

DE2 Electronics 2

Signals, Systems and Control

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Organization and Schedule (may change)

SCHEDULE (SPRING TERM 2026)

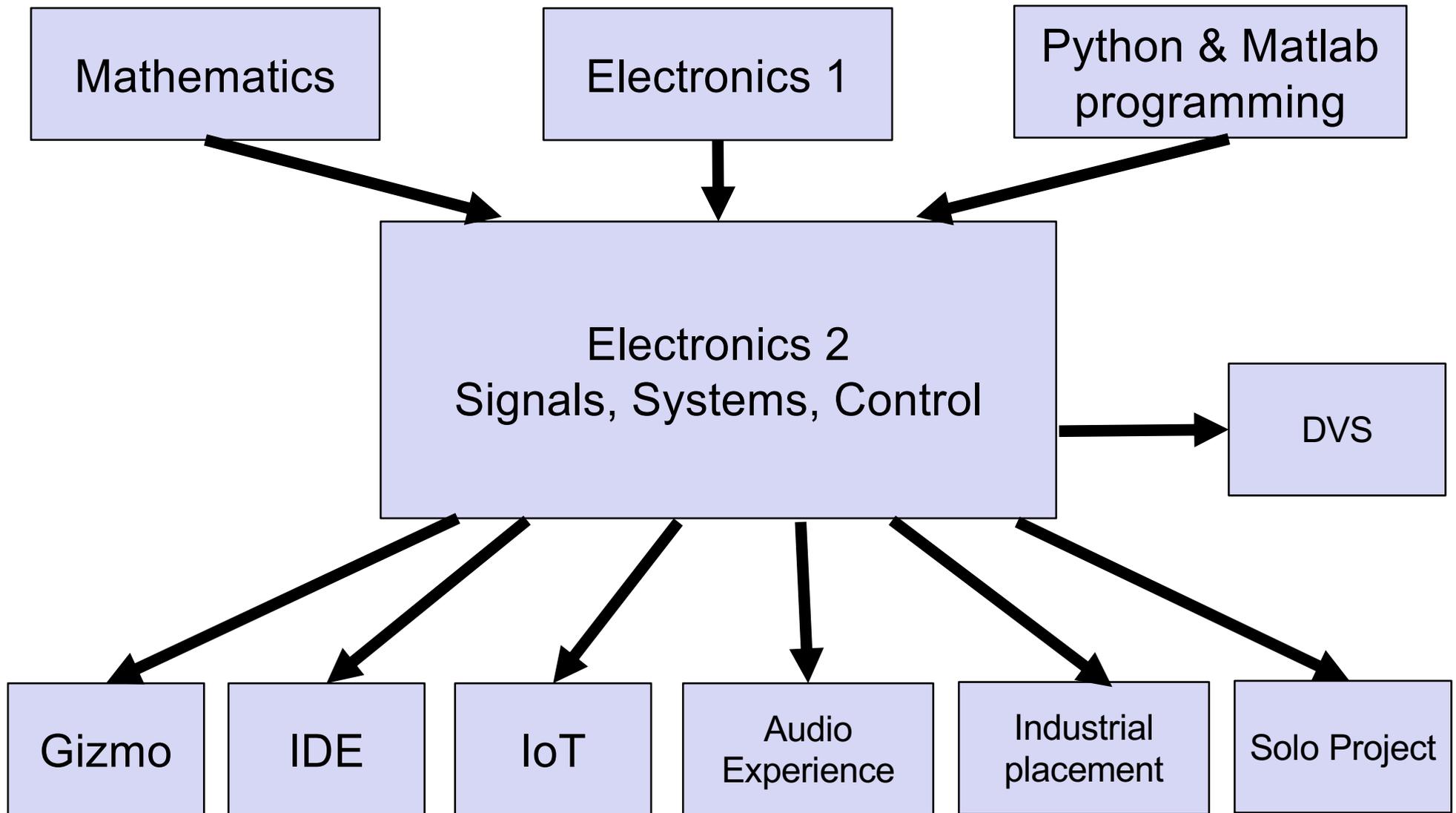
Week (starting)	Lectures	Lab	Comments
0 (5 Jan)	-	-	Exam week
1 (12 Jan)	1, 2, 3, 4	Lab 1 – Sig Proc & Matlab	
2 (19 Jan)	5, 6	Lab 2 – Sig Proc & Pybench	
3 (26 Jan)	7, 8	Lab 3 – Systems	
4 (2 Feb)	9, 10	Lab 4 – IMU & OLED	
5 (9 Feb)	-	LAB Oral	DRAW week
6 (16 Feb)	11, 12	Lab 5 – real-time systems	
7 (23 Feb)	13, 14	Lab 6 – Motor Control	
8 (2 Mar)	15, 16	Lab 7 – Challenges	
9 (9 Mar)	17	Lab 8 – Challenges	
10 (16 Mar)	-	FINAL LAB Oral	Final week

