EC312: Software Defined Radio

Details of course :-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Software Defined Radio	3	1	0	Digital Communication, Probability and Random Processes

Course Objective:Introduce Software Defined Radio, Cognitive Radio fundamentals, Dynamic Spectrum Access & Sharing and key applications.

Course Outcomes

CO1: Describe the fundamental concepts of software-defined radio, cognitive radio, spectrum management and associated policy challenges.

CO2: Outline the fundamental technologies enabling cognitive radios for dynamic spectrum environments.

CO3: Illustrate spectrum awareness, sensing& identification, dynamic spectrum access &sharing, and fundamental trade-offs.

CO4: Analyze different transmission techniques and challenges to achieve solutions for dynamic spectrum access.

CO5: Elucidate and examine cognitive radio network architectures, reconfiguration, adaptation&optimization. User cooperative wireless communications, throughput maximization and interference management.

S. No.	Content	Contact Hours
Unit 1	Introduction to Cognitive Radio: Hardware and software architectures of cognitive radio, Smart Antennas used in Cognitive Radio, Spectrum Management, Opportunities in Spectrum Access, and Policy Challenges for Cognitive Radios.	**6**
Unit 2	Technologies in Cognitive Radio: Radio Flexibility and Capability, Comparison of Radio Capabilities and Properties, Available Technologies for Cognitive Radios Radio Frequency Translation for Software Defined Radio Receiver Design Considerations, Transmitter Design Considerations,	**6**

	Candidate Architectures for SDR.	
Unit 3	Spectrum awareness, sensing and identification: Primary Signal Detection, From Detecting Primary Signals to Detecting Spectrum Opportunities, Fundamental Trade-offs: Performance versus Constraint, Fundamental Trade-offs: Sensing Accuracy versus Sensing Spectrum Access and sharing Unlicensed Spectrum Sharing, Licensed Spectrum Sharing, Secondary Spectrum Access, Non-Real-Time SSA, Real-Time SSA.	**9**
Unit 4	Transmission Techniques: Wireless Transmission for Dynamic Spectrum Access, Non-contiguous Orthogonal Frequency Division Multiplexing, NC-OFDM-Based Cognitive Radio: Challenges and Solutions, Overhead Interference Avoidance Problem, Spectral Footprint Minimization, Spectrum Usage Reporting, Potential Interference Analysis, Link Rendezvous, Distributed Sensing and Operation Channel Awareness and Multiple Signals in Space.	**9**
Unit 5	Reconfiguration, adaptation, and optimisation: Adaptation Engine Operating Parameters, Parameter Relationships, Cognitive Adaptation Engines Cognitive radio network architectures: Overview of Architectures Topology-Aware CRN Architectures, Publish-Subscribe CRN Architecture, Introduction to User cooperative communications, Relay Channels and User Cooperation in Wireless Networks,Multi-hop Relay Channel, Cross-layer optimization for multi-hop cognitive radio networks, Mathematical Models at Multiple Layers A Case Study: The Throughput Maximization Problem Numerical Results for the Throughput Maximization.	**12**
	Total	**42**

Books:-

S. No	Name of Books / Authors/ Publishers
1	Cognitive Radio Communications and Networks Principles and Practice/ Alexander M. Wyglinski, Maziar Nekovee, Y. Thomas Hou/ Elsevier/ 2010.
2	Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems/ Edited by HÜSEYIN ARSLAN, University of South Florida, Tampa, FL, USA/Springer, 2007.
3	Cognitive Radio Technology/ Bruce A. Fette/ Elsevier, 2009.