

COURSE OUTLINE

Department & Faculty: Faculty of Electrical Engineering	Page : 1 of 5
Course Code: SEL 4533 - MICROCONTROLLER Total Contact Hours: 3 hours/week	Semester: 2013/14 Academic Session: 2

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Synopsis : This course introduces the principles and applications of microcontroller. The topics emphasized are microcontroller architecture and software programming using C language. The content also covers internal peripherals such as parallel input and output, analogue to digital converter, ADC and serial communication. The student will learn technique and circuit to interface microcontroller with other devices in embedded system.

LEARNING OUTCOMES

By the end of the course, students should be able to:

No.	Course Learning Outcomes	Programme Learning Outcome(s) Addressed	Assessment Methods
CO1	Describe the single-chip microcontroller architecture	PO1	T1, HW, PR1
CO2	Describe the functions of internal peripheral interfaces in a microcontroller and their related I/O registers	PO1	T1, PR1, F
CO3	Design and build interfaces to a single-chip microcontroller and program their operation in C language	PO3	PR, F, D
CO4	Work in a group and communicate effectively	PO10	PR, Pr, D

(T=Test; HW= Homework; PR=Project; Pr=Presentation; F=Final exam; D=Demo)

Prepared by: COURSE COORDINATOR Name: DR. YEONG CHE FAI Signature: Date: 18 FEBRUARY 2014	Certified by: (Course Panel Head) Name: Signature: Date:
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STUDENT LEARNING TIME (SLT)

Teaching and Learning Activities	Student Learning Time (hours)
1. Face-to-Face Learning	
a. Lecturer-Centered Learning <ul style="list-style-type: none"> i. Lecture 	38
b. Student-Centered Learning (SCL) <ul style="list-style-type: none"> i. Laboratory/Tutorial ii. Student-centered learning activities 	4
2. Self-Directed Learning	
a. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc.	30
b. Revision	34
c. Assessment Preparations	8
3. Formal Assessment	
a. Continuous Assessment	2
b. Presentation and Demonstration	1
c. Final Exam	3
Total (SLT)	120

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TEACHING METHODOLOGY

The teaching and learning activity will be implemented through the following method:

i. Lecturing Method

Lecturing is the main teaching method to provide basic understanding of concept and theory on the embedded system. However lecturing method will be combine with other method to make sure that the students stay focus.

ii. Cooperative and collaborative method

This method is used to develop the interactive teaching and learning environment among students and with lecturer. Since the students come from various background and course, they can share many experience and application of embedded system. They will also participate and involve directly in problem/question solving.

iii. Demonstration Method

This method will be used to explain the operation of simulation software and demonstrate the steps for using it. Beside software, student will use trainer kit and this requires comprehensive demonstration. The student will have the hands on experience in using the software and hardware.

iv. Problem based method

The teaching and learning activity that is targeted for C04 is a group project. Usually, the nature of group project is Student Centered Approach which involves Problem Based Learning, Cooperative Learning and Presentation.

The student will be assigned into groups which consist of 3 to 4 students. Each group has to build a project which is an application of a system based on microcontroller device. For example, a house alarms system or a digital clock. They have to discuss and come out with a title for their group project (group discussion, role play). Then they have to prepare a project proposal (role play, responsibility). Next, the group shall start developing the project (role play). Usually, the project consists of software and hardware development. And, the most important part in the project is the integration of both systems (role play).

At the end of the project, the group shall present the project as a whole, from planning to design, development and testing (presentation). The presentation also involves a demonstration on the actual developed system (project work, presentation). For the final task, the group has to submit a full report on the project development (project report).

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WEEKLY SCHEDULE

Week	Topic
Week 1	INTRODUCTION TO MICROCONTROLLER Single chip microcontroller, microcontroller vs. microprocessor, embedded system
Week 2 - 4	Microcontroller System Hardware Fundamental Introduction to Atmel AVR, Atmega328 microcontroller, ATmega328 pin-out & description, ATmega328 Hardware Design, Arduino Uno Board
Week 5 - 7	Microcontroller System Software Development Arduino IDE, Arduino Programming Language, Brief Review of C Language, Software Development & Debugging Processes
MID SEMESTER BREAK	
Week 9 - 10	Microcontroller Internal Peripheral Interfaces On-chip interfaces in general I/O registers, parallel I/O interface, Analog-to-digital converter
Week 11 - 12	Microcontroller Internal Peripheral Interfaces Serial communication, serial peripheral, Timers & PWM
Week 13 - 14	Microcontroller Interfacing LED interfacing, mechanical switch, interfacing with power electronics devices, DC & stepper motor
Week 15	Case Studies on Embedded System Design

REFERENCE:

1. Jack Purdum, Beginning C for Arduino: Learn C Programming for the Arduino, APress, 2012.
2. Brian Evans, Beginning Arduino Programming, Apress, 2011.
3. <http://www.arduino.cc>
4. <http://www.atmel.com/devices/ATMEGA328.aspx>

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GRADING:

(Provide details on the allocation of marks and the time schedule for all quizzes, tests, assignments, etc.)

No	Type of Assessment	% total	Date
1	Assignment 1	10	Week 3
2	Test 1	10	Week 7
3	Test 2	10	Week 13
4	Assignment 2 (Project, Presentation and Demo)	20	Week 14
5	Final Examination	50	Week 15-18
Overall Total		100	

*Students are recommended to buy a "Starter Kit for Arduino UNO".