- ◆ Textbooks (not compulsory)
 - BP Lathi, Linear Systems and Signals (International ed, ????)
 - Schaum's Outline of Feedback and Control Systems (~£29 Amazon)
- ◆ DRAW week Lab Oral (20%), Final week Lab Oral (20%)
- ◆ Examination on first week of Summer Term, 1.5 hour paper (60%)

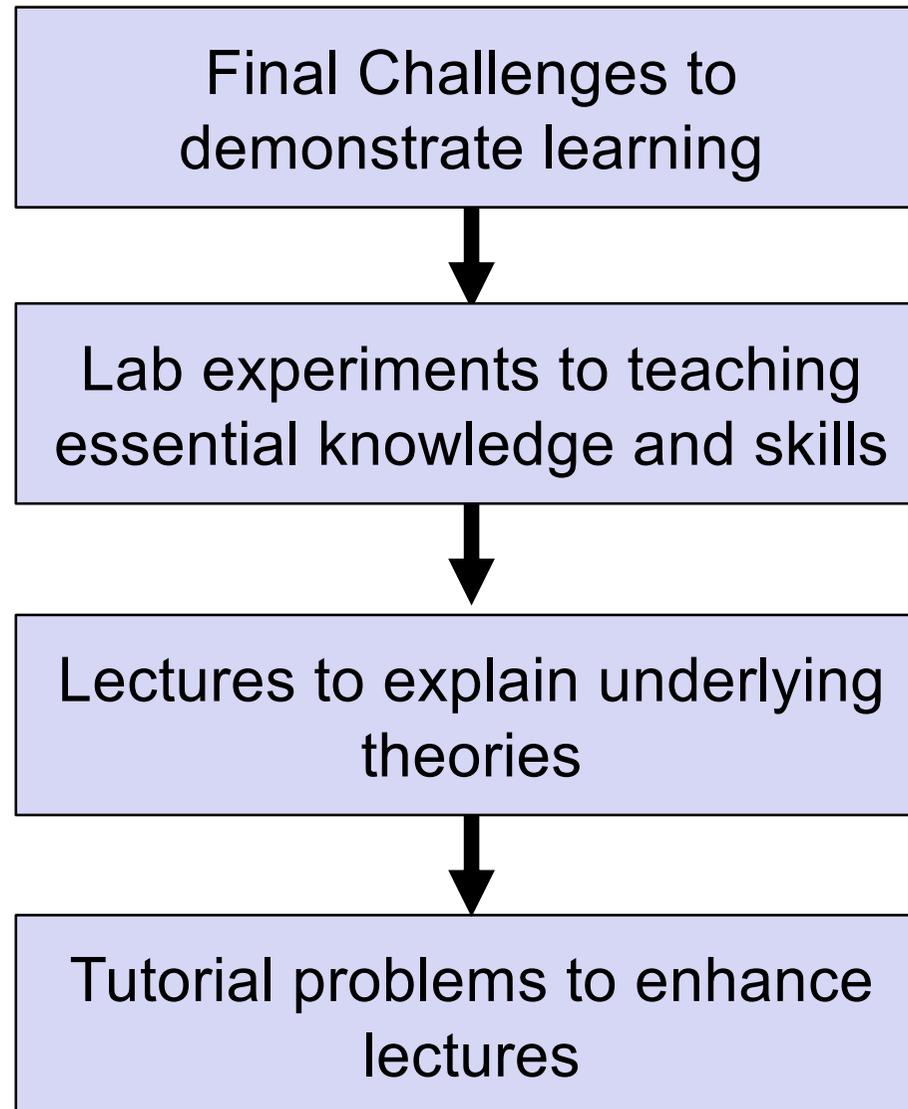
Why is this module important to Design Engineering?

