

Embedded Systems

Week 1: Introduction



Fenerbahçe University

Professor & TAs

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Course Plan

- Embedded Systems
 - Introduction
 - Linux Fundamentals I
 - Linux Fundamentals II
 - Linux Fundamentals III
 - Embedded Linux ToolChain I
 - Embedded Linux ToolChain II
 - PL/PS CoProcessing
 - Interfaces I
 - Project Course
 - Custom Module Interfacing I
 - Custom Module Interfacing II
 - Interfaces II
 - Interfaces III

Course Plan

Linux Fundamentals I

- Linux Architecture
- Ubuntu 18.04, Virtual Box Install
- Fundamental Linux Commands

```
b00m@acer:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        1.9G   0    1.9G   0% /dev
tmpfs           1.9G  37M   1.9G   2% /dev/shm
tmpfs           1.9G  9.0M   1.9G   1% /run
tmpfs           5.0M  4.0K   5.0M   1% /run/lock
tmpfs           1.9G   0    1.9G   0% /sys/fs/cgroup
/dev/sda1       20G   7.3G   12G   40% /
tmpfs           1.9G  36K   1.9G   1% /tmp
tmpfs           1.9G   0    1.9G   0% /var/tmp
/dev/sda2      439G   78G  339G   19% /home
tmpfs          382M  16K   382M   1% /run/user/1000
/dev/sdb2       29G   20G   7.4G   73% /media/b00m/home_fs
/dev/sdb1       7.8G   6.1G   1.7G   79% /media/b00m/root_fs
```

Course Plan

Linux Fundamentals II

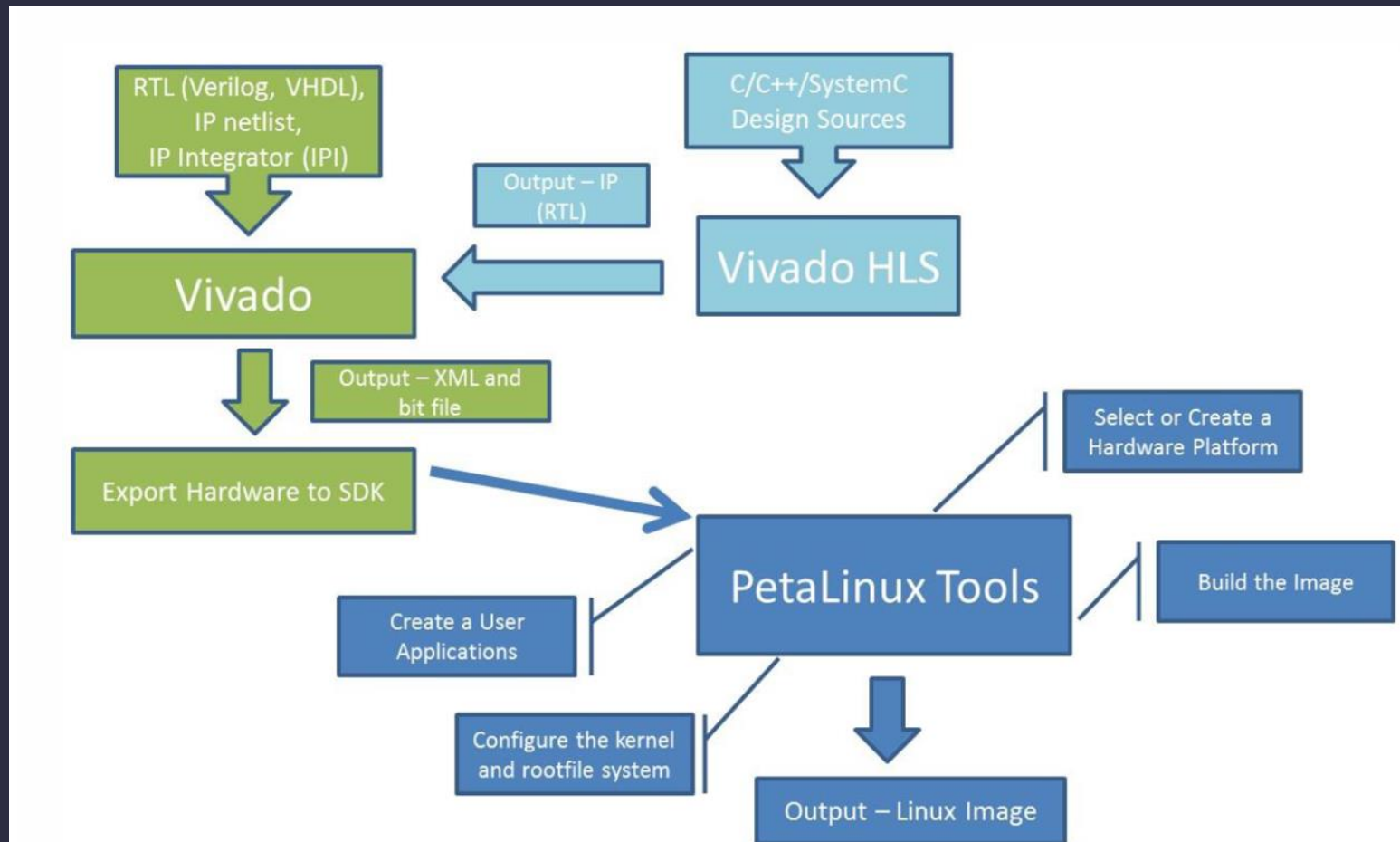
- Bash Scripting

```
#!/bin/bash
# set the STRING variable
STRING="Hello World!"
# print the contents of the variable on screen
echo $STRING
```

