

# EE6314 Advanced Embedded Microcontroller Systems

## Spring 2021

### Instructor Information

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**Instructor:**

Jason Losh, Ph.D.

**Office Number:**

ERB 649

**Office Telephone Number:**

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**Email Address:**

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**Faculty Profile:**

<https://mentis.uta.edu/explore/profile/jason-losh>

**Office Hours:**

E-mail and virtual Q&A sessions in Teams.

**Grader:**

Nikhil Ashok Kumbhar, [nikhilashok.kumbhar@mavs.uta.edu](mailto:nikhilashok.kumbhar@mavs.uta.edu)

### Course Information

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**Section Information:**

001, 10x

**Time and Place of Class Meetings:**

Lectures: Videos will be recorded on campus in Echo360 and available in Canvas on demand.  
Live sessions will be held in Teams for office hours and interactive help sessions.  
Test: On campus, MW 2:30-3:50pm, Room ERB 125, 126, and 127  
Laboratory: M or T or W or Th or F 7-9:50pm, NH 148 (Section 10x)

**Description of Course Content:**

Study of advanced microcontroller system designs with an emphasis on multi-tasking, real-time control of devices. Topics include: design of real-time control systems, design of bootloaders, USB peripherals, and Ethernet applications. Prerequisite: EE5314.

**Student Learning Outcomes:**

Upon successful completion of this course, students will have knowledge of:

- Selection of a class project topic
- Review of M4F architecture, assembly code, and C programming
- Development of a bootloader
- Determination of the need for a real-time operating system (RTOS)
- Benefits and drawbacks of RTOS and alternatives to RTOS implementations
- Case study of RTOS implementation issues (i.e. priority inversion on Mars Pathfinder, blocking threads)
- Converting device drivers from blocking to RTOS-friendly handlers

- Construction of a real-time operating system (preemptive and cooperative)
- Development of ethernet stack with ARP/RARP, ICMP (ping, ack, nack), IP, and UDP
- Class Project specific topics

### **Class Web Page:**

Additional files will be provided as needed on the course web site at <http://ranger.uta.edu/~jlosh/>.

### **Communication:**

All class-wide communication by the instructor, including distribution of homework sets, will occur via the class listserv. Please sign up for the EE6314-L listserv by sending an e-mail from your UTA e-mail account to [listserv@listserv.uta.edu](mailto:listserv@listserv.uta.edu) from your UTA e-mail account (no subject line needed) and the command SUBSCRIBE EE6314-L as the message body. You will then receive an e-mail from the listserv server to which you must acknowledge to join the listserv with "OK" in an e-mail.

Canvas will only be used for Echo360 access.

### **Textbooks and Other Course Materials:**

No textbook will be required for this course. Extensive references, datasheets, application notes, and class notes will be provided on the course web site.

All students are required to own a TM4C123GXL evaluation kit. The cost is \$12.99. Information on this board is available at <http://www.ti.com/tool/EK-TM4C123GXL>.

### **Lab Safety Training:**

Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., Fall through Summer II) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned. The safety website for EE is <https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/electrical/students/ug-lab/safety>. You must complete this form at this link and submit it to be able to work in the lab.

### **Major Assignments and Examinations:**

Project 1: Wednesday, March 10  
 Test: Wednesday, April 21  
 Project 2: Wednesday, April 28

### **Technology Requirements:**

Students will need a computer capable of accessing Canvas and watching the Echo360 lectures. The computer and OS must be capable of running appropriate cross-compiler tools for programming the microcontroller.

## **Grading Information**

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### **Grading:**

- Grade scale: A (90-100), B (80-89), C (70-79), D (60-69), and F (0-59)
- Grade calculation: Test (33.3%), Project 1 (33.3%), Project 2 (33.3%)
- The instructor reserves the right to make reasonable changes in performance evaluation as needed.
- Any request for re-grading must be submitted to the Grader within one week of the completion of grading.

### **Test:**

- Test is open-book, open-notes, calculators allowed.

- No makeup will be provided for any test missed.

#### **Projects:**

- The projects will consist of hardware construction and firmware development and it is expected that it will take approximately 80 hours to complete.
- Project 1 is an individual assignment. You can help each other with concepts, but no sharing of code is allowed.
- Project 2 teams consist of 1 to 5 members.
- Interim deadlines for hardware construction and some software milestones will be announced as the class progresses.

### **Course Schedule**

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- Project selection (3 hrs)
- RTOS introduction (3 hrs)
- RTOS on M4F (1.5 hrs)
- Project 1 introduction (1.5 hrs)
- Ethernet introduction and IP stack demo (6 hrs)
- Bootloader introduction and demo (4.5 hrs)
- Project 2-specific code demos (6 hrs)
- Project 1 support lecture content (6 hrs)
- Project 2 support lecture content (6 hrs)
- Project 1 and 2 defenses (3 hrs)
- Exam (1.5 hrs)

The instructor reserves the right to make changes in the schedule as needed as the class progresses.

The official dates for registration, census, and dropping are available at [www.uta.edu/acadcal](http://www.uta.edu/acadcal).

### **Academic Integrity**

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This information is copied from <http://www.uta.edu/conduct/academic-integrity/index.php>.

The University of Texas at Arlington strives to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and responsibility. Furthermore, it is the policy of the University to enforce these standards through fair and objective procedures governing instances of alleged dishonesty, cheating, and other academic/non-academic misconduct.

Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, and collusion on an examination or an assignment being offered for credit. Each student is accountable for work submitted for credit, including group projects.

- Cheating
  - Copying another's test or assignment (added note: remember this includes homework!)
  - Communication with another during an exam or assignment (i.e. written, oral or otherwise)
  - Giving or seeking aid from another when not permitted by the instructor
  - Possessing or using unauthorized materials during the test
  - Buying, using, stealing, transporting, or soliciting a test, draft of a test, or answer key
- Plagiarism
  - Using someone else's work in your assignment without appropriate acknowledgement
  - Making slight variations in the language and then failing to give credit to the source
- Collusion

- Without authorization, collaborating with another when preparing an assignment

## **Institution Information**

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UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](http://www.uta.edu/provost/administrative-forms/course-syllabus/index.php) page

(<http://www.uta.edu/provost/administrative-forms/course-syllabus/index.php>) which includes the following policies among others:

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

## **Additional Information**

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### **Attendance:**

At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

### **Emergency Exit Procedures:**

Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

### **Student Success Programs:**

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring by appointment](#), [drop-in tutoring](#), [etutoring](#), [supplemental instruction](#), [mentoring](#) (time management, study skills, etc.), [success coaching](#), [TRIO Student Support Services](#), and [student success workshops](#). For additional information, please email [resources@uta.edu](mailto:resources@uta.edu), or view the [Maverick Resources](#) website.

## **Emergency Phone Numbers**

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In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381