Physics and Maths	
Model of physical world	
Analysis	Synthesis
Understand and Predict	Design
Creation of new product or system	

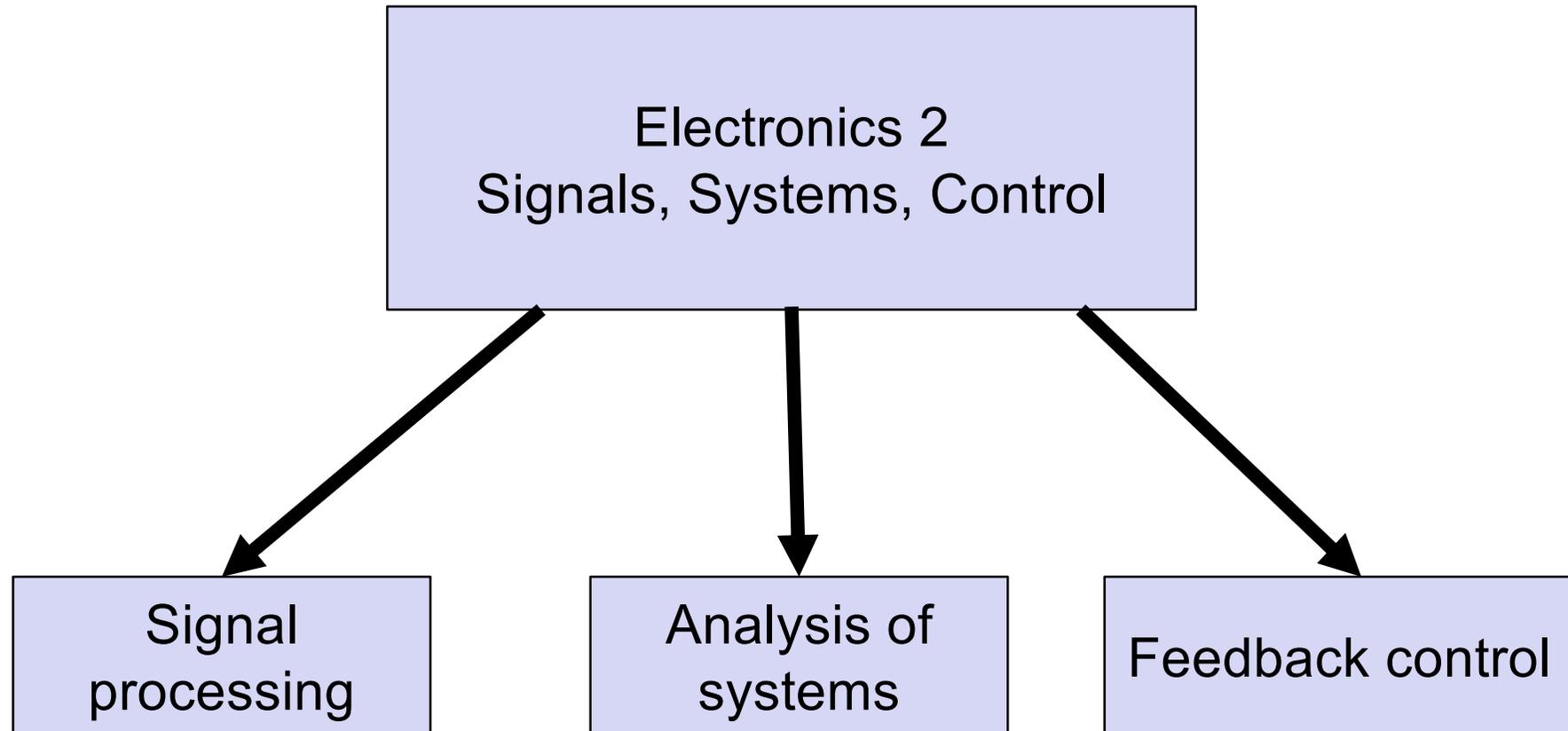
Context of Electronics 2



Course Design - Back-to-front

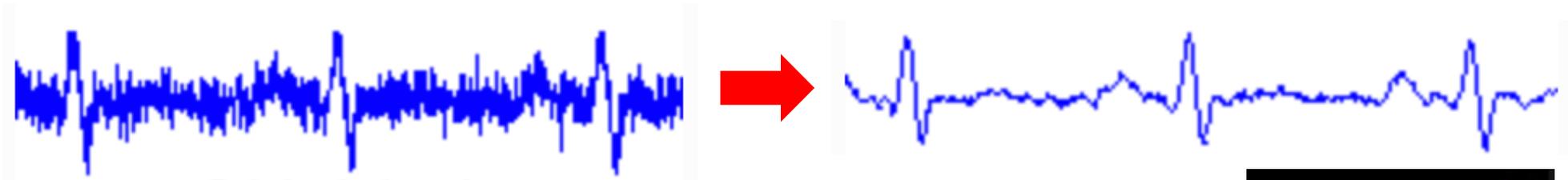


Three topics of Electronics 2



Why is signal processing important?

1. To reduce noise in an electrical signals – e.g. clean up ECG signal



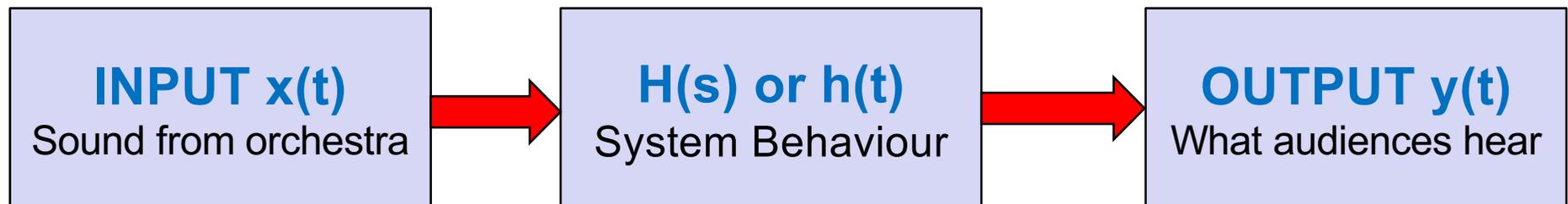
2. To make correction or desired changes to the signal – e.g. blur surrounding while keep part of the camera photo in focus



3. Derive useful information from the signal – e.g. derive health condition of an individual on a phone

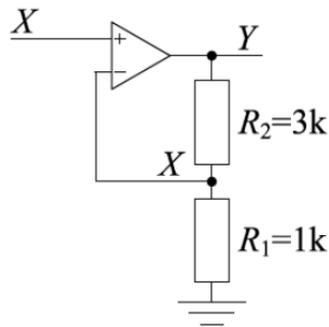
Why is system analysis important?

- ◆ Allow **analysis** and **prediction** of a situation.



Why is feedback control important?

- ◆ Automatic correction of behaviour – e.g. robotic arm under load
- ◆ Achieve desired performance – e.g. keep Segway upright



- ◆ ... and achieve the impossible – e.g. fly this fighter jet which is impossible for a human to fly



