CmpE242
Spring2023

1/

Jan 25th(Wed). 2023
Organizational meeting.
1° Class Syllabus, "Greensheet".

Organizational meeting. Note: 1° In-person Class, M.W. 3:00-4:15pm.; 2° Office Hours, Please make a good use of the O.H. But it will expire by the end of the Semester, By the end of the class. 3°.

San José State University
Computer Engineering Department
CMPE 242 Embedded Hardware Systems, Section 1, S2023 Lab Room/Facility: Rm 268. Access form.

Course and Contact Information

Instructor:	Hua Harry Li, Ph.D.
Office Location:	Engineering Building, Rm 267A
Telephone:	(650) 400-1116 Text Message Only
Email:	hua.li@sjsu.edu
Office Hours:	Mondays and Wednesdays 4:30 – 5:30 pm Zoom link for the Office Hours Join Zoom Meeting https://us04web.zoom.us/j/9841607683?pwd=UlA3aEk1TnV4bjNLQk5CQkw0dDk4UT09 Meeting ID: 984 160 7683 Passcode: 121092
Class Days/Time:	Monday and Wednesday 3:00 – 4:15 pm
Classroom:	Engineering Build Room 325
Prerequisites:	CMPE 180A and 180D, classified standing, or instructor consent

Note: 4°. Nature of the Class

Target platform selection:
- Hardware: NVDA Jetson NANO 2gb/4gb. Broadcom R.pie 3b+, Pie 4.
- Software: 1° Kernel Source Dist. JetPack; 2° Device Development SPI, I2C, PWM, 3° Python, C/C++

Course Format

Technology Intensive, Hybrid, and Online Courses (Required if applicable)

This course requires use of computer/laptop, special microprocessor/ARM hardware for system prototyping, Python and/or C/C++ compiler for software programming. Students must have to participate in classroom activities and after class homework and projects assignment.

Faculty Web Page and MYSJSU Messaging (Optional)

Copies of the course reference materials such as datasheets, project references etc. can be found on line at https://github.com/hualili/CMPE242-Embedded-Systems- and/or SJSU CANVAS. Office hours Zoom link (during the Pandemic): Join Zoom Meeting https://us04web.zoom.us/j/9841607683?pwd=UlA3aEk1TnV4bjNLQk5CQkw0dDk4UT09 Meeting ID: 984 160 7683 Passcode: 121092

5° Github

6°. Homework/projects submission on CANVAS.

Course Description (Required)

Advanced topics dealing with microprocessor and microcontroller hardware and firmware including processor architecture, advanced memory and I/O systems design, multilevel bus architecture, interrupt systems. Design project. Prerequisites: CMPE 180A and 180D, classified standing, or instructor consent.

Course Learning Outcomes (CLO) (Required)

hualili / CMPE242-Embedded-Systems- Publi

Course Learning Objectives (CLO):

CMPE242
Spring2023

2/

Course Description/Nature: Hands-on, Sound Theoretical Background, Coverage of Theory. Note: Sensors. LSM303

3D Printer, CNC machines.

Motors { Stepper motors. NEMA17
3phase BLDC motor.
Automobile window Wipper motor

Robotics.

Required Texts/Readings (Required) Note: Datasheets.

Textbook

1. S3C6410 RISC Processor datasheets, Samsung Electronics https://github.com/hualili/CMPE244/blob/main/2021F-105-%230-cpu-arm11-2018S-29-CPU_S3C6410X.pdf and Development Board schematics https://github.com/hualili/CMPE244/blob/main/2021F-105b-%232018S-29-SCH-Tiny6410SDK-1111-PCB.pdf
2. Nvidia Jetson NANO datasheets.
   (a) Jetson Nano development kit document https://github.com/hualili/CMPE244/blob/main/2021F-108-%231NVIDIA_Jetson_Nano_Developer_Kit_User_Guide.pdf
   (b) Jetson NANO System-on-Module https://github.com/hualili/CMPE244/blob/main/2021F-108b-%23JetsonNano_DataSheet.pdf
   (c) Optional (not used) SoC Park CPU reference https://github.com/hualili/CMPE244/blob/main/2021F-106-tx2-%23Parker_TRM_DP07821001p.pdf
3. Broadcom Raspberry Pie CPU datasheets, BCM2835 CPU https://github.com/hualili/CMPE244/blob/main/2021F-104-%230-cpu-pie-BCM2835-ARM-Peripherals.pdf and https://github.com/hualili/CMPE244/blob/main/2021F-104d-simplifiedCPU-datasheet-%23rpi_DATA_CM_1p0.pdf

Other Readings

1. Professor Li's PPT, handout materials, lecture notes on line https://github.com/hualili/CMPE242-Embedded-Systems-

Ref: on github, Lecture Notes.

