

## System Programming

Course Name	Course type (credit/hours)		Elective course(4/5)		Course code	F087
	Target students Division/major/grade		Software and Computer Engineering/		Opening semester	2018 2ND SEMESTER
	Class time and classroom		Wed 13:30~15:00 (Pal409)Fri 13:30~15:00 (Pal409)Fri 8.5(Pal318) Fri 9.5(Pal318)		English Grade	A(100%English)
Reference to this course	Prerequisite courses		Computer Programming			
	Related basic courses		Data Structures, Operating Systems, Computer Architecture			
	Recommended concurrent courses					
	Related advanced courses		Embedded Software			
Instructor	Name (title/division)		JeongGil Ko(Assistant Professor, Software and Computer Engineering)			
	Office Room Number	팔달관 604	Office phone Number	3815	e-mail	
	Office hours	Tue 16:00~17:00		Homepage address	http://aeislab.ajou.ac.kr	
Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

### 1. Introduction

- The increasing interest in ubiquitous computing introduces a new computing paradigm and together the importance of embedded systems computing is also increasing. At the basis of embedded systems programming is the knowledge that will be taught in this system programming course. We will learn the basics of what one should know to perform programming in the embedded systems and distributed systems environments.
- In this course, we will learn topics such as assemblers, linkers, loaders, basic operating system principles, device drivers and also learn how to combine these topics and design a real-world system.
- This course also includes a practice portion while will deal with loaders, cross-compilers, operating systems and device drivers in an embedded linux programming environment.

### 2. Course Objectives

#### <Course Objectives>

This course discuss about different system software functionalities and tries to emphasize on system application capabilities.

#### <Goals of Course>

- 1) A student will learn the basic concepts and process of program building (프로그램 학습성과 1,13)
- 2) A student will learn the basic concepts of the Linux file system and device drivers. (프로그램 학습성과 2,13)
- 3) A student will understand the concepts and functionalities of an assembler and linking loaders. (프로그램 학습성과 4,13)
- 4) A student will be able to apply and understand Linux device drivers on the embedded practice board.(프로그램 학습성과 5, 13)

### 3. Class types and activities

Mixture of in-class learning and practice

- Discussion-based in-class learning
- Linux-based practice and projects

### 4. Teaching Method

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> lecture                                     | <input checked="" type="checkbox"/> discussion and debate         |
| <input checked="" type="checkbox"/> team project(presentation and case studies) | <input checked="" type="checkbox"/> experiments(role-playing,etc) |
| <input type="checkbox"/> designing and production                               | <input type="checkbox"/> on-site learning(on-site training)       |
| <input type="checkbox"/> others   |   |

### 5. Support Systems in Use

- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> AjouBb               | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input type="checkbox"/> cyber lecture                   | <input type="checkbox"/> online content             |   |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others                     |   |

### 6. Teaching Tools

- |   |   |  |
|---|---|--|
| <input checked="" type="checkbox"/> PBL(Problem Based Learning) | <input type="checkbox"/> CBL(Case Based Learning) | <input checked="" type="checkbox"/> TBL(Team Based Learning) |
| <input type="checkbox"/> UR(Undergraduate Research)             | <input type="checkbox"/> FL(Flipped Learning)     | <input type="checkbox"/> DSAL(Data Science Active Learning)  |
| <input type="checkbox"/> others                                 |   |  |

### 7. Knowledge and ability required for taking this course

- 컴퓨터 시스템 기본 지식 (Basic Knowledge on Computer System)
- C 언어 사용 능력 (C Programming Language Usability)
- 자료구조 이해 (Understanding of Data Structures)
- Basics on Computer Architectures

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance			
midterm exam	1	20%	
final exam	1	25%	
quiz	2	5%	
presentation			
discussion			
homework	3	35%	Term Project and Homework
etc	1	15%	Class participation / Practice participation / etc.
study hours	4시간		

## 9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	System Software	Leland Beck	Addison Wesley	1997
Main	임베디드시스템 실습자료 (Internal embedded board-related documents)	공동 – Custom	미출판 – not public	
Sub	System Programming with C and Unix	Adam Hoover	Addison Wesley	2010
Ref.	Introduction to System Software	Jonathan Misurda	미출판	2010

## 10. Class system and Class shedule

시스템 소프트웨어와 관련된 Linux OS 를 비롯한 Assembler, Loader, Linker 및 리눅스 시스템 소프트웨어의 주요기능을 강의하고, 실습과제 및 프로젝트 진행을 통하여 응용과정을 경험한다.

