

## DATA COMMUNICATION IN SENSOR NETWORKS

### 1.1. Identification

University:	Alma Mater Studiorum – Università di Bologna											
School:	School of Engineering											
Course:	Data communication in sensor networks											
ECTS:	6											
Semester:	<i>Winter</i>				X	<i>Summer</i>						
Category	<i>Fundamental course</i>						<i>Specialisation course</i>					X
Module	<i>MFI</i>		<i>MFI</i>		<i>MFI</i>		<i>MSI</i>		<i>MSI</i>		<i>MSI</i>	X
Teachers:	Marco Chiani											
Language:	<i>English</i>	X	<i>Italian</i>	X	<i>Swedish</i>		<i>Spanish</i>					

### 1.2. Learning-outcomes

- knowledge about the fundamentals of wireless communication systems
- knowledge about the theoretical limits for data communications in wireless sensor networks

### 1.3. Competencies

#### ▪ General

- To have critical understanding of technical and scientific tools.
- To be able to select and apply software simulation tools.
- Communication skills.
- To be able to work in an international context

#### ▪ Specific

- To understand the main engineering issues and the ultimate communication limits in sensor networks.
- To understand the methods for designing advanced wireless communication systems for sensors.
- To simulate the wireless communication among sensors.

### 1.4. Contents

1. Introduction to wireless point-to-point communication.
2. Time and frequency signal analysis.
3. Basics of wireless propagation characteristics.
4. Modulation and coding.

5. Wireless networks: multiple access and duplexing techniques.
6. Multiple antenna systems for throughput enhancement and interference mitigation.
7. Complexity and energetic issues in the design of wireless sensor networks.
8. Existing and emerging standards, from ZigBee to UWB.

### **1.5. Teaching Methodology**

- Lecture sessions.
- Laboratory sessions using software tools.

### **1.6. Evaluation**

- Oral exams, including discussion of the laboratory work.

### **1.7. Bibliography**

- A. Goldsmith, *Wireless Communications*. Cambridge University Press, 2005.  
T. S. Rappaport, *Wireless Communications*, 1st ed. Upper Saddle River, New Jersey 07458: Prentice Hall, Inc., 1996.