMETRIC WAVE CIRCUITS	1	Classify different microwave circuits based on applications.
			2	Estimate the importance of transformers and resonators in microwave circuit design.
			3	Design of microwave filters and periodic structures.
			4	Understand the feeding principles and excitation techniques in waveguide design.
			5	Construct millimeter wave circuits using electromagnetic tools.
	21	RADAR	1	Understand the concept of radar communication and its ground environment.

			ENGINEERING & MM RADAR		Analyze the radar design principles and understand the types of Radar.
				3	Understand Propagation and Scattering of Millimeter-Length Waves.

			4	Understand various radar based Remote Sensing Applications.
4	21 EC 5104	RF SYSTEM AND ANTENNA DESIGN	1	Classifying the design consideration of RF/MW circuits, signal flow in a circuit, interpretation of measurements in-terms of Scattering and Impedance, HF and MW filter design process.
			2	Interpreting the amplifier/oscillator design process and identifying the stability, gain and noise figure with respective BJT and FET module.
			3	Interpreting aperture antenna design principles with mathematical analysis.
			4	Interpreting array antenna design principles with mathematical analysis.
1	21 EC 51A1	EMI/EMC & ELECTRONIC WARFARE	1	Understand the concept of electromagnetic interference (EMI) in circuits and measurement techniques with open area test sites.
			2	Demonstrate the techniques like grounding, shielding, bonding and EMI filters in the usage of cables, connectors, and components.
			3	Understand the mathematical models of electronic systems as targets of electronic warfare
			4	Describe the mathematical models of systems and techniques for jamming and their effectiveness.
2	21 EC 51A2	MICROWAVE SEMI-CONDUCTOR DEVICES	1	Understand the behavior of high frequency equivalent circuits and operation of varactor, schottky diodes with applications.
			2	Outline the functionality of tunnel and IMPATT diodes with performance characteristics.
			3	Estimate the applications of Gunn and PIN diodes in microwave integrated circuits.
			4	Categorize different microwave transistors and their applications.

3	21 EC 51A3	SMART ANTENNAS	1	Interpret the fundamentals of antenna and defining smart antenna.
			2	Understand the smart antenna configurations, principles, and specifications.
			3	Understand the DOA estimation fundamentals.
			4	Understand the beam forming fundamentals.
4	21 EC 51A4	EMBEDDED SYSTEMS & VLSI FOR WIRELESS COMMUNICATION	1	Understand the Basic components and RF design using SDR.
			2	Study the transmitter and receiver design of RF wireless system using SDR.
			3	Understand VLSI design of receiver for wireless communication.
			4	Understand VLSI design of transmitter for wireless communication.
1	21 EC 51B1	PHASED ARRAY SYSTEMS	1	Understanding and Interpreting the array antenna conventional scanning techniques, principles and the linear, planner array concepts with respective number of elements, radiation pattern lobe and grid design.
			2	Understanding feed networks for phased arrays
			3	Understanding frequency scanned array design.
			4	Understanding search patterns in array antenna.
2	21 EC 51B2	GPS & GLOBAL NAVIGATION SATELLITE SYSTEM	1	Understand GPS and UTC Time, Signal Structure and get an idea about Receiver Components and Specifications.
			2	Perform Mathematical Analysis to estimate Clock Errors, Total Electron Content and Dual frequency.
			3	Discussion on GPS Data Processing and Position Fixing.

			4	Understand GNSS Principle of Operation and Architecture. Understand Different Satellite Navigation Systems like Galileo, GLONASS, IRNSS Space, Control and Ground segments.
3	21 EC 51B3	NEXT GENERATION NETWORKING & COMMUNICATION TECHNOLOGIES	1	Interpreting wireless WAN, PAN and LAN concepts, equipment, standards, and specifications.
			2	Understand the wireless networks and its technologies
			3	Understand the data transfer via GPRS and protocols.
			4	Understand the 4G systems and technologies.
4	21 EC 51B4	DEEP LEARNING WITH ARTIFICIAL INTELLIGENCE	1	Insight into the fundamental's concepts related to AI.
			2	Understand the process, algorithms for the development of convolution neural networks.
			3	Understand the recurrent neural networks in relation to forecasting with a case study.
			4	Understand the concepts of deep learning and its training network.
7	21 IE 5149	SEMINAR		Enhancing verbal delivery, body language, power point skills, structuring the presentation, engaging audience, tone of presentation for the overall improvement of individual presentation skills.
8	21 TS 5101	TECHNICAL SKILLING - I		Enhancing the system design and modeling capabilities through visualization of scientific theories and concepts while building and developing the capabilities of designing a new system by altering and implementing new algorithm and methods through visualization tools.