2022S-101-notes-cmpe242-3-14.pdf

CmpE242
Spring2023

Grading Information (Required)

Midterm Examination	30%
Homework and Projects	30%
Final Examination	40%

The examination grades are given based on the written answer in
grades are given based on the work submitted, prototype system
programming source code. The detailed rubrics for each homew
assignment is given, check online both CANVAS and https://git
project will be given to students for each submission with multip
learning. Rubrics examples for project 1 submission, for exampl
software implementation counts 40%, report counts 20%, so the

Determination of Grades

Exams: In-Person, In-Class.
Submission To CANVAS.
Need Laptop & Prototype System in the exam.

Alternative1: Broadcom. Raspberry Pie3, 3B+, 4.
Quad ARM.

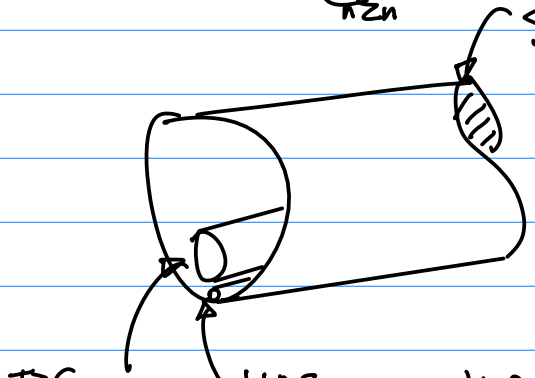
Jan29 (Monday).
1. Homework. 0 pt. Honesty pledge.
Due this Wednesday, ON CANVAS.

Discussion: I/O I/F for An Embedded System:
1° UART (Serial Communication) Tx/Rx/GND
MiniCom/Putty ~1200kbps Slow!
2° SPI. ~100mbps
3° I2C {SDA SCK
4° PWM
5° CAN
6° ADC

"3+1" {MOSI MISO SCK nEn

Ref from the github
2022S-101-notes-cmpe242-3-14.pdf

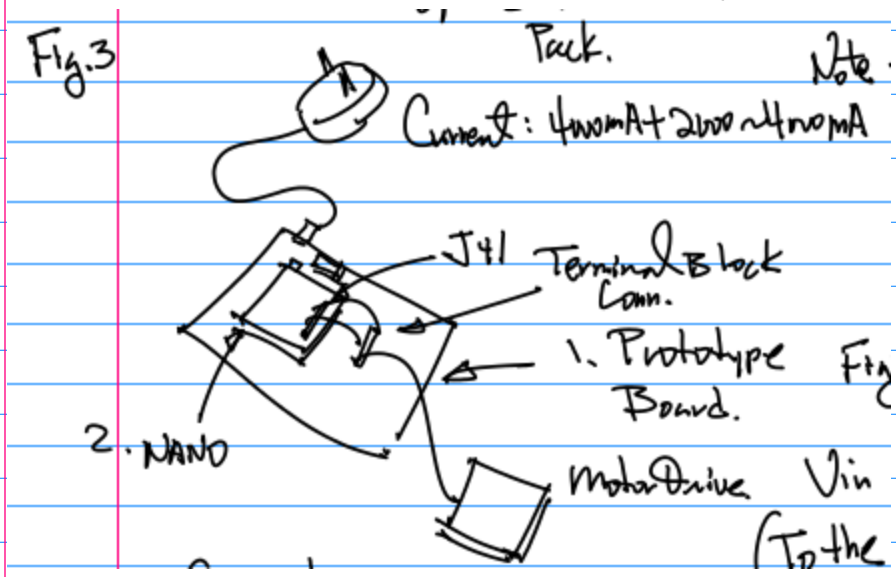
Example: Selection of Target platform.
Build Selection matrix Below.
1° Architectural Aspects.
X86; ARM, MIPS
CISC : RISC MIPS 1982
for Server
2. User Basis, Marketshare.
3. OS kernel Aspect: Linux/Unix.
4. Forward Looking → GPU →
GPGPU (general purpose) →
AI/ML.
for Example: Jetson NANO
Quad CPU: ARM.
GPU (128 GPUs)



NAND, ~$140
4gb.
Check 2gb Towards the end
of Life.

Homework Preparation.

1° Build A prototype Board. Ref. pp.3. Fig.3



Note: 1° prototype Board. Dimension: