

Drexel University  
College of Engineering [E]  
ECE 302 Design with Embedded Processors

1. ECE 302 Design with Embedded Processors
2. Credits: 3.00 Contact Hours: Two-hour Lecture and one two-hour Lab
3. Instructor: Prawat Nagvajara, Ph.D. (Associate Professor) Electrical and Computer Engineering  
Bossone 103, Office hours M, W 2-3pm 215 895-2378 [nagvajap@drexel.edu](mailto:nagvajap@drexel.edu)
4. Textbook and Materials

Textbook: Exploring BeagleBone: Tools and Techniques for Building with Embedded Linux, Molloy, Wiley 2014, ISBN: 978-1-118-93512-5

Recommended References:

1. P. Nagvajara, Real-time Applications Exercises, 2015
2. [http://processors.wiki.ti.com/index.php/PRU\\_Training:\\_Hands-on\\_Labs](http://processors.wiki.ti.com/index.php/PRU_Training:_Hands-on_Labs)

5. Specific Course Information

- a. Brief description of the course (Course Catalog Description)  
A project-based course on design and implementation of mixed-signal systems (digital, analog and software) with applications in signal processing, control, wireless and internet of things.
- b. Pre-requisites 200-level or higher programming language course (e.g., C, C++, Java and Python )
- c. Elective for Electrical Engineering, Computer Engineering, and other engineering and science degree programs such as mechanical engineering, biomedical and physics.

6. Specific Goals for the Course

- a. Course Outcomes: At introductory level students will gain abilities to
  1. develop embedded Linux applications on industry standard Integrated Design Environment
  2. specify and verify design
  3. develop embedded applications to inter-operate with peripherals (sensors, actuators and wireless devices)
  4. develop applications using interrupts and concurrency and real-time operating system
  5. Perform measurement using signal generator and oscilloscope
- b. Accreditation Board for Engineering and Technology (ABET) Student Outcomes
  1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
  2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- c. Drexel Student Learning Priorities (DSLPS)
  - Creative and Critical Thinking
  - Information Literacy
  - Self-directed Learning
  - Use of Technology Use
  - Professional Practice
  - Research, Scholarship And Creative Expression

## 7. Brief List of Topics to be Covered

Week 1: Introduction to embedded processor and applications

Week 2: Embedded Linux Systems

Week 3: Linux Systems continued

Week 4: Peripherals

Week 5: Intro to C++ Programming

Week 6: Programming General Purpose Input/Output (GPIO)

Week 7: Cross-Compilation, Integrated Design Environment and Remote Debug

Week 8: Bus and Physical World Interfaces

Week 9: Hard Real-time applications

Week 10: Programmable Real-time Unit

## 8. Evaluation

### a. Design Assignments 25%

Students demonstrate the design correctness and their understanding

### b. Exam

Students demonstrate the design correctness and their understanding. Students earn partial credits on incomplete designs

i. Quizzes 20% each 50 minutes during the week 4 and week 8 lab sessions

ii. Midterm 20% is 100 minutes during the week 6 lab

iii. In-lab design final exam 35%

### c. Grades assignment

Score x

Grade : x < Upper Bound      x ≥ Lower Bound  
          Upper Bound      Lower Bound

A : x ≤ 100%      x ≥ 93%

A- : x < 93%      x ≥ 88%

B+ : x < 88%      x ≥ 83%

B : x < 83%      x ≥ 78%

B- : x < 78%      x ≥ 73%

C+ : x < 73%      x ≥ 68%

C : x < 68%      x ≥ 63%

C- : x < 63%      x ≥ 58%

D+ : x < 58%      x ≥ 53%

D : x < 53%      x ≥ 48%

F : x < 48%

## 9. Academic Policies

a. Academic Integrity, Plagiarism and Cheating Policy: Refer to “Student Conduct and Community Standards” [www.drexel.edu/studentaffairs/community\\_standards/studentHandbook/](http://www.drexel.edu/studentaffairs/community_standards/studentHandbook/)

b. Students with Disabilities: Refer to

<http://drexel.edu/oed/disabilityResources/faculty/SyllabusStatement/>

c. Course Drop Policy: Refer to [http://www.drexel.edu/provost/policies/course\\_drop.asp](http://www.drexel.edu/provost/policies/course_drop.asp)

d. Course Change Policy: The instructor has the right to make minor changes to the course contents and the pedagogy. The changes will be announced at least two weeks prior to the action and the reasons will be communicated to students.