1	21 EC 5215	4G, 5G, AND MODERN WIRELESS TECHNOLOGIES	1	Understanding Channel propagation and different channel models in mobile communication
			2	Understanding cellular communication and analysis of cell capacity
			3	Analysis of wireless channel capacity and design of receivers
			4	Understanding various wireless standards and analyzing how scientific aspects are applied to a particular technology
			5	Design of experiments for capacity analysis and bit rate analysis
2	21 EC 5216	ADVANCED COMMUNICATION SYSTEMS & NETWORKS	1	Advanced Wireless Communication Spectrum sharing
			2	Massive MU-MIMO System and spectral efficiency
			3	Wireless Systems and Networks in Automation and Paradigms for Advanced Wireless Networks (PAWN)
			4	Cryptography and Cryptanalysis
			5	Lab- Advanced Communication Systems & Networks
3	21 EC 5217	MODERN RADAR SYSTEMS AND AUTONOMOUS VEHICLES	1	Summarize the advanced techniques in modern radar system and Categorize advanced pulse compression waveform modulations and techniques.
			2	Understand the concept of MIMO radar system and applications.
			3	Understand adaptive digital beam-forming principles
			4	Understand the concepts of Automotive radar through Intelligent Transportation System Applications

4	21 EC 5218	OPTICAL NETWORKS & SATELLITE COMMUNICATIONS	1	Understand and recognize various Satellite Systems, architecture, and Sub-modules
			2	Interpret and demonstrate Satellite Link Design for LEO, MEO, HEO and GEO with respective ground and for High altitude platforms.
			3	Describe and identify the basic network components required for setting up an optical network gateway.
			4	Understanding the process of Wavelength Assignment and ability to reconfigure/re-modify the optical network as per the demand.
1	21 EC 52C1	ESTIMATION & DETECTION THEORY	1	Classify different criteria associated to detection theory at receiver.
			2	Understand the concepts of integration of optimum receiver and matched filter receiver.
			3	Analyze the maximum likelihood estimation methods.
			4	Understand the concepts of estimation in the presence of Gaussian noise and prediction with Kalman filters.
2	21 EC 52C2	RADAR SIGNAL PROCESSING & SYSTEM	1	Understand Radar range equation, basics, Range resolution and Get an idea about Radar signals and target tracking.
			2	Understand Radar clutter, matched filter. Apply Kalman filter for Time-domain & Sequential Processing.
			3	Discussion on phased array, multiple array, beam-forming and concept of SAR.
			4	Understand applications of Radar, ECM &ECCM. Understand radars based on functioning and major features

3	21 EC 52C3	HIGH PERFORMANCE COMMUNICATION NETWORKING	1	Understanding the concepts related to packet switched network principles
			2	Understanding the network security implementation and its associated algorithms and protocols.
			3	Understanding TCP/IP and Circuit switched networks.
			4	Understanding optical network infrastructure and its modules used for data transfer.
4	21 EC 52C4	CRYPTOGRAPHY & NETWORKING SECURITY	1	Understanding the modern cryptography and reconfigurable hardware technology
			2	Analyzing the prime and binary finite field arithmetic
			3	Analyzing sphere decoder architecture.
			4	Understanding block ciphers and advanced encryption standards.
1	21 EC 52D1	MACHINE LEARNING & SOFT COMPUTING APPLICATIONS IN COMMUNICATION	1	Able to demonstrate various machine learning algorithms
			2	Able to understand soft computing principles
			3	Able to apply deep reinforcement learning principles to wireless networks
			4	Able to apply deep learning for RADAR and communication processes.
2	21 EC 52D3	REMOTE SENSING & SENSORS	1	Understanding the concepts and principles of remote sensing through optical and RF methods.
			2	Understanding the various platforms and sensors for remote sensing applications.
			3	Understanding the processing of microwave remote sensing data.
			4	Understanding the data processing of thermal imaging system.

3	21 EC 52D4	AUTOMOTIVE ELECTRONICS & AVIONICS	1	Understand and recognize various control systems, sensors, engine construction and its associated subsystems as well as standard environment parameters for the functioning of an automotive.
			2	Understanding the various safety monitoring controls and the electronics behind the alert systems in Automated Vehicle Assisting systems.
			3	Identifying and interpreting the technology behind autonomous vehicles.
			4	Understanding the various electronics systems integrated in avionics for the development of autonomous flight and control operations.
4	21 IE 5250	TERM PAPER	1	Enhancing the skill sets in research by recognize and identifying problems, exploring/defining the problem by gathering information, formulation of the research objectives, addressing the problem through scientific process and methods.
5	21 TS 5102	TECHNICAL SKILLING-II	1	Enhancing the system design and modeling capabilities through visualization of scientific theories and concepts while building and developing the capabilities of designing a new system by altering and implementing new algorithm and methods through visualization tools.