

Embedded Systems Design

CSCE 3612, Section 001 and 002

Spring 2016

Class Timings: Tuesday and Thursday, 11:30 AM – 12:50 PM, NTDP B142

Instructor: Robin Pottathuparambil (Email: rpottath@unt.edu, Office: NTDP F263)

Office Hours: Tuesday and Thursday 5:00 PM – 6:00 PM or by appointment

Instructional Assistant: Evan Rodrigues (Email: EvanRodrigues@my.unt.edu, Help Lab: Monday and Wednesday 9:00 AM to 11:00 AM)

Course Webpage: All the course related material will be posted on the course webpage which is available through blackboard (<https://learn.unt.edu>).

Course Outcomes:

- Understand the differences between embedded computing systems and general purpose computing systems, including constraints on performance, energy consumption, memory and physical dimensions.
- Able to specify embedded systems using UML or other high level abstract models.
- Able to use modern micro-controllers, including programming and interfacing such micro-controllers.
- Understand the use of DSP processors and other Application Specific processors.
- Understand trade-offs associated with using micro-controllers, DSPs, ASICs, and FPGAs to meet embedded system requirements.

Text: *Computers as Components: Principles of Embedded Computing System Design* by Marilyn Wolf, Third Edition, ISBN: 978-0-12-388436-7

Catalog Description: Prerequisite: CSCE 2610, EENG 2710 or ENGR 2720, ENGR 2730. Computer systems as embedded computing elements and micro-controllers. System specification using UML or other high-level abstract models. Issues and constraints on embedded computing systems, including power, performance, memory and size. Use of DSP, ASIC and micro-controllers in a single design.

Topics:

- Introduction to Embedded Systems and its design process
- Instruction sets for ARM, PIC, and DSP
- Introduction to CPUs and co-processors
- Computing platforms and its design
- Program design and analysis
- Introduction to processes and operating systems
- System design techniques
- Networks and multiprocessors

Grading:

Homework	10%
Lab assignments	20%
Quizzes	10%
Midterm Exam (03/10/2016)	25%
Final Exam (05/10/2016)	35%

Homework: Homework will be in the form of problem sets with a due date 1 week after it is assigned. **No late homework will be accepted.** Homework must be done individually (you will learn the most from this). Any evidence of group participation will be interpreted as academic dishonesty. There will be six to seven homework assignments.

Lab Assignments: The laboratory projects are an integral part of the course and are intended to provide experience in the application of the design techniques discussed in lecture. There will be six to seven lab exercises assigned. Lab exercises can be done in the Embedded Systems Lab (NTDP F243) or on your own PC. Lab grades will be based on lab write-ups and demonstrated functionality of problem requirements. A lab report is due at the time of demonstrating the lab. All lab assignments will require demonstrating the exercise working on the board.

Quizzes: There will be six to seven pop quizzes given throughout the semester. These will be to reward students who consistently show up to class, but will be more than just attendance points.

Exams: There will be a midterm exam and a final exam. Mobiles phones are not permitted. Exams will include material from the lecture, the readings, homework, and lab assignments. Final exam will be comprehensive. Exam dates are:

- Midterm exam: Thursday, March 10th, 2016 11:30 AM – 12:45 PM , NTDP B142
- Final exam: Tuesday, May 10th, 2016 10:30 AM – 12:30 PM, NTDP B142

Missing Classes/Assignments/Exams: Attendance at all exams is mandatory. Throughout the semester, a student may miss classes, assignments, quizzes, or exams due to many reasons. Most of the reasons will not be accepted as an "excused" absence. Assignments, quizzes, or exams can be made-up only under extraordinary circumstances and only when notification is given to me before the quiz or exam is administered. A no-show for a quiz or exam without prior notification and a verifiable excuse (appropriate official documentation) results in a grade of 0 for that quiz or exam.