Course Plan

Embedded Linux Toolchain I

- System bring-up process
- Tool Chain Introduction



Course Plan

Embedded Linux Toolchain II

- FSBL
- U-Boot
- Device Tree
- Kernel
- File System
- GCC Application Compilation

```
external-xilinx-toolchain
Arrow keys navigate the menu. <Enter> selects submenus --->,
highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes,
<M> modularizes features. Press <Esc><Esc> to exit, <H> for Help, </>
for Search. Legend: [*] built-in [ ] excluded <M> module < >

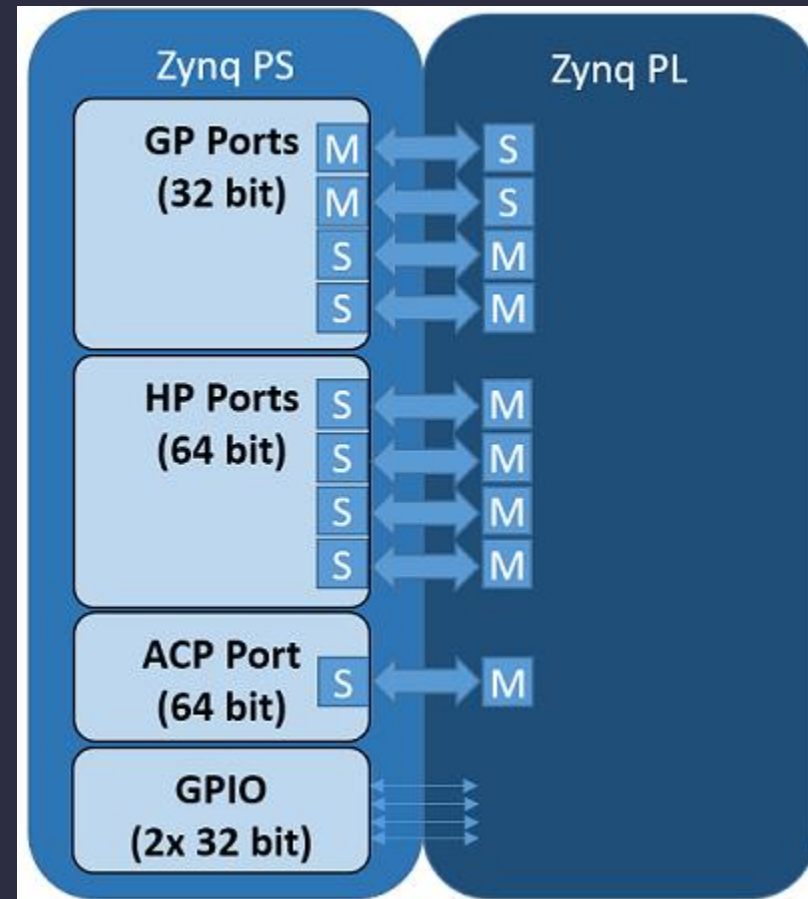
[ ] catchsegv
[ ] eglibc-extra-ss
[ ] eglibc-profile
[ ] eglibc-utils
[*] glib-driver
[ ] lib
[*] libc
[*] libgcc-s1
[ ] libmmap
[ ] libsegfault
[ ] libstdc++
[ ] libthread-db1
[ ] linux-libc-headers
[ ] nscd
[ ] nls

< Select > < Exit > < Help > < Save > < Load >
```

