Group code: TUE-08 **Student names:** Anuj Gautam, Anuj Yadav, Angad [redacted] Singh, Amol Pagare, Sukhanshu **EDL 2025**

Project title: P-14 dsPIC33A microcontroller based UWSHM **Date:**

Use your notebooks for discussions and rough work. Fill out this sheet after working individually and discussing within your team.

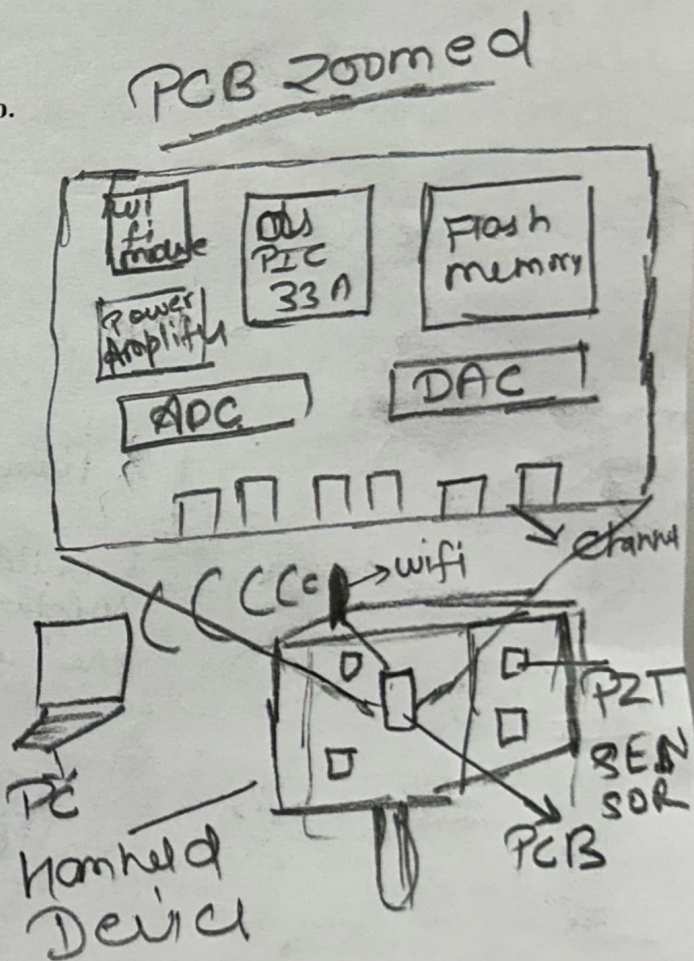
1. **In simple words, describe what you are going to build in your project, what its purpose is, and how it will function.** Be as detailed as possible, covering all the major aspects of your project.
   a. What is the main goal of your project?
   b. What problem does it solve, and how?
   c. Who will use your project, and in what context?

   Draw a pencil sketch of what your project will look like at the end of the course, for final demo.

Ans a) Goal
→ Building a wireless embedded platform for ultrasonic guided wave based inspection of structures.
→ We can inspect aluminium plates, metal pipes, etc.

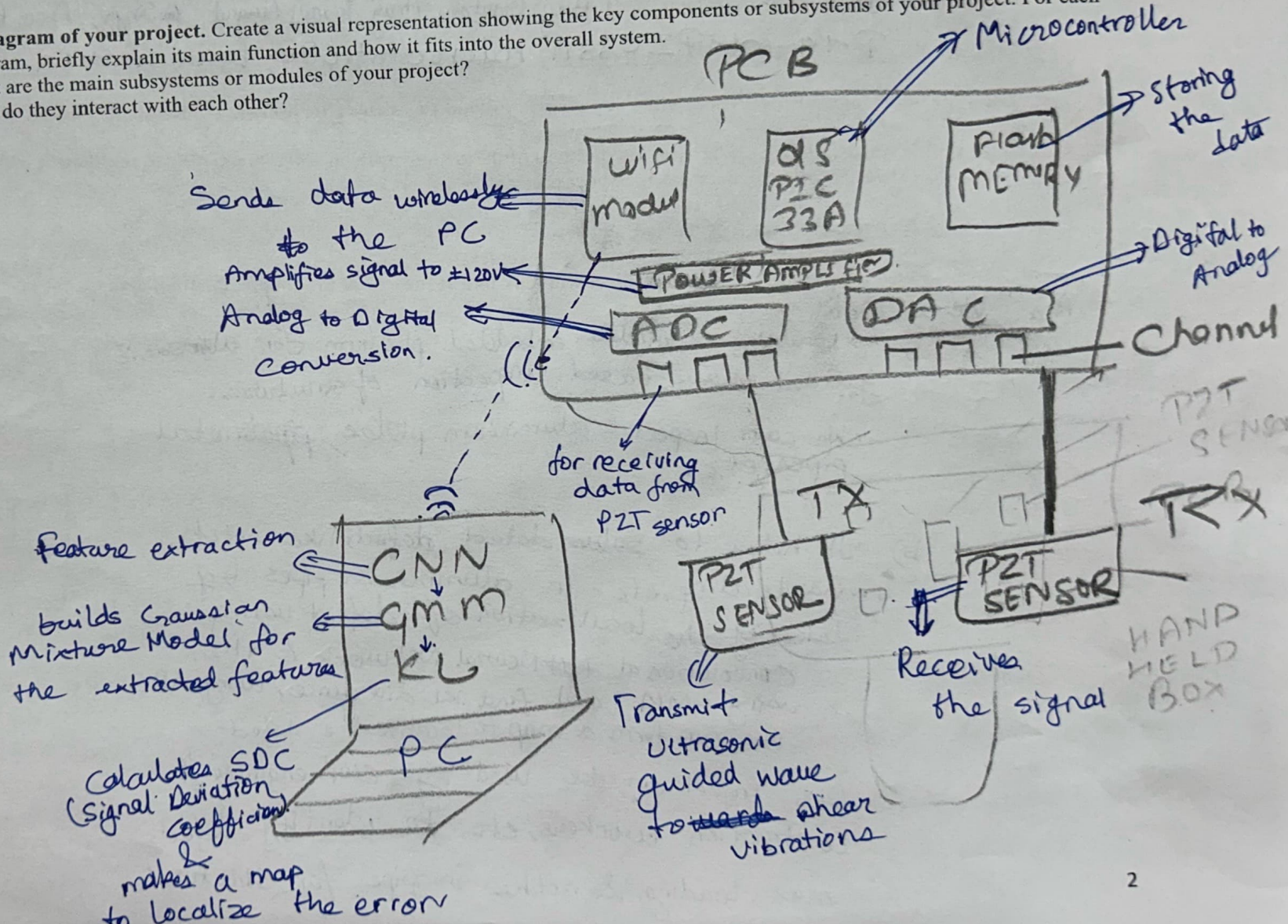
b) It helps to detect defects like notch, mass loading, etc - in aluminium pipes by localization of defect using Convolutional Neural Network. & then using GMM and find KL divergence. Using SDC we can form a map to localize the defect

