# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
## *COMPUTER ENGINEERING DEPARTMENT*

### COE 545: Wireless Sensor Networks
### Term 192 (Winter 2020)
### Course Syllabus

**Instructor:** Dr. Abdulaziz Barnawi
**Lecture:**    M.W.: 8:10-9:25 PM
**Class location:**    Bldg 24 Room 165
**Office hours**: Mon. 3:00-4:00PM, Wed. 9:00-10:00AM (Loc: 59-1040), or by appointment
**Office-Te**l: 1038
**Web site:** http://faculty.kfupm.edu.sa/coe/barnawi
**e-mail**: barnawi AT kfupm

**Course Description:**
Advanced development in wireless communication technologies as well as an increasing interest in applications that involve environment monitoring and control (e.g. wildfire and habitat monitoring, structural control, health care and target tracking in military systems) has lead to the emergence of a new kind of wireless networks, namely wireless sensor networks The objective of this course is to introduce students to the state of the art in wireless sensor actuator networks. Lectures will emphasize aspects of energy management, MAC protocols, routing and data aggregation, localization. Case studies from existing applications will be used.

**Prerequisite:** Undergraduate level in computer networking and data communication

**Textbook‡:**

*There is no specific textbook assigned for this course.* The main three books used for the course lectures are:
- **B1.** *Protocols and Architectures for Wireless Sensor Networks* by Holger Karl and Andreas Willig, Wiley, ISBN: 0-470-09510-5, June 2005
- **B2.** *Wireless Sensor Networks*, by Ian F. Akyildiz and Mehmet Can Vuran, John Wiley & Sons 2010, ISBN: 978-0-470-03601-3.
- **B3.** *Fundamentals of Wireless Sensor Networks: Theory and Practice* by Dargie, Waltenegus and Poellabauer, Christian, John Wiley & Sons 2010, ISBN: 9780470997659

The following books are also *recommended* as a supporting reading material:
- **B4.** *Wireless Sensor Networks*, by Suraiya Tarannum, ISBN 978-953-307-325-5, 342 pages, Publisher: InTech.
- **B5.** *Ad hoc Wireless Networks – Architecture and Protocols,* by C. Siva Ram Murthy and B. S. Manoj, Prentice Hall, 2004, ISBN – 013-147-023x.

**Tentative Grading Policy:**

| | | |
|---|---|---|
| Assignments/paper presentations | 15% | |
| Project | 35% | |
| Mid-Term | 20% | (March 09, 2020) |
| Final | 30% | (May 07, 2020) |

**Important Policies:**

- All KFUPM regulations and standards will be enforced. Attendance will be checked each class.
- You have 48 hours to object to the grade of a presentation or assignments from the end of the class time in which the graded submissions have been distributed back.
- Check the course webpage and Blackboard for updates, emails and announcements.
- Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated.

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‡ There are electronics versions of the main reference books. You can find them through KFUPM digital library

## Expected Learning Outcomes

Upon successful completion of this course:
1. Students will be introduced to some existing applications of wireless sensor actuator networks.
2. Students will be introduced to elements of network protocol design and will learn to apply these principles in the context of wireless sensor networks
3. Students will learn the various hardware, software platforms that exist for sensor networks
4. Students will get an overview of the various protocols for MAC layer, routing, time synchronization, aggregation.
5. Students will read and present seminal papers on various issues in sensor networks, opening a path to course project as well as possible research in this area.

### Tentative Class Schedule

| Week | Lecture | Date | Topic |
|------|---------|------|-------|
| 1 | 1 | 20-Jan | Logistics and introduction |
|   | 2 | 22-Jan | Sensor node architecture |
| 2 | 3 | 27-Jan | Power and Energy Management |
|   | 4 | 29-Jan | Basics of Wireless Communications |
| 3 | 5 | 3-Feb | Sensor Network Architecture |
|   | 6 | 5-Feb | Network Bootstrapping and Clustering / *Regular Assignment (A1) is due* |
| 4 | 7 | 10-Feb | Network Bootstrapping and Clustering (cont.) |
|   | 8 | 12-Feb | Medium Access Control (MAC) (Introduction) / *Paper Presentation Assignment (A2) is due* |
| 5 | 9 | 17-Feb | MAC Protocols for Sensor Networks (cont.) / *Project proposal draft submission starts* |
|   | 10 | 19-Feb | MAC Protocols for Sensor Networks (cont.) |
| 6 | 11 | 24-Feb | MAC Protocols for Sensor Networks (cont.) |
|   | 12 | 26-Feb | *Paper Presentation Assignment (A3) is due* |
| 7 | 13 | 2-Mar | Routing and Data Aggregation *Project proposal submission deadline* |
|   | 14 | 4-Mar | Routing and Data Aggregation (cont.) / |
| 8 | 15 | 9-Mar | **Mid-term Exam** |
|   | 16 | 11-Mar | Localization |
| 9 | 17 | 16-Mar | Time Synchronization / *Project proposal presentations* |
|   | 18 | 18-Mar | Time Synchronization (Cont.) |
| 10 | 19 | 23-Mar | Cross-layer Optimization |
|   | 20 | 25-Mar | Cross-layer Optimization (Cont.) / *Experimental or Regular Assignment (A4) is due* |
| 11 | 21 | 30-Mar | Contemporary Topics |
|   | 22 | 1-Apr | Contemporary Topics |
| 12 | 23 | 6-Apr | *Paper Presentation Assignment (A5) is due* |
|   | 24 | 8-Apr | Contemporary Topics |
| 13 | 25 | 13-Apr | Contemporary Topics |
|   | 26 | 15-Apr | Review *Regular Assignment (A6) is due* |
| 14 | 27 | 20-Apr | Review |
|   | 28 | 22-Apr | ***Project Presentations*** |
| 15 | 29 | 27-Apr | ***Project Presentations*** |