

## A PERMANENT CLASS LISTING FOR SPRING 2015

**TITLE: COGNITIVE RADIO NETWORKS**

**COURSE OBJECTIVE:**

In this class, the challenges and the existing solutions for the design and development of cognitive radio network architectures and communication protocols are presented.

Moreover, cognitive radio network functions such as spectrum management, spectrum mobility and spectrum sharing are explained in detail. The influence of these functions on the performance of upper layer communication protocols such as routing and transport are investigated and open research issues are also outlined.

**Level: Graduate**

**Credit Hours: 3**

**Textbooks:**

Own class lecture notes will be available on the web site.

Also the VERY LONG SURVEY PAPER by

I.F. Akyildiz, W.Y. Lee, M.C. Vuran, S. Mohanty,

"NeXt Generation/Dynamic Spectrum Access/Cognitive Radio Wireless Networks: A Survey",  
Computer Networks (Elsevier) Journal, Vol. 50, pp. 2127-2159, Sept. 2006; as the basic reference  
and all the recent research papers as additional references.

Note that this field is brand-new and there is no TEXTBOOK available so far.

**Potential Instructors:**

IAN F. AKYILDIZ, GEOFFREY YE LI, GORDON STUBER, MARY ANN INGRAM, F. FEKRI, R. SIVAKUMAR

**Course Pre-requisites: ECE6602 or ECE6610**

**GRADING FORMULA:**

Homework 1. 10% Exam 1: 15% --> 25

Homework 2. 10% Exam 2: 15% --> 25

Homework 3. 10% Project: 13% --> 25

Final Exam: --> 25%

**Project:**

**NO PROJECTS**

## **CHAPTERS:**

### **1 Introduction**

### **2 Cognitive Radio**

#### **2.1 Physical Architecture of the Cognitive Radio**

#### **2.2 Cognitive Capability**

#### **2.3 Reconfigurability**

### **3 The Cognitive Radio Network Architecture**

#### **3.1 Cognitive Radio Network Functions**

#### **3.2 Cognitive Radio Network Applications**

#### **3.3 Existing Architectures**

### **4 Spectrum Sensing**

#### **4.1 Transmitter Detection (Non Cooperative Detection)**

##### **4.1.1 Matched Filter Detection**

##### **4.1.2 Energy Detection**

##### **4.1.3 Cyclostationary Feature Detection**

##### **4.1.4. Wavelets Based Sensing**

##### **4.1.5. Covariance Matrix Based Sensing**

##### **4.1.6. Compresed Sensing**

#### **4.2 Cooperative Detection**

#### **4.3 Interference-based Detection**

#### **4.4 Spectrum Sensing Challenges**

### **5. Spectrum Sharing**

#### **5.1 Overview of Spectrum Sharing Techniques**

#### **5.2 Inter Network Spectrum Sharing**

#### **5.3 Intra Network Spectrum Sharing**

#### **5.4 Spectrum Sharing Challenges**

### **6. Spectrum Mobility**

#### **6.1 Spectrum Handoff**

#### **6.2 Spectrum Mobility Challenges**

### **7. Common Control Channel Solutions**

### **8. Routing Algorithms**

### **9. Standardization Activities**

#### **SHORT LIST OF THE COURSE OUTCOMES:**

**This course is covering an up-to-date topic of cognitive radio networks.**

**At the conclusion of the course, several objectives will be achieved:**

- 1. Students will learn about cognitive radio network architectures and the communication protocol**
- 2. Students will understand the theoretical aspects of these networks.**
- 3. Students will be able to understand how the cognitive radio networks are operating**
- 4. Students will be introduced to several novel communication protocols  
which are unique to cognitive radio networks**