c) Our Project can be used by civil engineers, construction workers, etc. to identify defects, mass loading & notches in pipe for structural Health Monitoring.



2. **Draw a block diagram of your project.** Create a visual representation showing the key components or subsystems of your project. For each block in the diagram, briefly explain its main function and how it fits into the overall system.
   a. What are the main subsystems or modules of your project?
   b. How do they interact with each other?

Ans



3. **Write down details for these blocks:** What are the key performance metrics for each block (e.g., power, size, speed)? What trade-offs are you considering in your design choices? Are there any constraints or limitations for each block?

Block	Key specifications of this block	Design choices for this block
1) PC [CNN, GMM, KL divergence]	feature extraction from GW signals and mitigating environmental causes	
2. Wifi Modul	boot ROM = 64 kB USER RAM = 80 KB Speed = 10 mbps clock speed = 2.4 GHz	ESP8266 (GPIO PIN 8/14)
3. dsPIC33A microcontroller	Memory size = 128, 64, 32 Pin Count = 28, 36, 48, 64 RAM = 8, 16 ADC rate = 400000 kbps	dsPIC33A
4. ADC and DAC	→ 10 bit Resolution → 10 Msps : Samp rate → Maxim MAX 1426 ADC/DAC	MAX 1426 → ADC MAX 7821 → DAC
5. Opamp INA	→ 230400 : Baud Rate. - Amplify to ±12 V - Resistor adjustable gain INA	INA 128, TL072 Opamp
6. Power Amplifier	Amplify from 12V to 100 V	High Power opamps Ex - ADHV4702-1, LT1055 etc ±110V ±120V
7. PZT Sensor	PZT transducers → material → PZT-5P-5H geometry → 25 x 10 x 1 (mm) density → 7.5 g cm^{-3} charge const d_{31} → -265×10^{-12} C/N charge const d_{33} → 550×10^{-12} C/N Capacitance C → 7500 pF	PZT → lead zirconate titanate ↳ PZT 5P-5H

4. **What are the unknowns or uncertainties in this project?** Identify aspects of your project that you are uncertain about or that require further research. This may include areas where you know what you need to do but are unsure how to approach it.
    a. What technical challenges or questions are you facing?
    b. Are there any assumptions you must make in order to move forward?

a) Ans: ① To be able to store data, we need to share explicit memory block to store the incoming data. ② Check out the peripheral support on the Microcontroller ③ To check the Actuating capabilities of PZTSP-5H on dspic33A microcontroller. ④ There might be an error in the real sight of device and calculated using KVL model, so we need to reduce this error. ⑤ To decide upon the right power Amplifier. ⑥ To decide the suitable Wifi Module to be able handle the reqd. bandwidth.

b) Ans: No such Assumptions aved. Assumed.

Other things to consider from now until Milestone 1 deadline:

5. **Roles and Responsibilities: How will the work be divided among team members?** Assign specific tasks and responsibilities to each team member. Be clear about who is responsible for each part of the project.
    a. Who will work on which blocks or subsystems?
    b. What are the deadlines for each task?
    c. How will the team communicate and coordinate to ensure everyone is on track?

6. **Next Steps: What is your plan for the next phase of the project?** Outline what needs to be done in the short-term to move forward.
    a. What are the immediate next tasks or priorities?
    b. Are there any dependencies between tasks? How will you handle these interdependencies?
    c. What resources or materials do you need to proceed?

7. **Feedback and Collaboration: How will you gather feedback and collaborate during the project?** Describe how your team plans to share progress, give and receive feedback, and collaborate throughout the course of the project.
    a. How often will you check in with your team members?
    b. Will you conduct regular brainstorming or review sessions?