I started teaching online in 2014. I've taught MATH 1107 Linear Algebra I a dozen times and the grad course MATH 5801 linear optimization twice. Both courses were delivered asynchronously but tutorials were either face-to-face or online in real-time. Linear Algebra I had between 70 to 130 students per term while the grad course had no more than 10 students per term.

When it comes to online teaching, my approach is actually quite conservative because of Murphy's Law: Anything that can go wrong will go wrong. So I try to stick with things that work well.

My main tools consist of the following: a 2013 Mac Pro, a Wacom pen tablet, a Shure vocal mic, my own presentation app, final cut pro for video editing, and occasionally I use Apple Motion for special effects and GIMP for photo-editing.

Now, some survival tips for those who are new to online teaching.

For hardware: you'll need a sufficiently powerful desktop or laptop computer, a reliable high-speed internet connection, a decent microphone, with or without a camera. Laptops sometimes have low-quality microphones. Check out yours to see if the quality is good. Bad audio can be a big turn off.

Things that are nice to have are a tablet computing device, a specialty camera, and a scanner.

For software, you'll probably need to use some sort of learning management system like cuLearn unless you have a very small class, a video-conferencing system like Big Blue Button or Zoom, and a video hosting platform unless you don't plan to record any video.

It’s nice to have a video editor, a document format converter, and an automatic audio transcriber for close captioning.

Assuming a 6-week course, I suggest building the first and fourth weeks first. This gives you some breathing room in the middle if you have to build the course as you go. Have frequent low-stake assessments with a couple of mid-stake ones. High-stake assessments should be avoided because the temptation to cheat on these is high.

If you plan to do synchronous online teaching all you need is an app that streams your power-point or write-and-talk lecture as you normally do in a physical classroom. For the latter, you’ll need a decent webcam or document camera.

The main advantages are that you don’t really have to adapt your teaching much and you can also get real-time feedback from your students.

The disadvantages are: it only works for small classes and you have no idea when network disruptions will happen, even when everyone has a fast internet connection. Also, facilitating in-class discussions or group work can be challenging. Finally, 3-hour online lectures can be physically and mentally draining for everyone.

For asynchronous teaching, you’ll need to prepare good notes and provide supplementary videos divided into modules, either by week or by topic.

The advantages are that you’re somewhat free from the occasional network disruptions. Students can work according to their own schedules. And large classes can be accommodated.

The disadvantages are: it can be hard to gauge and maintain student engagement, the course need to be well planned ahead of time, changes

midway through the course can be hard to make, and creating videos can be quite time-consuming.

You don't have to create a video for everything in the course if you provide good notes and learning activities. Supplementing with open education resources is definitely an option. Keep videos short because encoding and uploading large videos can take a long time. I found it helpful to create separate videos for examples. Also, don't forget to close-caption your videos because of accessibility requirements.

For me, the main challenges of online teaching are: engaging students, enforcing deadlines, dealing with technical glitches, anticipating students' difficulties, and mitigating cheating.

To improve student engagement, bite-sized activities and gamification can help. As far as deadlines are concerned, I grant no exceptions but I build enough flexibility into the evaluation scheme so that missing a piece of work or two does not affect the final grade much, if at all. To cope with technical glitches, I use only well-tested tools. To anticipate students' difficulties, I look at past teaching experience and data. To mitigate cheating, I give personalized assessments and ask students to make an honour pledge.

Finally, my favourites are the quiz tool and the discussion forum in culearn, Big Blue Button for office hours, and YouTube's auto closed captioning feature.

And now, I am happy to address questions and perhaps do some demos.