

# **Experience of adapting learning for practical electrical engineering laboratory experiments under remote teaching circumstances**

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# The Challenge



- COVID19 impacted all HE institutes severely
- Teaching needed to be changed dramatically with a great deal of uncertainty
- Pre-COVID19 teaching for labs was 100% face to face, practical sessions in a specifically equipped labs space
- Large year group was recruited (240 students compared to ~120 students in previous years)
- Location of students. This changes on daily. Difficult to keep a record of this. How to plan hybrid teaching when students change countries.

# Traditional Delivery



- Previously lab activities were only face to face
- Some preparation work was encouraged but not activity demanded
- Outside of planned face-to-face hours students had the ability to come into the lab and work on their experiments in some free sessions
- Little or no remote experimental work was encouraged
- Time for lab activities was 3hrs sessions once a week
- No recorded video teaching or live video used at all
- Paper lab books were a requirement

- When we were allowed students in the lab, we implemented the following:
  - Smaller groups in shorter sessions
  - Record taking of attendance was very important for tracking
  - Encourage but didn't make mandatory the NHS tracking app
  - Masks on for sessions for all
  - Spaced out >2m
  - Clean up between sessions while all kit, desks, computers were wiped down
  - When some students did show symptoms or get track&tracked. Decided to ask those particular lab groups to work remotely for that week to allow a 2 week gap between face-to-face interactions.
  - Very challenging to manage

# Planning for Adapting



- Early on in planning we chose NI MyDAQ solution as the way forward
  - Reasons for this are 1) Used this previously on smaller scale 2) The ability to both simulate and experimentally run session 3) Size, Cost, etc.
  - This cost was justified to the College via our plans for teaching delivery. Labs is a key practical skill the 1st year learn, and it was seen as a priority to allow students to experience this
- Purchased large quantity of myDAQs + components to create "toolkits" for students.
- Adapt all lab content to be **hybrid** 2 parallel streams 1) Simulation using Multisim 2) Experimentation using myDAQ
  - Needed the same learning outcomes, same flow of constructing "experiment" and data acquisition, plotting of graphs etc.
  - Some content could not run using the myDAQ. These sessions were adapted to suitable experiments based on the limits of the hardware and simulation
- **Hybrid = Online/Face-to-face & Experimental/Simulation based**
- Recruit PGTAs and train on new form of hybrid teaching using combination of live videos, pre-recording content and forums as well as traditional face-to-face sessions

# Planning for Adapting



**UCL**

IMAGE OF MULTISIM AND  
MYDAQ SHOWING THEM  
DOING SAME ACTIVITY



- 240 students we ran
  - 4 sessions Thurs 10am-1pm virtually
  - 4 face to face sessions Thurs PM & Fri PM
- Content was provided as videos/PPTs/Forums/live sessions
- Generated experimental PPT instructions and Simulation PPT instructions. These were covering the same content but with or without the MyDAQ equipment
- Students started with the simulation content and once they received their lab kits then transferred to doing the practical content
- Team of 10 PGAs, 2 academics, 1 teaching fellow, 2 technicians to runs the course
- Assessment
  - Moodle quizzes – Weekly – Pre-lab (Formative) & Post-lab (Summative)
  - Graphs – 4 over the term – Summative
  - Blackbox test – Reverse engineering hidden circuits - Simulation based - Summative
  - Lab notes – End of term – Electronic documents for first time – Summative
  - Previously assessed student's capabilities of operative test & measurement equipment in person but this was impossible in the remote teaching circumstances so removed from the course this year

# Lessons learned along the way



- **Logistics**
  - Ask suppliers to create toolkits and reduce logistical overhead on technicians. Possibly also look to create an account with NI and have students order their myDAQ directly to their houses. Companies are good at shipping and logistics, but Universities aren't!
- **Remote technical support is hard!**
  - Teaching content required installing software and using hardware. Some students had issues with drivers, the OS being incompatible, hardware not working etc. This was impossible to manage remotely and provide IT support on non-UCL accredited PCs. Manage to provide remote access for some students to run software on UCL machines rather than their own. But this was a big challenge that doesn't have an easy solution.
- **MyDAQ**
  - Wasn't a perfect replacement for a whole set of bench top equipment. Very challenge to provide over shoulder support remotely to students. Simple such as correctly wiring the device are challenge to debug remotely. Possibly run dedicated troubleshooting sessions for students who have issues and ask them to show their circuits on their webcam.
- **Zoom**
  - Used 4 parallel Zoom calls 1hr each over a period of 4 hrs to ensure small group sizes.
  - Lecturer moved between these to give briefings on content and answer questions.
  - BUT better means of operating was to have a single call. Give a common briefing at the start and then use breakout rooms to have improved interactions between students.
  - Level of interaction from students was lower than hoped for at times. It was necessary to actively ask students questions by name to try and promote comment.
- **Hybrid of practical & simulation**
  - This was a good choice. Simulation only would have removed too much of the learning objectives linked to practical labs. Exposure to building circuits via live demos, videos and labs notes at least showed the students how this could work. Once they received their equipment they could then go back and re-do session they completed as simulation only.

# Conclusion & Discussion

- We did a lot of try and give the students the best experience we could under the circumstances
- Hybrid teaching for both online/f2f & experimental/simulation based required a lot of adaptations to content and redesign of delivery. But we believe this effort has improved the course, and we will continue to use this adapted content for the next academic year
- MyDAQ was a very useful tool. Not perfect but allowed for students to quickly move from simulation of circuits to practically building them due to the close relationship between how you complete both methods.
- Assessment of practical skills via remote circumstances is very challenging. Moodle quizzes do help but aren't ideal to assessing capabilities.

Thanks for listening  
Any Questions?