YEDİTEPE UNIVERSITY

FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM

2019/2020-1

COURSE INFORMATON				
Course Code	**EE 242**	**Course Title**	**MICROPROCESSOR SYSTEMS**	
Semester	*Credits*	*ECTS*	*C +P + L Hour*	Prerequisites
4	4	6	3+0+2	EE241

Language of Instruction	**Course Level**	**Course Type**
English	Undergraduate	Core/Elective
Course Coordinator	Dr. Gökhan Şahin	
Instructors	Dr. Gökhan Şahin	
Assistants	Cihan Yüksel	
Goals		
Content	- In this class, the fundamentals of embedded system hardware and firmware design will be explored. - Basics of microcontroller architecture will be introduced. - A well-known 32-bits ARM based microcontroller; STM32F407VG (SGS-Thomson Microelectronics) will be studied. - Firmware design using 'C language' and firmware debugging will be discussed. - Cortex Microcontroller Software Interface Standard (CMSIS) will be studied. - The HW/Firmware development tools for the microcontroller will be used effectively. - A complete embedded system design cycle will be carried out.	
Contribution of the Course to the Professional Education	- Embedded system design tools will be understood. - The basics of microprocessor systems is studied - The student understands how a HW-SW system design carried out - Practical hands-on experience is gained to enable the students to realize their ideas/projects.	

Course Learning Outcomes	**Detailed Program Outcomes**	**Teaching Methods**	**Assessment Methods**
Introductory understanding of microcontroller architecture	3a	1	A
Data and program memory accessing and interfacing	3a	1,7	A,D
Timing and synchronization, the use of interrupts	1b,2a,4b	1,7	A,D

Use of internal peripherals like ADC, Timer, PWM modules.	1b,2a,4b	1,7	A,D
Interfacing with on-chip and external devices, i.e. motors, timers, LEDs, switches, buttons, sensors, etc.	1b,2a,4b	1,7	A,D
Practical experience to use a microcontroller	7c,5a	7	D

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Use of simulations, 5: Problem solving assignment, 6: Reading assignment, 7: Laboratory work, 8: Term research paper, 9: Presentation by guest speaker, 10: Sample Project Review, 11: Interdisciplinary group working, 12: …
Assessment Methods:	A: Written exam, B: Multiple-choice exam C: Take-home quiz, D: Experiment report, E: Homework, F: Project, G: Presentation by student, H: …

DERS AKIŞI

Hafta	Konular	Çalışma Malzemeleri
1	Common Computer Organization / Microcontroller basics Lab1: Introduce the discovery board, Installation of Compiler/debugger, basic examples demonstrating the use of compiler/debugger	Course book / Lecture Slides
2	Common Computer Organization / Microcontroller basics Lab2: Introduce the discovery board, Installation of Compiler/debugger, basic examples demonstrating the use of compiler/debugger	Course book / Lecture Slides
3	Introduction to ARM cortex processors, STM32F40x HW architecture Lab3: Using C language on discovery board	Course book / Lecture Slides
4	IO interfacing, and STM32F407 interfaces Lab4: General purpose IO module and blinking LED application	Course book / Lecture Slides
5	Parallel port, GP output -> using the 7-segment module Lab5: multi-7-segment display application	Course book / Lecture Slides
6	Parallel port, GP input -> using the matrix keypad Lab6: 7-segment display with matrix keypad application	Course book / Lecture Slides
7	Midterm	Course book / Lecture Slides
8	Int. to Cortex microcontroller software interface standard (CMSIS) libraries, Reset and Clock control module->PLL and frequency settings Lab7: GP input/output experiments using CMSIS	Course book / Lecture Slides
9	Sampling, ADC module Lab8: Read ADC, write to 7-segment	Course book / Lecture Slides
10	Interrupts, Timer interrupt, sampling Lab9: generate a square wave with desired frequency	Course book / Lecture Slides
11	PWM applications Lab10: Generate PWM with adjustable duty cycle. Freq.: 10 KHz. Duty cycle should be adjusted using pot. Observe PWM signal using osc.	Course book / Lecture Slides
12	Serial communication: UART Lab 11: data transfer application between PC and STM32F407 using hyper terminal via UART connection	Course book / Lecture Slides
13	Application examples	Course book / Lecture Slides
14	Application examples	Course book / Lecture Slides

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RECOMMENDED SOURCES	
Textbook	Geoffrey Brown, Discovering the STM32 Microcontroller, 2012
Additional Resources	Reference manual

MATERIAL SHARING	
Documents	Laboratory experiment sheets and Lecture Slides
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterm	2	%25
Lab Experiments	1	%10
Total		
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Field Course

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES		
No	Program Learning Outcomes	check
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	√
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	
2a	Ability to identify, formulate, and solve complex engineering problems,	√
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	
3a	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result,	√

3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	√
4b	Ability to employ information technologies effectively.	
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	
7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	√
7d	Ability to make effective presentations,	
7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	
9b	Knowledge on standards used in engineering practice.	
10a	Knowledge about business life practices such as project management, risk management, change management.	
10b	Awareness in entrepreneurship and innovation.	
10c	Knowledge about sustainable development.	
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,	
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.	

11c	Awareness of the legal consequences of engineering solutions.

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	**Quantity**	**Duration (Hour)**	**Total Workload (Hour)**
Course Duration	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Mid-terms	2	1	2
Laboratory	10	2	20
Final examination	1	4	4
Total Work Load			
Total Work Load / 25 (h)			
ECTS Credit of the Course			6