Disputing Grades: If you have a disagreement with how an assignment, quiz, or exam is graded, you should first get the solution to the assignment, quiz, or exam off the Blackboard course page and examine it. If you really believe that your answer is correct (matches the answer given in the solution), contact the grader and discuss it with him. The grader will listen to your concern, and act on it, at their discretion. In any case, they will sign the assignment verifying that they saw it again. Note that instructor or grader addition errors should follow the above procedure. Assignment, quiz, exam, and homework grades are disputable for **1 week** from the day the grades were assigned on Blackboard.

Syllabus Revisions: This syllabus may be modified as the course progresses. Notice of such changes will be by email or announcement in class.

Class Policies: Please note that portable phones, pagers, and late arrivals are disruptive to the instructor and to your peers. The use of cell phones, beepers, or communication devices is disruptive and is therefore absolutely prohibited during class or while taking exams or quizzes. Turn off your cell phone while in class. If I catch you using these devices, your final grade will be reduced by 10% for each and every transgression and you will be asked to leave the class. Except in emergencies, students using such devices must leave the classroom for the remainder of the class period. I know that some of you may wish to take notes directly on your computer and I have no problem with that. If however, you choose to access your email, search the web, play games, or instant messenger your friends during class, you will have 5% deducted from your final grade for each and every transgression. This penalty will be at the sole discretion of the instructor. If I am late arriving to class, it will be because of circumstances beyond my control. You are expected to remain for 20 minutes past the scheduled class start time while I attempt to communicate my situation and relay instructions.

Course Policies: Keep all of your graded assignments, quizzes, and tests for study and review. You should track your own progress using Blackboard, and be aware of current grades throughout the term. I will make all the effort to return the graded assignments, but it's your responsibility to collect back the graded assignments from the grader or the instructor if it is not given back to you. Final grading will be done as follows. **A:** > 90%, **B:** > 80% and < 90%, **C:** > 70% and < 80%, **D:** > 60% and < 70% and **F:** < 60%. Grades will be curved if necessary. Grades cannot be changed after they have been electronically entered into the university's system except for instructor error. Any extenuating circumstances that may adversely affect your grade must be brought to my attention before the final course grades are recorded. To be considered, such circumstances must be unusual, unavoidable, and verifiable.

Disability Services/Special Needs: UNT complies with all federal and state laws and regulations regarding discrimination including the Americans with Disability Act of 1990 (ADA). If you have a disability and need a reasonable accommodation for equal access to education or services please contact the Office of Disability Accommodation. Please initiate this process and inform me during the first two weeks of class.

Academic Dishonesty: All the provisions of the University code of academic integrity apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid. For homework and lab assignments, while discussion is allowed, direct copying is not and students must turn in individual submissions. Realize that mastery of the material in the homework and lab assignments will be essential for a good performance on the exams! All students are required to know, observe and help enforce the UNT Code of Student Academic Integrity. Cheating will result in disciplinary action according to UNT Policy 18.1.16. The penalty for a first offense can range from a formal warning to an 'F' for the course. Regardless of the penalty imposed, a record of the offense will be kept in the Office of the Dean of Students.

Tentative Course Schedule:

Week	Lecture	Assignments
01/18 – 01/22	Embedded computing	
01/25 – 01/29	Embedded computing	Homework 1
02/01 – 02/05	Embedded computing	Lab 1
02/08 – 02/12	Instruction set	Homework 2
02/15 – 02/19	Instruction set	Lab 2
02/22 – 02/26	CPUs	Homework 3
02/29 – 03/04	Computing platforms	Lab 3
03/07 – 03/11	Computing platforms/Review	Midterm Exam
03/14 – 03/18	Spring Break	
03/21 – 03/25	Program design and analysis	Lab 4
03/28 – 04/01	Program design and analysis	Homework 4
04/04 – 04/08	Processes and operating systems	Lab 5
04/11 – 04/15	System design techniques	Homework 5
04/18 – 04/22	System design techniques	Lab 6
04/25 – 04/29	Networks and multiprocessors	Homework 6
05/02 – 05/06	Networks and multiprocessors	
05/09 – 05/13	No Lecture	Comprehensive Final Exam