FAU
FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Department Computer & Electrical Eng. and Computer Sci.

College Engineering and Computer Science
(To obtain a course number, contact erudolph@fau.edu)

Prefix CNT **Number** 5106	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Course Title** Embedded Networked Sensor Systems
Credits *(Review Provost Memorandum)* 3 **Effective Date** *(TERM & YEAR)* FALL 2017	**Grading** *(Select One Option)* Regular X Sat/UnSat	This course introduces the technical foundations of embedded networked sensor systems, the building blocks of the Internet of Things. This is an implementation-centric course covering concepts, software foundations, basic embedded circuits, communication protocols, and network algorithms.

Prerequisites COP 2220 or permission of instructor	**Corequisites** COP 3530 or permission of instructor	**Registration Controls** *(Major, College, Level)* Graduates, Juniors, Seniors (College of Engineering or College of Science)

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course: Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	**List textbook information in syllabus or here** There are no required textbooks for this course.
Faculty Contact/Email/Phone Jason O. Hallstrom, jhallstrom@fau.edu, 561-297-4748	**List/Attach comments from departments affected by new course** N/A

Approved by		**Date**
Department Chair		3/3/17
College Curriculum Chair		3/7/17
College Dean		3/16/17
UGPC Chair		3-29-2017
Graduate College Dean		3-29-17
UFS President		
Provost		

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

1. Course title/number, number of credit hours

CNT 5106 Embedded Networked Sensor Systems	3 credit hours

2. Course prerequisites, corequisites, and where the course fits in the program of study

Prerequisites: COP 2220 or permission of instructor
Corequisites: COP 3530 or permission of instructor

3. Course logistics

Fall 2017
Location : TBD

4. Instructor contact information

Instructor's name	Jason O. Hallstrom
Office address	Engineering East, Room 324
Office Hours	TBD
Contact telephone number	561-297-4748
Email address	jhallstrom@fau.edu

5. TA contact information

TA's name	TBD
Office address	
Office Hours	
Contact telephone number	
Email address	

6. Course description

This course introduces the technical foundations of embedded networked sensor systems, the building blocks of the Internet of Things. This is an implementation-centric course covering concepts, software foundations, basic embedded circuits, communication protocols, and network algorithms.

7. Course objectives/student learning outcomes/program outcomes

Course objectives:	Upon completing the course, students will
	• *Understand the concepts that underlie the Internet of Things*
	• *Understand the applications of IoT technology*
	• *Achieve competency in embedded programming using an ARM-class processor*
	• *Understand the construction and operation of basic sensors and actuators*
	• *Achieve competency in using some of the most common embedded peripherals*
	• *Be capable of reasoning about and applying some of the most common sensor networking algorithms*
	• *Have a basic understanding of embedded circuits*
	• *Be capable of integrating IoT devices with upper-tier cloud services*

8. Course evaluation method

Projects - 65 %
- Project #1 – 20%
- Project #2 – 30%
- Project #3 – 15%

Midterm - 15 %

Final Examination - 20 %

I reserve the right to adjust the percentage weight within each category by up to 15%

Each project involves a significant software implementation for an ARM-based development board with associated add-on boards for sensing and communication. The first project is completed independently, and the last two projects are completed in groups of two to three. Each project culminates in the submission of a video demonstration of the implementation.

9. Course grading scale

Grading Scale (%):
- > 90.00 : A
- 85.00 – 89.99 : A-
- 82.00 – 84.99: B+
- 77.00 – 81.99: B
- 75.00 – 76.99: B-
- 72.00 – 74.99: C+
- 67.00 – 71.99: C
- 65.00 – 66.99: C-
- < 65.00: F

I reserve the right to make the grading scale more lenient (i.e., in your favor).

10. Policy on makeup tests, late work, and incompletes

All deliverables must be submitted at the beginning of the class period on their due date. Late work will not receive any credit. Similarly, failure to attend class on the day of a scheduled presentation or exam will result in an automatic zero for the work. If a student arrives late on the day of a scheduled presentation or exam, he/she will be allowed to participate, but will not be given additional time to compensate for being tardy. Make-up work will be granted only with a written medical or university excuse. It is the student's responsibility to give me the written excuse and to arrange for the make-up work within one week of the absence.

If you are having difficulties with the course material, or would like to suggest improvements to the course, please do not hesitate to make an appointment with me to chat.

11. Special course requirements

N/A

12. Classroom etiquette policy

Students are expected to attend every class. If you must miss a class, it is your responsibility to get any missed lecture notes, handouts, and assignments from your fellow students. **As a courtesy to me, when you do attend class, please show up on time.**

If I am more than ten minutes late to class, you should assume that I am dealing with an emergency, and that I will not be able to make it to class. In such a rare case, class is automatically canceled, and you are free to leave.

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.

This is a discussion-oriented course. For us to maximize the benefit of our time together, students are expected to actively engage in classroom discussions.

13. Disability policy statement

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 111F (561-799-8585) —and follow all SAS procedures.

14. Honor code policy

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys unfair advantage over any other. **Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility.** Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at
www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

15. Required texts/reading

There are no required textbooks for this course.

16. Supplementary/recommended readings

Students will be required to read portions of the following documents:

http://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-42023-ARM-Microcontroller-ATSAM4L-Low-Power-LCD_Datasheet.pdf

http://infocenter.arm.com/help/topic/com.arm.doc.dui0553a/DUI0553A_cortex_m4_dgug.pdf

http://www.atmel.com/Images/Atmel-42103-SAM4L8-Xplained-Pro_User-Guide.pdf

http://www.atmel.com/images/atmel-42078-io1-xplained-pro_user-guide.pdf

http://www.atmel.com/images/atmel-42028-lightweight-mesh-developer-guide_application-note_avr2130.pdf

17. Course topical outline, including dates for exams/quizzes, papers, completion of reading

The content of this course evolves from one semester to the next to keep pace with the current state of the art. The syllabus is not fixed. Hence, the following topic list should be considered tentative:

The *approximate* ordering of topics is as follows:
- **Week 1**
    - *Introduction to the Internet of Things*
    - *Introduction to the development tool-chain*
- **Week 2**
    - *Introduction to embedded programming*
    - *Introduction to the ARM Cortex-M4*
- **Week 3-4**
    - *Programming the ARM Cortex-M4*
    - *Project deadline*
- **Week 5-6**
    - *Serial communication protocols*
    - *UART, SPI, I2C*
- **Weeks 7-8**
    - *Introduction to analog and digital sensing*
    - *Programming embedded sensors*
    - *Project deadline*
    - *Midterm exam*
- **Weeks 9-10**
    - *Embedded event scheduling*
    - *Programming embedded radios*
- **Week 11-12**
    - *Convergecast routing protocols*
- **Week 13-14**
    - *Time synchronization protocols*
    - *Project deadline*
- **Week 15**
    - *Cloud integration*
- **Final Exam**