EEL 4730 – Programming Embedded Systems Spring 2025

Department of Electrical and Computer Engineering

Instructor   :   Dr. Herman Watson
Office Hours   :   by appointment with Zoom

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Classroom/Time: On Line

Web Page   :   http://web.eng.fiu.edu/watsonh/

Catalog Description:
Embedded Systems implementation using programming of synchronous state machines to capture behavior of time-oriented systems for running on microcontrollers.
(3 Credits)

Textbook – license required:
Frank Vahid and Tony Givargis
Programming Embedded Systems
zyBooks.com

Course Objectives:
Through successful completion of the course, the student will:
1. Recognize the stages of the embedded system problem solving process
2. Utilize Finite State diagrams for solution development
3. Interpret how the problem solving stages use finite states for software implementation.
4. Interpret how C Programming implements Finite State software
5. Utilize the C programming language, as a vehicle for the solution of real time embedded problems.

Relationship of course to program 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
4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7) an ability to acquire and apply new knowledge as needed, using appropriate learning

Topics Covered:
- Introduction to embedded systems
- Bit-Level manipulation in C
- Time-ordered behavior and state machines
- Time intervals and synchronous SMs
- Input/output
- Concurrency
- Creating a task scheduler
- Communication
- Utilization and scheduling
- Embedded system coding issues

Grading Scale:		
A	92-100	"Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook."
A-	90-92	
B+	88-90	
B	82-88	
B-	80-82	
C+	78-80	
C	70-78	
D	60-70	
F	< 60	

Department Regulations Concerning Incomplete Grades
To qualify for an Incomplete, a student:
1. Must contact (e.g., phone, email, etc.) the instructor or secretary before or during missed portion of class
2. Must be passing the course prior to that part of the course that is not completed
3. Must make up the incomplete work through the instructor of the course
4. Must see the Instructor. All missed work must be finished before last two weeks of the following term.

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Policies:
1. **Academic Misconduct:** For work submitted, it is expected that each student will submit their own original work. Any evidence of duplication, cheating or plagiarism will result at least a failing grade for the course.
2. Absences: Resolution of absences and materials missed are student responsibility
   o **Unexcused Absences:** Two unexcused absences are permitted during the term. More than two will result in the loss of points from your final grade. (1 point per absence above two, 3 points per absence above 5).
   o **Excused Absences:** Only emergency medical situations or extenuating circumstances are excused with proper documentation.
      ▪ 1. Review documentation with the lecturer,
      ▪ 2. email as a written record to watsonh_fiu@yahoo. (Note underscore)
         • Name, SID, class, section, description and date of the absence
3. **On Time:** As in the workplace, on time arrival, preparation, and submissions are required.
4. **Deadlines:** Work is due before midnight on the date specified. Late submissions within one week will receive up to half credit. <mark>After one week, late work will not be accepted.</mark> Late submissions are graded after the final exam. If you get a low score correct and resubmit your work before the deadline. Participation deadlines are absolute – no late completions or makeups
5. **Submissions:** <mark>**This class is paperless**. Submissions are made using the web form listed on the class web site (online and in class sections) See web site for instructions.</mark>
   All submissions must have
      1. Captures of work must be whole screen images (include time and calendar)
      2. Everything placed in a single word or pdf document stored on your own cloud storage
      3. Contain your name, date, and time of completion within the document
      4. Permission: accessible <mark>by anyone with link</mark> and readable with a browser
      5. Use a single URL link to view the document
6. **DO NOT** submit work by email.
7. Instructor reserves right to change course materials or dates as necessary.

Grading Scale: NOTE: There are *no makeup exams* offered

Topic	Percentage
Exam 1 *no makeup*	16%
Exam 2 *no makeup*	18%
Exam 3 *no makeup*	20%
Exam 4 *no makeup*	20%
Homework	10%

Participation
    Zybooks Exercises
    MQTT
	16%
	8%
	8%

Attendance	Unexcused absence penalty based on in class policy

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Wk	Date Mon	Class Weekly Schedule: 4730 Weekly Spring 2024 Tuesday Thursday	HW: Due Tue Instructions on Class Web SITE
		>>>>>>>>>> Each week's Zybooks chapter requires Participation exercises- they count for 8% of your overall grade	
01	01/06	Ch Z1 – Introduction V1 Order MQTT Parts - NOW	HW1-Z1: 01/14
02	01/13	Chapter Z2 Bit-Level Manipulation in C V2 V3 (MLK Holiday Mon 01/15)	HW2-Z2: 01/21
03	01/20	Ch Z3 Time-ordered Behavior and State Machines V4, V5	HW3-Z3: 01/28
04	01/27	**Tue 01/28 Review V6**	**Thur 01/30 Exam 1**	HW4-Z4: 02/04
05	02/03	Ch Z4 Time Intervals and Synchronous SM's V7 V8	HW5-Z4: 02/11
06	02/10	Ch Z6 Input / Output V9	Ch Z5 Multiple SM, V10 V11	HW6-Z6: 02/18 HW7-Z5: 02/18
07	02/17	Ch Z5 Concurrency and Multiple Synch SM's V12	**Thur 02/20 Review V13**	HW8-Z5: 03/04
	02/24	**Spring Break**		
08	03/03	**Tue 03/04 Exam 2**	Ch Z8 Simple Scheduler V14 MQTT Project Starts	HW9-Z8: 03/11 MQTT L1
09	03/10	Ch Z7 Communication & Peripherals V15	HW10-Z7: 03/18 MQTT L2
10	03/17	Ch Z10 Utilization and Scheduling V17 V18 (03/17 Last Drop)	HW11-Z10: 03/25 MQTT L3
11	03/24	**Tue 03/25 Review V19**	**Thur 03/27 Exam 3**	
12	03/31	Ch Z9 Programming Issues V20	Ch Z11 Basic Control Systems V21	MQTT L4 04/08
13	04/07	Ch Z12 Digital Signal Processing V22 PQDSP	
14	04/14	**Tue Review V23 04/15**	**Thur 04/17 Exam 4**	
15	04/21	**No Final Exam given**	