



COURSE SYLLABUS

Course title	Microprocessor - based Automation System		
Course Code	MA	Lecture credit	3
Department		School	MUST
Pre-requisites course code	None	Co-requisites Course code	
Primary instructor	Luubaatar.B		
E-mail address	luubaatar@must.edu.mn	Phone number	8611 1177
Other instructors			
Learning Hours	Total: 144 Learning hours (2:2:0:5) Lecture(32 hr), Seminar(32 hr), Assessment (80 hr)		
Course type	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective <input type="checkbox"/> Selected elective <input type="checkbox"/> Other		
Offer in Academic Year	<input checked="" type="checkbox"/> 1 st Semester <input checked="" type="checkbox"/> 2 nd Semester <input type="checkbox"/> Summer <input type="checkbox"/> Year Long		
Introduction language	Mongolian or English		
AIMS AND OBJECTIVES:			
<ul style="list-style-type: none"> • Understand structure of 32 bit microcontroller (structure of microcontroller) • Program microcontroller in C and Assembler (program microcontroller) • Analyze program structure for microcontroller (analyze a code) • Evaluate microcontroller based systems performance based on program structure and hardware structure • Detect bugs of program and prevent from creating bugs. • Implement microcontroller based system () • Apply control theory and implement it on microcontroller 			
ESSENTIAL READINGS: (Textbooks, journals, website addresses etc)			
BIBLIOGRAPHY			
<ul style="list-style-type: none"> • Joseph Yiu, THE DEFINITIVE GUIDE TO THE ARM® CORTEX-M3 • Norman S. Nice CONTROL SYSTEMS ENGINEERING 6th edition 			
COURSE DESCRIPTION			
The course covers theoretical and practical information of microprocessor/ microcontroller based systems. The architecture of microcontroller to be introduced is ARM Cortex M3. Students will experience to develop ARM Cortex M3 oriented systems with C and Assembler languages.			
TEACHING METHODS: Flipped classroom and seminar-based learning (Blended learning)			
COURSE CONTENTS			
Lecture content:		Hours	
Architecture of Cortex M3 microcontrollers.		2	
Registers		2	

Assembler instructions.	2	
Cortex M3 microcontroller's memory	2	
Cortex M3 microcontroller's GPIO	2	
Interrupt structure	2	
Cortex M3 microcontroller's Timers	2	
Serial interface	2	
Analog to digital converter	2	
Embedded C	2	
CMSIS library	2	
Debugging Cortex M3	2	
Cortex M3 microcontroller interfacing with LCD display	2	
Serial connection between two microcontrollers	2	
A project with timer	2	
Implementing PID controller with Cortex M3	2	
Seminar content:	Hours	
Microcontroller based system structure	2	
Simple program examples	2	
Program example with assembler	2	
Sorting programs	2	
GPIO related programs	2	
External interrupt related programs	2	
Timer programming	2	
Serial transmitter program	2	
Serial receiver program	2	
ADC programming	2	
Program design methods	2	
Microcontroller programming development environment	2	
LCD programming	2	
Timer programming	2	
DC motor programming	2	
Implementing PID controller with Cortex M3	2	
COURSE LEARNING OUTCOMES (CLOs)	PLOs	
By the end of the main course, the students should be able to:		
1. Explain microprocessor/microcontroller based system structure	A.2	
2. Apply C and Assembler language programming skills to program microcontroller based system	A.2	
3. Identify problems, to propose solution, to use system design methods	A.2	
4. Apply classic control methods to design control system based on microcontroller	A.2	
5. Use datasheets, manuals	C.2	
6. Apply speaking and writing skills to write course report and present	C.2	
By the end of the seminar, the student should be able to:		
7. Design simple microcontroller based systems	A.2	
8. Program Cortex M3 microcontroller	A.2	
9. Use program development environment	B.2	
10. Identify the team work	C.1	
TEACHING AND LEARNING ACTIVITY		
Weekly contact hours: (2:2:0:5)-1×2 hours lecture, 1×2 hours seminar. Traditional and active learning methods will be used within lecture, seminar and homework assignments		
Learning methods /Pedagogy/	Types of teaching method	CLOs
➤ Case based learning	✓ Lecture	1,2,3,4,5,6

➤ Flipped classroom	✓ Seminar	7,8,9,10	
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Assessment tools	Assessment frequency	Weight	CLOs
Attendance/participation in class	Weekly/ Every 3 weeks	8%	1,2,3,4
Assessment	8, 13 th week	15%	2,3,4,5,6
Med-term	8, 13 th week	15%	1,2,3,4
Seminar	Every weeks	32%	7,8,9,10
Final exam	17 th / 18 th week	30%	1,2,3,4,9
PREPARED:			
Course coordinator	B.Luubaatar	Date:	2020/05/07
APPROVED BY:			
Head of Department		Date:	