22ECPE808	COGNITIVE RADIO				SEMESTER VIII
PREREQUISITES		CATEGORY	PE	Credit	3
		Hours/Week	L	T	P	TH
			3	0	0	3

Course Objectives

1	To enable the student to understand the requirements in designing software defined radios and cognitive radio and its functionalities
2	To enable the student to understand the evolving paradigm of cognitive radio communication and the enabling technologies for its implementation.
3	To analyse the spectrum management functions using cognitive radio systems and cognitive radio networks.

Unit I	INTRODUCTION TO COGNITIVE RADIOS	9	0	0	9

Marking radio self-aware, the cognition cycle, organization of congnition tasks, structuring knowledge for cognition tasks, Enabling location and environment awareness in cognitive radios –concepts, architecture, design considerations.

Unit II	SDR ARCHITECTURE	9	0	0	9

Software Defined Radio: Evolution - essential functions of the Software Defined Radio - architecture goals - quantifying degrees of programmability - top level component topology - computational properties of functional components - interface topologies among plug and play modules - architecture partitions - merits and demerits of SDR - problems faced by SDR.

Unit III	COGNITIVE RADIO ARCHITECTURE	9	0	0	9

Cognitive Radio – functions, components and design rules, Cognition cycle – orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture

Unit IV	COGNITIVE RADIO NETWORK SECURITY	9	0	0	9

Overview of IEEE 802.22 standard for broadband wireless access in TV bands -Primary user emulation attacks - security vulnerabilities in IEEE 802.22 - security threats to the radio software.

Unit V	MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO	9	0	0	9

MAC for cognitive radios – Multichannel MAC - slotted ALOHA – CSMA, Network layer design – routing in cognitive radios, flow control and error control techniques.

Total (45 L) = 45 Periods

Text Books:

1	Alexander M. Wyglinski, MaziarNekovee, and Thomas Hou Y, "Cognitive Radio Communications and Networks - Principles and Practice", Elsevier Inc., 2010
2	Kwang-Cheng Chen and Ramjee Prasad, "Cognitive Radio Networks", John Wiley & Sons Ltd, 2009

Reference Books:

1	Arslan H, "Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems", University of South Florida, USA, Springer, 2007.
2	Khattab, Ahmed, Perkins, Dmitri, Bayoumi, Magdy, "Cognitive Radio Networks - From Theory to Practice", Springer Series: Analog Circuits and Signal Processing, 2009.
3	Mitola J, "Cognitive Radio: An Integrated Agent Architecture for software defined radio", Doctor of Technology thesis, Royal Inst. Technology, Sweden 2000.
4	E. Biglieri, A.J. Goldsmith., L.J. Greenstein, N.B. Mandayam, H.V. Poor, "Principles of Cognitive Radio", Cambridge University Press, 2013.

E-Reference:

1	http://www.wirelessinnovation.org/Cognitive_Radio_Architecture
2	http://www.xgtechnology.com/innovations/cognitive-radio-networks/
3	http://www.radio-electronics.com/info/rf-technology-design/cognitive-radio-cr/technologytutorial.php

Course Outcomes: Upon completion of this course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Understand the concepts and design of cognitive radios.	L2
CO2	Study about the SDR architecture and analysis.	L1
CO3	Analyse the various cognitive radio network architectures.	L4
CO4	Analyse the various security threats to the radio software in cognitive radio network.	L4
CO5	To analyse the performance of MAC and network layer design for cognitive radio.	L3

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COURSE ARTICULATION MATRIX

COs/POs	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		2	2	2	1		2		1		1	1	2		1
CO2		2	2	1	2		1		1		1	1	2	1	1
CO3		1	3	1	1		1		1		1	1	2	1	1
CO4		2	2	1			2		1		1	1	2	2	1
CO5		2	3	1	1		1		1		1	1	2	2	1
Avg		1.8	2.4	1.2	1.2		1.4		1		1	1	2	1.2	1
3/2/1 - indicates strength of correlation (3-High,2- Medium,1- Low)															