



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering, Cairo  
Graduation Project Description Form

Project Title:

## Communications in Wireless Ad Hoc and Sensor Networks

Project Supervisor(s):

Dr. Hussein ELAttar (EC Dept., College of Eng., AAST, Cairo)

Duration from 2/2013\_\_till 2/2014

### Product Category

Algorithm\_\_\_ Hardware\_\_\_ Software **X**

### Standards:

Safety: UL, CE\_\_\_ IEEE **802.11 X** FCC\_\_ Other \_\_\_

### Practical Realization Form

PCB \_\_\_ Firmware\_\_\_ Embedded CPU Kit (ARM, ..etc):\_\_\_

PC Software \_\_\_ Ready-made Package\_\_\_ DSP Kit\_\_\_ FPGA Kit\_\_\_

VLSI Schematics \_\_\_ VLSI Layout \_\_\_ VLSI Silicon (ASIC)\_\_\_

### Language

VHDL/Verilog \_\_\_ Matlab **X** C/C++/Java **X**

### Productization

Finished Product Form:\_\_\_ Possible Commercialization \_\_\_

Amount of Funds Needed for buying components: \_\_\_

### Testing

Functional\_\_\_ Simulation **X** Parameters\_ Final Hardware\_\_\_

### Lab Test Setup

EMC \_\_\_ Environmental\_ Microwave \_\_\_ Analog Lab\_

### CAD Tools *(No unauthentic software is allowed):*

OPNET /MATLAB

### Elective Classes Recommended:

EC521Communication Networks **and/or** EC526 Mobile Communications, **and/or** EC528 Data Communications



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## Abstract

### **Communications in Wireless Ad Hoc and Sensor Networks**

Dr. Hussein ElAttar

In the near future, fourth-generation (4G) wireless technologies will be able to support Internet like services. This provision will be achieved through an integration of different types of wireless networks with different transmission speeds and ranges interconnected through a high speed backbone. Fourth generation wireless networks include Wireless Personal Area Networks (WPANs), Wireless Local Area Networks (WLANs), cellular wide area networks and satellite networks. These networks may be organized either with the support of a fixed infrastructure or in the form of an ad hoc network.

A wireless ad hoc network is a group of nodes without centralized administration or fixed network infrastructure, in which nodes can communicate with other nodes out of their direct transmission ranges by cooperatively forwarding packets for each other. Ad hoc networks can also enable streaming of video and audio among wireless nodes in the absence of any base station. Another application area for ad hoc networks is emergency services, including search and rescue and disaster recovery operations.

A wireless sensor network (WSN) consists of a number of sensors spread across a geographic area. Each sensor node has wireless communication capability and some level of intelligence for signal-processing and networking of data. A WSN could be deployed in wilderness areas for a sufficiently long time (e.g., years) without the need to recharge or replace the power supplies. Typical applications of WSNs include monitoring and tracking.

## **References and Links**

1. Overview on wireless ad hoc and sensor networks and the IEEE 802.11 Standard.
2. Physical Layer Limitation such as Limited Link Bandwidth and Quality, energy conservation, Service, Variation in Link and Node Capabilities.
3. Controlling Physical Layer Parameters for Ad-Hoc Networks. Physical Layer Design, *Modulation and Coding Choices, Energy Consumption, Data Rate, Probability of Error, and interference* in Ad Hoc Networks.
4. Random Access Mac Protocols.
5. Routing protocols and power conservation techniques in wireless ad hoc networks.
6. Study the performance of wireless ad hoc and sensor networks through simulation tools such as MATLAB and/or OPNET.