B. Project Summary

This proposal requests funds to establish the Wireless and Sensor Networking Laboratory at the Department of Computer Science and Engineering at Florida Atlantic University in Boca Raton, Florida. The equipment, accessories, and software will be dedicated to the support of research in wireless communication and sensor networks.

**Intellectual Merits.** The equipment will be used for conducting research in the areas of wireless communication and sensor networking, including, in particular, the following projects:

1. **Area Coverage in Wireless Ad-Hoc Sensor Networks.** The area coverage problem has many applications in disaster recovery, environmental monitoring, and homeland defense. In this project, we will design a localized and distributed area coverage protocol that is energy-efficient, provides sensor network connectivity and a reliable data retrieval mechanism. We will analyze the performance of our protocol for a sensor network through simulation using the Opnet network simulator. We will implement and test our protocol on the MICA mote sensor platform in our Laboratory.

2. **Efficient Broadcasting in Wireless Ad-Hoc Sensor Networks.** Broadcast is an important operation in wireless ad-hoc sensor networks, encountered for example in data diffusion and on-demand data gathering. Broadcast by flooding is not a feasible solution because of transmission redundancy, a factor that heavily increases contentions and collisions. Thus, the forwarding node set needs to be selected carefully, considering the basic characteristics of a wireless sensor network, such as lack of global sensor information and resource limitation. In this project, we will design efficient broadcast protocols that fit the wireless sensor network characteristics, will simulate our protocols for large networks using Opnet and will implement and test them on the MICA mote sensor platform.

3. **Topology Control in Mobile Ad-Hoc Networks with Hitch-hiking.** Topology control is an important problem in mobile ad-hoc networks, needed for example in proactive routing protocols. The objective of this project is to design a distributed topology control mechanism that assigns a transmission power to every wireless node such that the resulting topology is strongly connected and the total energy consumed is minimized. We will address this topology control problem in the Hitch-hiking model, a new energy-efficient mechanism proposed by the co-PI. Specifically, we will strive to minimize the total power expenditure by exploring the advantage offered by the Hitch-hiking model that successfully decodes a packet by combining partial receptions. We will design an efficient topology control protocol, simulate it in large networks using Opnet, and implement and test it in the Laboratory, for a mobile ad-hoc network of laptop and palm computers.

**Broader Impacts.** The Department of Computer Science and Engineering does not have a modern research-quality wireless and sensor networking platform. The addition of the Wireless and Sensor Networking Laboratory would provide a perfect research facility for graduate students to conduct research in wireless and sensor networking areas. This Laboratory fits the educational plan in the Department that currently offers courses in the areas of wireless communication, wireless networks, and ad hoc networks. Florida Atlantic University was designated as a Minority Serving Institution. The proposed Laboratory will provide the equipment needed by minority students in their research efforts, giving them the opportunity to stay competitive with peers at other institutions, locally and nationally. The results obtained from these research projects shall be disseminated via web pages, invited talks, conference presentations, and journal publications.