**Fall 2011**

**COT 4930/5930, EEL 4930– Embedded Robotics**

**Course Syllabus:** Focus on physical computing. Remote management of autonomous embedded robots with different behaviors to achieve a set of coordinated team objectives.

**Texts:** 1. Barnett, R., et al ., Embedded C Programming & Atmel AVR, 2nd Ed, Delmar, 2007

2. Barrett, S.F., Arduino Microcontroller Processing for .., Morgan &Claypool, 2010 (ebook/FAU)

**References (for COT 5930):** Reas, C., and Fry, B., Getting Started with Processing; Becker, B.W., Java: Learning to Program with Robots, Free book and software at: [www.learningwithrobots.com](http://www.learningwithrobots.com); Braunl, T., Embedded Robotics, 3rd edition, Springer, ISBN: 978-3-540-70533-8, 2008; Magee, J., and Kramer, J., Concurrency, Wiley, 2006; Barrett, S.F., & Pack, D.J., Atmel AVR Microcontroller Primer, ebook/FAU

**Our Web Reference:** <http://robotics.fau.edu/>

**Software to be used:** Eclipse, Java, Arduino, C, and FSP/LTSA (the last one only for COT 5930)

**Prerequisite:** Programming and Microprocessors

**Instructor:** Ravi Shankar, Professor, CEECS

**Contact Info:**  (561) 297-3470, [shankar@fau.edu](mailto:shankar@fau.edu), 513 East Engineering Bldg, Cell: (561) 306-5625

**Time and Place:** TR 11 AM to 12.20 PM , EE 212, Office Hours: TR 10 to 11 AM, F 10 AM to 2 PM

**Course Description:** We have assembled a set of software, hardware, and systems components to build autonomous robots that can be remotely managed. Our goal in this course is to use this pre-built platform (of mobile and stationary robots) to program robots that together will achieve a set of objectives. We will use an indoor chess game as the overall motivation, but will focus on simpler related objectives. Such indoor robotic teams have various applications in health care, education, military, and other domains. This course focuses on interfacing sensors and actuators, programming, positioning, motion, communication, and control as pertinent to robots; robots will be built from kits. Graduate student may use topics from the references above for an advanced Mini project.

**Main Topics:**  Our open source Arduino-based board has somewhat different hardware and software environments, relative to Barnett’s book; but we will benefit significantly from the book.

1. Programming with Embedded C
2. The ATMEL RISC processor , the I/O Modules, and Interrupt service Routines
3. Standard I/O and Pre-processor Functions (will be adapted to Arduino and AVR-gcc used in class)
4. Robotic Animation with Java
5. Use of the tools (open source): Arduino, AVR Studio, and Eclipse.
6. Autonomous robots: communication, coordination, and concurrency strategies
7. Project topics and Project Development

**Course Evaluation:** Individual BloggingAssignments (on Java, C, and Robot assembly) 30%

Individual Blogging Assignments (Signaling, control, networking, localization, and navigation)- 40%

Project blogging assignments – completion, demo, presentation 30%

Robotic community service **(Extra)** 10%

Note: For COT 5930, the Mini project may be more complex and/or involve a topic from advanced references (Dr. Shankar will help). Note on Robotic community service – use your blog to provide tutorials, useful info, etc. Any class presentations/help sessions – do blog them about them at your site and include documentation.

**Project Phases:** 1. Modeling with Processing, Simulation with Java, and Prototyping with Arduino; 2. Floor demo with Arduino C of a simple art artifact; 3. Floor demo with AVR C of a complex art artifact. Good documentation, coding style, presentation, and demo are expected.