

ENG EC544 Networking the Physical World

2008-2009 Catalog Data:

Considers the evolution of embedded network sensing systems with the introduction of wireless network connectivity. Key themes are computing optimized for resource constrained (cost, energy, memory and storage space) applications and sensing interfaces to connect to the physical world. Studies current technology for networked embedded network sensors including evolving protocol standards. A laboratory component of the course introduces students to the unique characteristics of distributed sensor nodes including programming, reliable communications, sensing modalities, calibration, and application development. Experience with the C language required.

Status in the Curriculum: Elective

Class/Lab Schedule:

Lecture: 4 hours/week

Laboratory: 2 hours/week

Textbooks and other required materials:

(Required) Networking Wireless Sensors, Bhaskar Krishnamachari, (ISBN-13: 9780521838474 | ISBN-10: 0521838479), January 2006, Cambridge University Press.

(Required) Wireless Sensor Networks Seminar, Crossbow Technology, Inc. 2005

Reference:

Wireless Sensor Networks, C.S. Raghavendra, K.M. Sicalingam, and T. Znati, Eds., Springer, New York, NY, 2004.

A. Hac, "Wireless Sensor Network Designs", John Wiley & Sons, 2003

C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks : Architectures and Protocols", Prentice Hall PTR, 2004.

Edgar H. Callaway, Jr, Wireless Sensor Networks - Architectures and Protocols, by .., Auerbach Publications, 2003

J.A. Gutierrez, E.H. Callaway, Jr., and R.L. Barrett, Jr., Enabling Wireless Sensors with IEEE 802.15.4, Low-Rate Wireless Personal Area Networks, IEEE Press, 2003

C. Perkins, Ad Hoc Networking, Addison Wesley, 2001

C.-K. toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall, 2002.

TinyOS reference materials: <http://www.tinyos.net/> and

<http://sourceforge.net/projects/tinyos/>

nesC: a Programming Language for Deeply Networked Systems:

<http://nesc.sourceforge.net/>

Mote and Sensor Users Guides <http://www.xbow.com/Support/manuals.htm>

Coordinator:

Thomas Little, ECE

Prerequisites by topic:

EC312, EC450, EC441

Goals:

Teach design principles and tradeoffs in low-power embedded network sensor systems

Teach principles of operating system design in constrained microcontroller-sensor systems

Teach programming techniques for resource-constrained microcontroller-sensor systems

Teach computer networking principles applied in mesh sensor networks

Gain experience with state-of-the-art sensor network components

Course Outcomes:

1. Understand design principles and tradeoffs in low-power embedded network sensor systems

2. Understand principles of operating system design in constrained microcontroller-sensor systems

3. Understand programming techniques for resource-constrained microcontroller-sensor systems

4. Understand computer networking principles applied in mesh sensor networks

5. Be able to use and program state-of-the-art sensor network components

Course Outcomes mapped to Program Outcomes:

	a	b	c	d	e	f	g	h	i	j	k
Program Outcomes	a	b	c	d	e	f	g	h	i	j	K
Course Outcomes	1-5	1,4,5	1,2,4	1,5	1,3,5	1	1,5	1,5	1-5	5	1,5
Emphasis (1-5)	3	4	3	5	5	4	4	3			

1=not at all; 5=a great deal;

Topics in Project Assignments:

Students will choose projects that synthesize their experience and learnings in the earlier part of the course. Projects will involve reprogramming of sensor network nodes and will focus on either (a) refinement of concepts for individual system components (e.g., implementing a new routing protocol) or (b) end-to-end application development (e.g., designing and implementing a reliable peer-to-peer delivery service).

Contribution of Course to Meeting the Professional Component:

Engineering topics: 100%

Math & Basic Science: 0%

General Education: 0%

Prepared by: Thomas Little

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