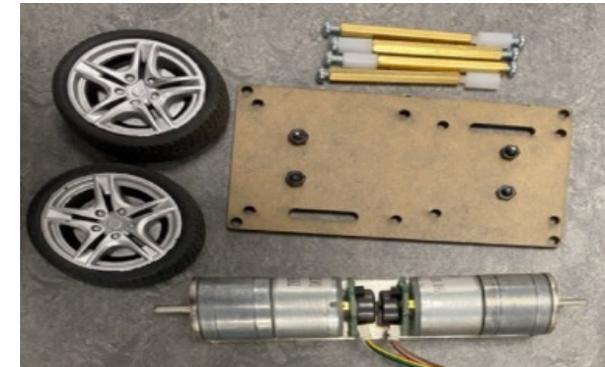
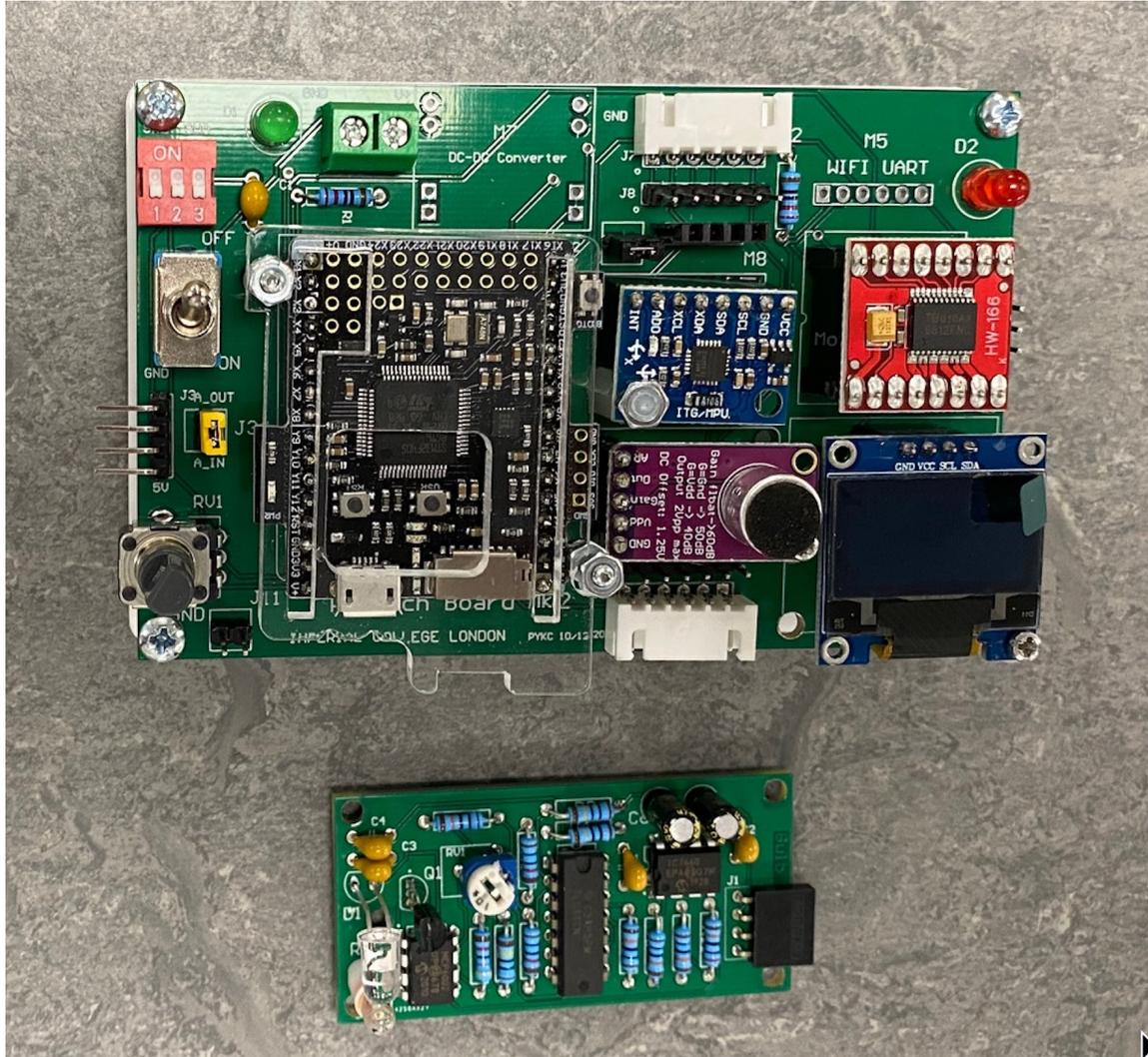
You will acquire these KNOWLEDGE

- ◆ Handling of **discrete time, quantised signals**
- ◆ Application of **Fourier transform** (time vs frequency domain)
- ◆ Application of **Laplace transform**
- ◆ Characterisation of **dynamic systems**
- ◆ Difference between **steady state** and **transient response** of a system
- ◆ Idea of **convolution**
- ◆ Basic digital **filtering** (and simple z-transform)
- ◆ Use of a simple feedback control method called **PID control**

