# Syllabus(2016-1)

| Course Title | Smart Software Project | Course No. | 37269-01 |
|---|---|---|---|
| Department/ Major | Computer Science and Engineering | Credit/Hours | 3 |
| Class Time/ Classroom | Mon 2:00pm ~ 6:15pm (Asan Eng. 122) | | |
| Instructor | Name: Prof. HyungJune Lee | Department: Computer Science & Engineering | |
| | E-mail: hyungjune.lee@ewha.ac.kr | Telephone: 02-3277-6644 | |
| Office Hours/ Office Location | Thu 3:30pm ~ 5pm (Asan Eng. 321-1) | | |

## Ⅰ. Course Overview

### 1. Course Description

This course is a hands-on embedded system programming and project course based on an Arduino hardware and software platform. The objective of this course is to provide students with the basics of designing, interfacing, configuring, and programming real-world embedded systems. Students will have valuable opportunities of applying the knowledge of computer architecture and embedded programming for implementing their own smart robot software as a term project. This course is intended to prepare students for cutting edge careers in research and industry.

### 2. Prerequisites

There are the following prerequisites for taking this course:
- Computer Programming and Lab(36339) or any C-language course is a prerequisite course.
- Computer Engineering Design(36503) is a prerequisite course.
- Computer Architecture(20493) is a recommended course.

Any prior knowledge of Android programming is not necessary.

### 3. Course Format

| Lecture | Discussion/Presentation | Experiment/Practicum | Field Study | Other |
|---|---|---|---|---|
| 40 % | 10 % | 50 % | | % |

(Instructor can change to match the actual format of the class.)

This course consists of a lecture class and a lab session each week:

■ Lecture class: to provide fundamental and advanced concepts of low-level embedded hardware/software and high-level software algorithms
■ Lab session: to practice in-lab programming exercises of controlling the SmartCAR Arduino platform

Arduino Mega 2560-based SmartCAR (Figure 1) with Nexus 7 Android tablet will be used for lab classes and a term project. Two students will form a team for the labs and the term project, and will share to use one SmartCAR robot within team.



Figure 1. Arduino Mega 2560-based SmartCAR Robot Platform

## 4. Course Objectives

The objective of this course is to provide students with the basics of designing, interfacing, configuring, and programming real-world embedded systems. Students will have valuable opportunities of applying the knowledge of computer architecture and embedded programming for implementing their own smart robot software as a term project. This course is intended to prepare students for cutting edge careers in research and industry.

## 5. Evaluation System

| Midterm Exam | Final Exam | Quizzes | Presentation | Projects | Assignments | Participation | Other |
|---|---|---|---|---|---|---|---|
| 25 % | % | % | % | 50 % | 20 % | 5 % | % |

(Instructor can change to match the actual format of the class.)

* Evaluation of group projects may include peer evaluations.

  Explanation of evaluation system:

■ There will be weekly lab assignments, midterm, project proposal, final report, and term project.
■ Late homework submissions will be acceptable up to 3 days with the score penalty of -30%.
■ This course syllabus is subject to change, and the instructor reserves the right to change the policy.

## Ⅱ. Course Materials and Additional Readings

### 1. Required Materials

Textbook:
- There is no textbook required for this course. We will use lecture slides that will be posted prior to each class.

### 2. Supplementary Materials

References:
- Official Arduino website –http://www.arduino.cc/
- Arduino Mega 2560 website – http://arduino.cc/en/Main/arduinoBoardMega2560/
- Any Arduino-related programming book

### 3. Optional Additional Readings

## Ⅲ. Course Policies

∗ For laboratory courses, all students are required to complete lab safety training.

- This course will be offered in English.
- iPad will be used to provide students with dynamic education environments.

## Ⅳ. Course Schedule (15 credit hours must be completed.)

| Week | Date | Topics & Class Materials, Assignments |
|------|------|----------------------------------------|
| Week 1 | (03/07) | Course introduction |
| | (03/07) | Arduino introduction: platform & programming environment |
| Week 2 | (03/14) | Embedded system overview & Source management in collaborative repository (using GitHub) |
| | (03/14) | Lab 1: Arduino Mega 2560 board & SmartCAR platform |
| Week 3 | (03/21) | ATmega2560 Micro-controller (MCU): architecture & I/O ports, Analog vs. Digital, Pulse Width Modulation |
| | (03/21) | Lab 2: SmartCAR LED control |
| Week 4 | (03/28) | Analog vs. Digital & Pulse Width Modulation |
| | (03/28) | Lab 3: SmartCAR motor control (Due: HW on creating project repository using GitHub) |
| Week 5 | (04/04) | ATmega2560 MCU: memory, I/O ports, UART |
| | (04/04) | Lab 4: SmartCAR control via Android Bluetooth |

| Week | Date | Topics & Class Materials, Assignments |
|---|---|---|
| Week 6 | (04/11) | ATmega2560 UART control & Bluetooth communication between Arduino platform and Android device |
| | (04/11) | Lab 5: SmartCAR control through your own customized Android app (Due: Project proposal) |
| Week 7 | (04/18) | Midterm exam |
| | (04/18) | |
| Week 8 | (04/25) | ATmega2560 Timer, Interrupts & Ultrasonic sensors |
| | (04/25) | Lab 6: SmartCAR ultrasonic sensing |
| Week 9 | (05/02) | Infrared sensors & Buzzer |
| | (05/02) | Lab 7: SmartCAR infrared sensing |
| Week 10 | (05/09) | Acquiring location information from Android device & line tracing |
| | (05/09) | Lab 8: Implementation of line tracer |
| Week 11 | (05/16) | Gyroscope, accelerometer, and compass sensors |
| | (05/16) | Lab 9: Using gyroscope, accelerometer, and compass sensors |
| Week 12 | (05/23) | Project |
| | (05/23) | Team meeting (for progress check) |
| Week 13 | (05/30) | Project |
| | (05/30) | Team meeting (for progress check) |
| Week 14 | (06/06) | Course wrap-up & next steps (1) |
| | (06/06) | Course wrap-up & next steps (2) |
| Week 15 | (06/13) | Project presentation & demo (1) (Due: source code, presentation slides, & poster slide) |
| | (06/13) | Project presentation & demo (2) |
| Makeup Classes 1 | (06/07) | Online Video Lecture Make-up for Jun 6 |
| Makeup Classes 2 | (mm/dd) | |

## V. Special Accommodations

\* According to the University regulation #57, students with disabilities can request special accommodation related to attendance, lectures, assignments, and/or tests by contacting the course professor at the beginning of semester. Based on the nature of the students' requests, students can receive support for such accommodations from the course professor and/or from the Support Center for Students with Disabilities (SCSD).

\* The contents of this syllabus are not final—they may be updated.