This course will discuss topics related to system software such as Linux OS, Assemblers, Loaders, Linkers and Basic functionalities of Linux systems software. The course will also include a lecture-based learning portion and a practice portion to re-learn the concepts in real-world implementations.

Linux 기반 임베디드시스템 실습 장비를 기반으로 실습 및 프로젝트를 진행한다. 실습장비 사용법 교육을 시작으로 어셈블러, 링커/로더, Cross compiler, 디바이스 드라이버 등 관련 시스템 프로그램을 실습장비 상에서 실제로 구현, 시험함으로써 시스템 프로그램 활용 능력을 키운다.

The practice portion of the course and the final project will be designed around an embedded board. We will start with a set of lectures on the usage of the embedded boards and move on the learning how the linker/loader, cross-compiler, device drivers are used within the Embedded Linux OS within the board.

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	과목소개(What is System Programming?), Linux 이론 및 기본 실습 (Basic linux practice)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)		
2	I/O(stream, file, pipe), 임베디드 실습 보드 소개 (Intro to embedded board)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam)	
3	Program Management, 임베디드 보드 포팅 실습 (Embedded board porting practice)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam), 과제 (Homework)	
4	SIC 가상머신 구조 (SIC Machine Architectures), 커널 컴파일/포팅 실습 (Kernel Compile and Porting)(1)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam), 과제 (Homework)	
5	Assembler 개요 (Assemblers intro), 커널 컴파일/포팅 실습 (Kernel Compile and Porting Practice)(2)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam)	
6	Assembler 기능 (Assemblers functionalities), 임베디드파일시스템 실습 (Embedded file system practice)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam)	
7	Embedded platform 개요 (Introduction to embedded platforms), 임베디드 부트로더 실습 (Embedded bootloader practice)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam)	
8	중간고사 (Midterm Exam)	E	JeongGil Ko	필기시험 (Written Exam)	중간지필평가 (Midterm Exam)	
9	프로젝트 제안발표 (Project proposal), 임베디드 디바이스 드라이버 실습 (Embedded Device Drivers)(1)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam)	
10	Loaders & Linkers 개요 (Intro to loaders and linkers), 임베디드 디바이스 드라이버 실습 (Embedded Device Drivers) (2)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam), 과제 (Homework)	

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
11	Loaders & Linkers 기능 (Loaders&linkers functionalities), 임베디드 디바이스 제어 실습 (Embedded device control practice)	E	JeongGil Ko	강의 (Lecture), 실습 (Practice)	지필시험 (Exam), 과제 (Homework)	
12	System Calls(Process, Libraries), 프로젝트 실습 (Project practice)(1)	E	JeongGil Ko	강의 (Lecture), 실습	지필시험 (Exam), 과제 (Homework)	
13	System Calls(Signal, Socket), 프로젝트 실습 (Project practice)(2)	E	JeongGil Ko	강의 (Lecture), 실습	지필시험 (Exam), 과제 (Homework)	
14	Recent issues in system programming	E	JeongGil Ko	발표 (Presentations)	지필시험 (Exam), 과제 (Homework)	
15	프로젝트 발표 (Final Project Presentation)	E	JeongGil Ko	발표 (Presentations)	발표평가 및 보고서평가 (Presentation and Report)	
16	기말고사 (Final Exam)	E	JeongGil Ko	필기시험 (Written exam)	기말지필평가 (Final Exam)	

## 11. Other items of notification