

NC5251 COGNITIVE RADIO NETWORKS

DETAILED SYLLABUS

OBJECTIVES

The students should be made to be

- Understand the concepts of cognitive radio
- Learn spectrum sensing and dynamic spectrum access

UNIT I INTRODUCTION TO SOFTWARE-DEFINED RADIO AND COGNITIVE RADIO

Evolution of Software Defined Radio and Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, radio frequency spectrum and regulations.

UNIT II COGNITIVE RADIO ARCHITECTURE

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, Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

UNIT III SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS

Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection, Bayesian Approach, Neyman Pearson fusion rule for spectrum sensing, Optimum spectrum sensing - Kullback Leibler Divergence and other approaches, Fundamental Tradeoffs in spectrum sensing, Spectrum Sharing Models of Dynamic Spectrum Access - Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

UNIT IV MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO

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

UNIT V ADVANCED TOPICS IN COGNITIVE RADIO

Cognitive radio for Internet of Things - Features and applications – Enabling technologies and protocols – M2M technologies - Data storage and analysis techniques – Requirement and challenges of IoT – Energy efficiency– MIMO Cognitive Radio – Power allocation algorithms.

REFERENCES

1. Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, "Cognitive Radio Communications and Networks", Academic Press, Elsevier, 2010.
2. Bruce Fette, "Cognitive Radio Technology", Newnes, 2006.
3. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive Radio Networks", John Wiley and Sons, 2009.
4. Huseyin Arslan (Ed.), "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems, Springer, 2007.
5. S.Shanmugavel, M.A.Bhagyaveni, R.Kalidoss, "Cognitive Radio-An Enabler for Internet of things", River Publishers, 2017.