Course Plan

PL/PS Coprocessing

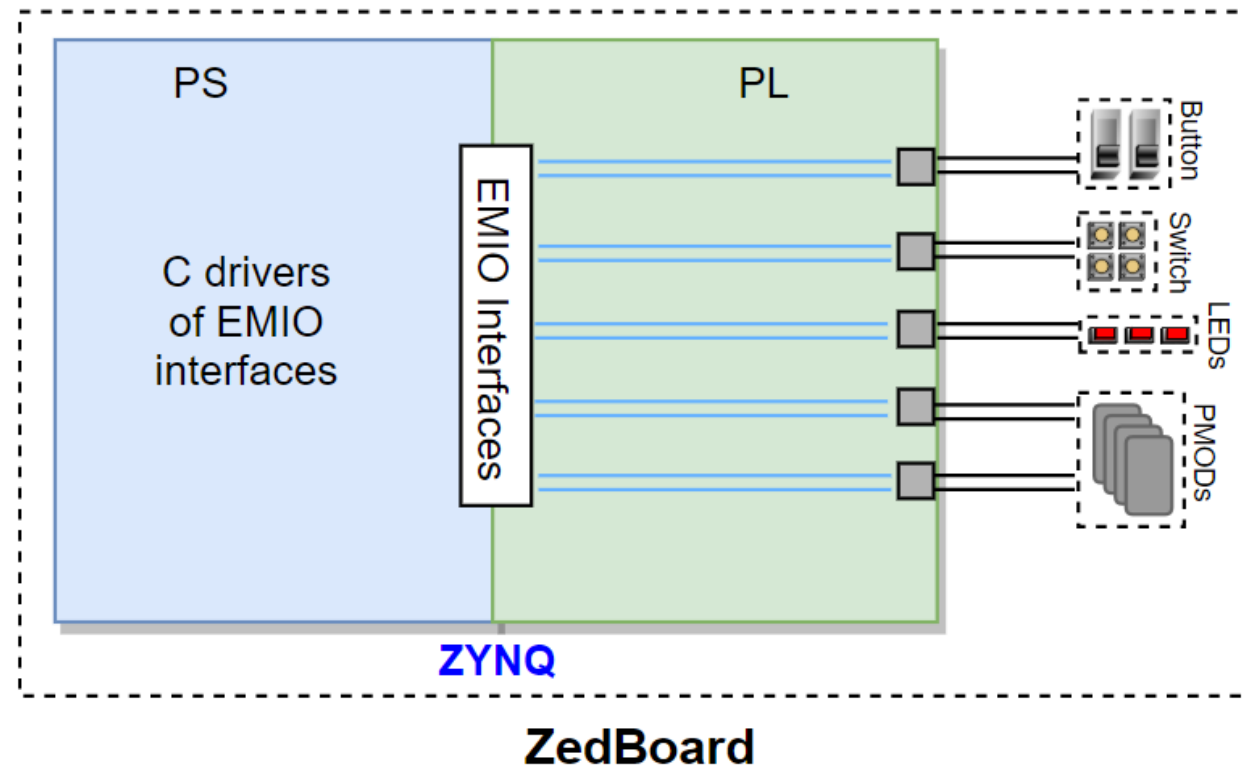
- AXI GPIO
- AXI BRAM



Course Plan

Interfaces I

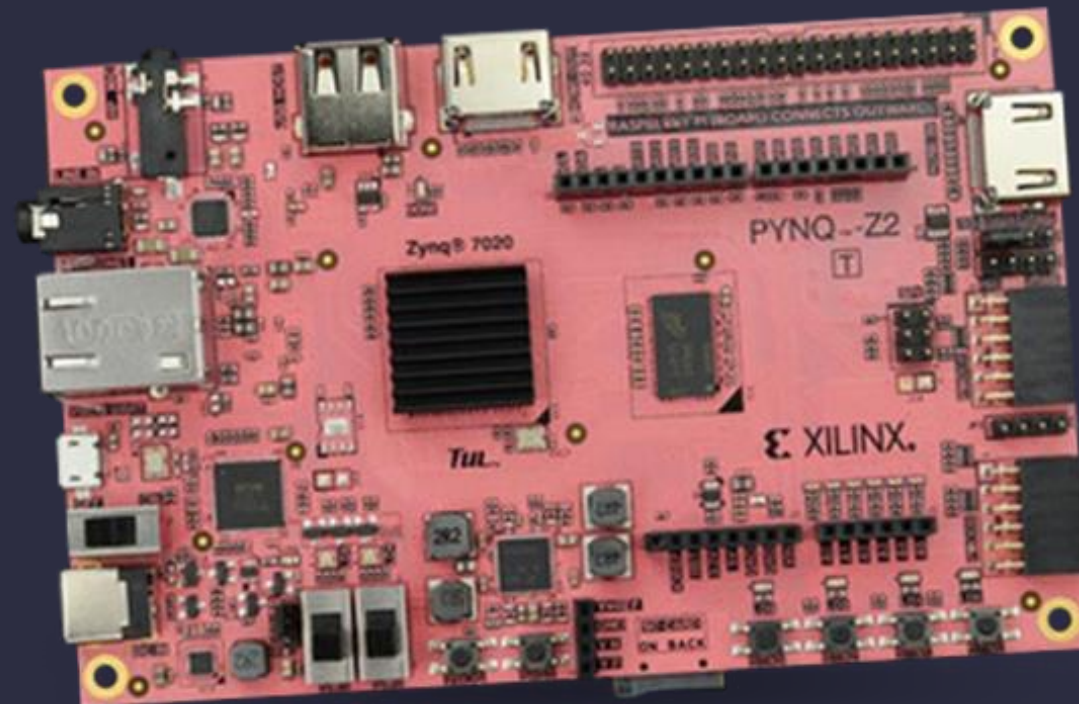
- UART
- AXI UART Lite



Course Plan

Project Course

- Custom AXI Lite Interfaced Module Development
- Xilinx FFT Usage



Course Plan

Custom Module Interfacing I

- Custom module data transfer with AXI GPIO

Course Plan

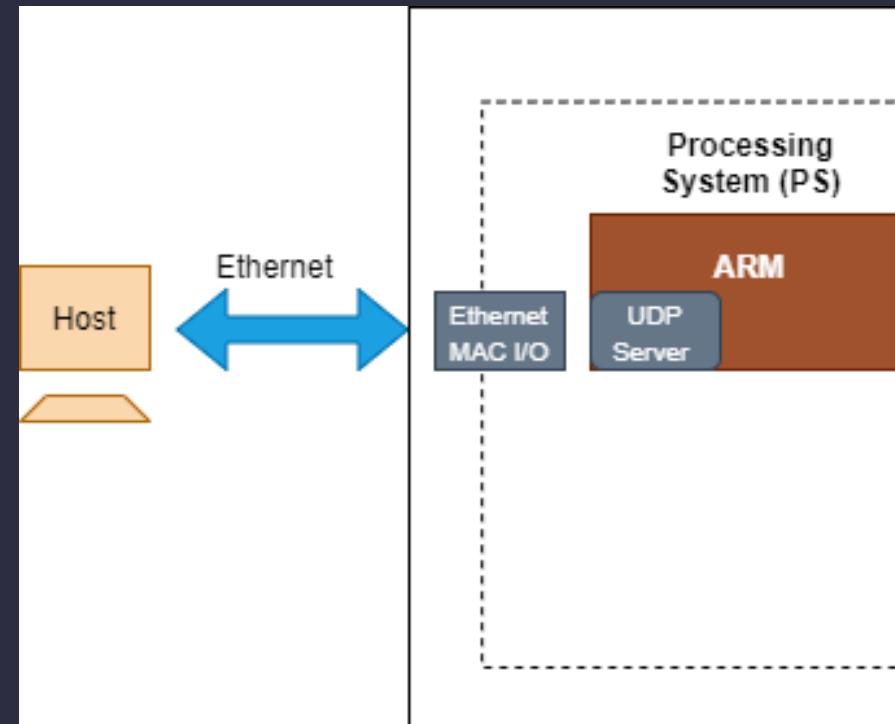
Custom Module Interfacing II

- Custom AXI Lite Module Development

Course Plan

Interfaces II

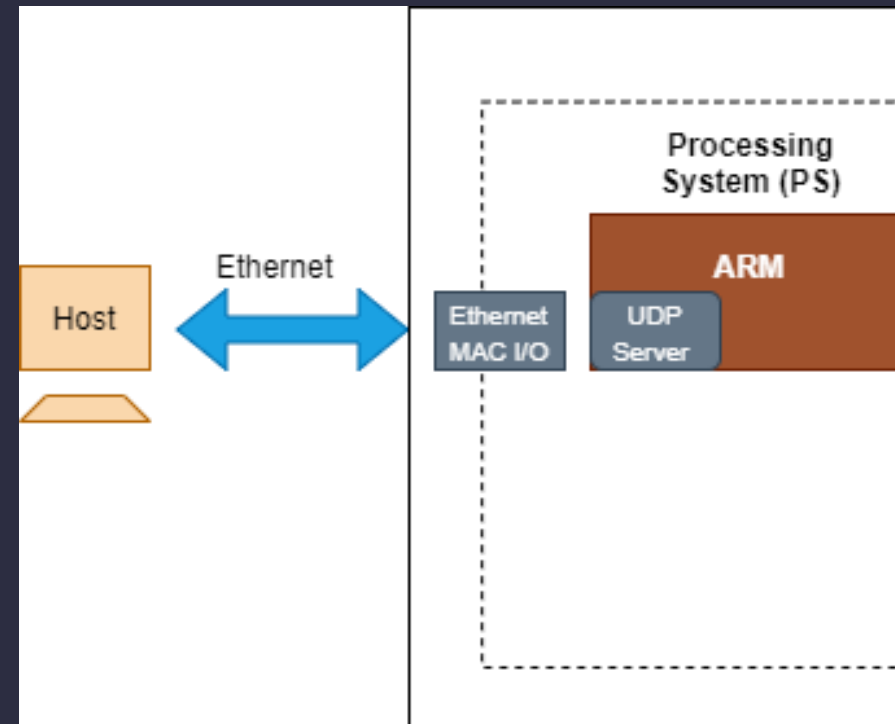
- Ethernet UDP Protocol



Course Plan

Interfaces III

- Ethernet ARP Protocol



Course Contents

Website: levent.tc

Courses> Embedded Systems

Course Contents

Course Page Content;

- Syllabus
- Course Schedule
- Course Notes
- Homeworks
- Projects
- Exams
- LMS and Piazza

Course Contents

Syllabus;

Lesson hours;

Wednesday 9.00-13.00

Office Hours;

Dr. Vecdi Emre Levent - Monday 17.00-18.00

Assistant. Uğur Özbalkan - Tuesday 16.00-17.00, Friday 16.00-17.00

