COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
REAL-TIME SYSTEMS	**CSE538**	**1**	**3+0**	**3**	**7**

Prerequisites	-

Language of Instruction	English
Course Level	Graduate Degree
Course Type	Technical Elective
Course Coordinator	
Instructors	Assoc. Prof. Sezer Gören Uğurdağ
Assistants	-
Goals	Intended to familiarize students with real-time/embedded programming tools & techniques with state-of-the-art boards (Texas Instruments EvalBOT, Zoom OMAP-L138 EVM/Experimenter Development Kit, ARM NXP LPC1768 Development Board). Through a series of laboratory exercises students acquire skills in the design/ implementation/debugging of core embedded real-time functionality. This hands-on course introduces real-time concepts and the real-time embedded development/programming/debugging techniques.
Content	Topics include I/O programming, cyclic executives, real-time principles (multi-tasking, scheduling, synchronization), real-time executives, DSPLink, DSPBIOS, RTAI, uCOS-III, MDK-ARM, and RTX.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Adequate knowledge in real-time concepts.	1,2,3,4,5	1,2,3	A,B,C,D
2) Ability to write real-time embedded applications.	1,2,3,4,5	1,2,3	B,D
3) Ability to debug, verify, emulate real-time embedded systems.	4,5	1,2,3	B,D
4) Ability to devise, select, and use modern techniques and tools needed for real-time embedded systems.	4,5	1,2,3	B,D
5) Ability to work in a team.	6	3	B,D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab (Unofficial), 4: Case-study

Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	FOREGROUND/BACKGROUND SYSTEMS VERSUS RTOS-BASED SYSTEMS, RTOS OVERVIEW	Textbook
2	CRITICAL SECTIONS OF CODE, SHARED RESOURCES, MULTITASKING, TASKS, CONTEXT SWITCHES	Textbook
3	KERNEL TYPES, KERNELS, SCHEDULERS, NON-PREEMPTIVE KERNELS, PREEMPTIVE KERNELS	Textbook
4	REENTRANT FUNCTIONS	Textbook
5	ROUND-ROBIN SCHEDULING, TASK PRIORITIES, STATIC/DYNAMIC PRIORITIES, PRIORITY INVERSION, PRIORIT INHERITANCE	Textbook
6	MUTUAL EXCLUSION, SEMAPHORES, DEADLOCK, SYNCHRONIZATION	Textbook
7	MIDTERM 1	Textbook
8	INTERTASK COMMUNICATION, MESSAGE MAILBOXES/QUEUES	Textbook
9	INTERRUPTS, INTERRUPT LATENCY/RESPONSE/RECOVERY, ISR PROCESSING TIME, NONMASKABLE INTERRUPTS, CLOCK TICK	Textbook
10	MEMORY REQUIREMENTS, ADVANTAGES/DISADVANTAGES OF REAL-TIME KERNELS	Textbook
11	EMBEDDED PROGRAMMING WITH OMAP-L138 EVM/EXPERIMENTER KIT, OVERVIEW OF OMAPL138 SOM	Textbook
12	DSP/BIOS, AUDIO PROCESSING	TEXAS INSTRUMENTS Website
13	OTHER RTOS: MDK-ARM, RTX, RTAI	Web
14	PROJECT DEMOS	-

RECOMMENDED SOURCES	
Textbook	Jean J Labrosse, Micrium's uC/OS-III: The Real-Time Kernel
Additional Resources	Donald Reay, Digital Signal Processing and Applications with the OMAPL138 Experimenter, Wiley.

MATERIAL SHARING	
Documents	http://tech.groups.yahoo.com/group/cse538/
Assignments	http://tech.groups.yahoo.com/group/cse538/
Exams	http://tech.groups.yahoo.com/group/cse538/

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	25
Assignment	5	25
Lab Work (unofficial)	10	20
Term Project	1	30
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

	COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution						
		0	1	2	3	4	5	
1	Knowledge in the advanced computer architecture field			**X**				
2	Knowledge in advanced system design for computer engineering						**X**	
3	Knowledge in the theoretical topics of computer science						**X**	
4	Ability to comprehend, analyse and critique academic publications and conduct scholarly research at the frontiers of computer engineering						**X**	
5	Ability and knowledge in the fields of Next-Generation and contemporary computer networks		**X**					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	4	56
Midterm examination	1	6	6
Homework	5	4	20

Project	1	45	45
Final examination	1	6	6
Total Work Load			175
Total Work Load / 25 (h)			7
ECTS Credit of the Course			7