PVP 22

COGNITIVE RADIO

22ECMC1T5A   **Credits: 4**
Lecture: 4 periods/week   **Internal assessment: 40 marks**
                                                    Semester end examination: 60 marks

Course Outcomes

At the end of the course, the student should be able to:
- Understand the design principles on software defined radio and cognitive radio
- Design and implement algorithms for cognitive radio spectrum sensing and dynamic spectrum access
- Apply the various routing protocols of cognitive radio in real time wireless applications
- Analyse the features of cognitive radio for real world applications

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.

Cognitive radio architecture
Cognition cycle – orient, plan, decide and act phases, Organization, SDR as a platform for Cognitive Radio – Hardware and Software Architectures, Overview of IEEE 802.22 standard for broadband wireless access in TV bands

UNIT II
Spectrum sensing and dynamic spectrum access
Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection 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 III
MAC and network layer design for cognitive radio
MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA, Network layer design – routing in cognitive radios, flow control and error control techniques.

UNIT IV
Cognitive Radio Platforms
Overview of security issues in cognitive radios, auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, cognitive radio for Internet of Things.

Learning Resources

Text Books
3. Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, ―Cognitive Radio Communications and Networks, Academic Press, Elsevier, 2010.
4. Huseyin Arslan (Ed.), ―Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems, Springer, 2007.

Reference Books
1. Linda E-Doyle CUP , Essentials of Cognitive Radio — 2009
2. Bruce Fette, ―Cognitive Radio Technology, Newnes, 2006.
3. Kwang-Cheng Chen, Ramjee Prasad, ― Cognitive Radio Networks, John Wiley and Sons, 2009.
4. Ezio Biglieri, Professor Andrea J. Goldsmith, Dr Larry J. Greenstein, Narayan B. Mandayam, H. Vincent Poor, ―Principles of Cognitive Radio , Cambridge University Press, 2012.
5. Dynamic Spectrum access and Management in Cognitive Radio Networks – Ekram Hossain, Dusit Niyato, Zhu Han, CUP -
6. Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
7. Jeffrey H.Reed, "Software Radio: A Modern Approach to radio engineering" Reprint by Pearson Education & Inc. 2002.