Course Contents

Syllabus;

Between 2-3 homework will be given.

Class attendance is compulsory at a rate of 80%.

Course Contents

Evaluation weights

Delivery time for assignments and quizzes
for every passing hour
5 points will be deducted.

Activities	Percentages
Midterm	%20
Homework / Quiz	%10
Lab	%15
Projets	%30
Final	%25
Bonus	Up to 5 points

Course Contents

Syllabus;

Grades

Point	Weight	Letter Grade
90-100	4.00	AA
85-89	3.50	BA
80-84	3.00	BB
75-79	2.50	CB
65-74	2.00	CC
50-64	1.50	DC
45-49	1.00	DD
0 -44	0	FF

Course Contents

Syllabus;

Expected effort

190 hours in total
effort is expected.

Counnt	Hour	#Times	Total
Preparation	2	14	28
Repetition	2	14	28
Homeworks	4	6	24
Project	48	1	48
Course	4	14	56
Midterm and Finals	3	2	6

Course Contents

Academic honesty



Cheat

Working together

Course Contents

Course schedule

Hafta	Konu
1	Giriş
2	Linux Fundamentals I
3	Linux Fundamentals II
4	Linux Fundamentals III
5	Embedded Linux Toolchain I
6	Embedded Linux Toolchain II
7	PL/PS CoProcessing
8	Vize
9	Interfaces I
10	Project Course
11	Interfaces II
12	Interfaces III
13	Custom Module Interfacing I
14	Custom Module Interfacing II
15	Final ve Proje Sunumları

Course Contents

Homeworks;

The assignments to be given and their solutions will be shared on the homework page.

Course Contents

Projects;

Projects to be completed by each student will be announced at the end of the term.

Course Contents

Exams;

Sample questions and solutions of exams will be shared for midterm and final exams.

Course Contents

Piazza;

The Piazza system is a classroom question and answer platform. Whenever you have a topic about lecture, homework or exams, you can write on this platform. The questions you write are seen by teachers and students. You can also help each other measuredly through this platform.

Course Contents

Grades;

On the Grades page, all the grades you have collected in the course are given.

You can see how many points you have collected from midterm, homework, quiz, lab, final and bonuses by browsing through the pages.