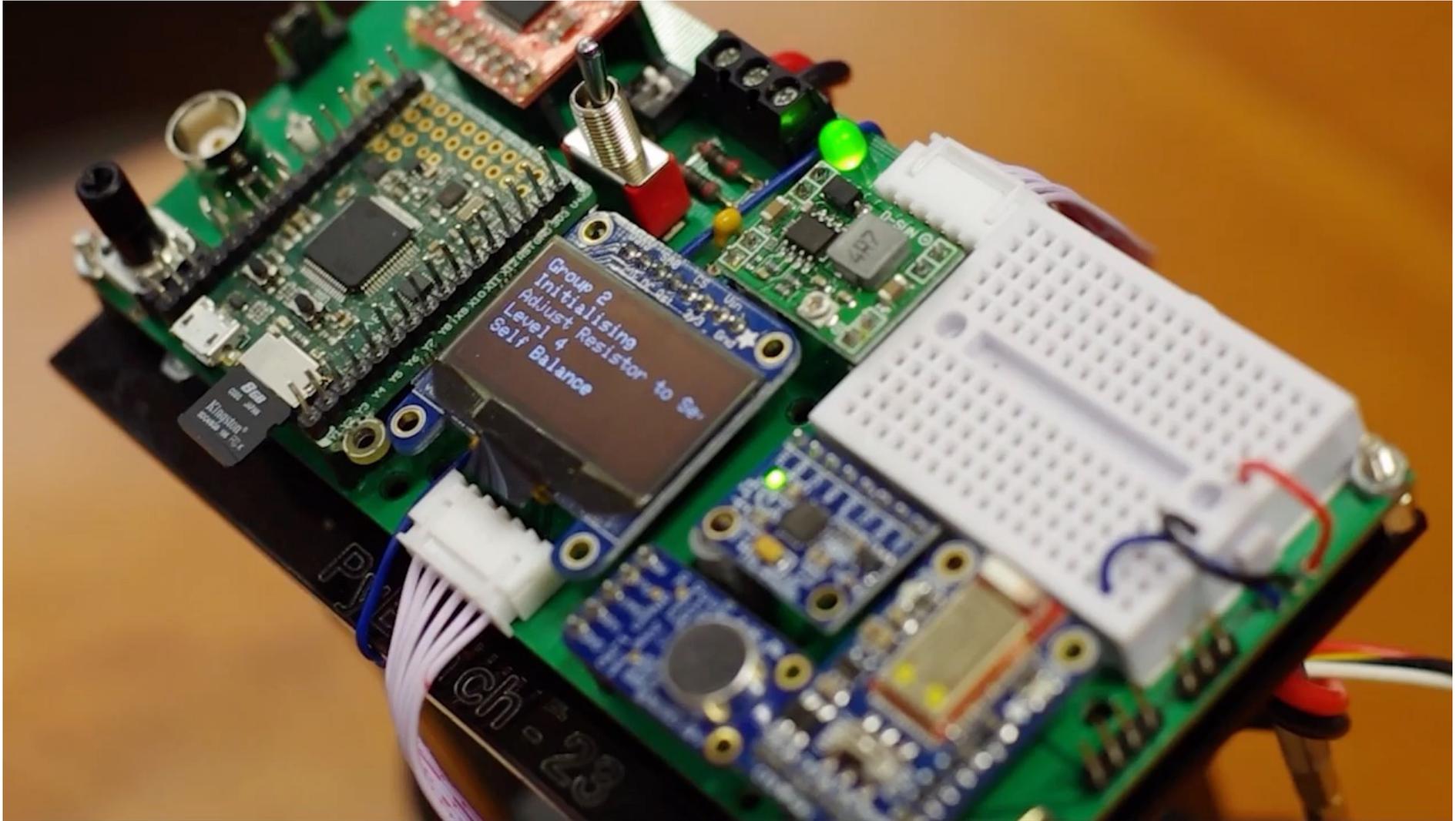
You will acquire these SKILLS

- ◆ Enhance your Python skills – particularly in Classes and object-oriented programming
- ◆ Learn embedded and real-time programming of a microcontroller
- ◆ Enhance your Matlab skills used for signal processing and GUI
- ◆ Apply mathematics to model and analyse physical systems

Lab-in-a-Box Kit



What your senior did before you



What next?

- ◆ Return Electronics 1 Kit if not already done so.
- ◆ Find yourself a lab partner.
- ◆ Complete survey form by noon 17 Jan 2025:
<https://forms.office.com/e/fRDHAm1vy8>
- ◆ Lab-in-a-Box will be issued to you on Friday 17 Jan., during the afternoon Session.