**CHE 100**

*What an interesting course. This was the first Chemical Engineering related course I took. In terms of course content I already forgot most of the concepts but I will always remember process flow and equilibrium. CHE 100 does not require heavy mathematical skills nor extensive knowledge of chemical knowledge. Instead it requires understanding mass balance, mol balance, and controlling inputs and outputs.*

*In terms of teaching, the department decided to take a unique approach. Instead of one professor they had 2 professor (Professor Boxin Zhao and Professor Michael Tam). Prof Tam taught the first half of the course while Prof Zhao taught the tutorials. After the midterm, they switched. There were weekly tutorials and they were mandatory. In the first half of the tutorial, the Prof held a quick review session on the concepts taught in class and in the second half was the weekly quiz. In my personal opinion, the quizzes were a good reflection on the material taught in class and forced you to study in order to do well in them.*

*This course also had a lab component that was held by a different professor (Professor Jeff Gostik). This was one of the worst labs I have ever taken. The labs were a mess and were very random. We started off learning how to use excel and write lab reports. It was in this course that I learned the importance of word automation, citation management, and figure/diagram creation. Although this was useful, it had little to no connection to Chemical Engineering which was very surprising for a first year chemical engineering core course. He then had us learn how to use AutoCad PID (A software for creating Piping instrumentation diagram. The task was to replicate the piping diagram for the liquid nitrogen tank system outside of E6) He wanted a PID diagram which none of us knew what they were and how to even create one. The funny thing is that Jeff Gostik doesn’t even know how to use the program, yet he expects first years to learn how to use the software and connect the pipes with the correct valves and other equipment in 1 week time. I know many students ditched the AutoCad software and just used Microsoft Paint to create them. We then moved onto learning very basic python which he struggled teaching as well. This lab was so disorganized and so random that I barely learned anything from it. I have heard from some first years currently that there is a new curriculum and it has improved a lot. I am hoping it is better for the future students.*

**CHE 102**

*CHE 102 was an extension of high school chemistry. It was built upon grade 12 fundamentals with some new concepts thrown here and there. There were a lot of students who had a strong chemistry background from high school who thought that this course was a breeze.*

*Personally, I thought that this course was easy if you did practice problems. There were only 5-6 different types of problems and as long as you figured out the pattern, all you needed to do was plug and chug numbers.*

*For the course structure, there were no labs, weekly online assignments, weekly tutorial assignments, 1 midterm and 1 final. For the weekly online assignments, there was usually 10 questions and you had 3 chances to submit your answer. These questions will be the same as your peers but with just different numbers. I would advise that you work together as some of the questions are tricky and wordy. For the weekly tutorial assignments, all you needed to do was show up and answer 2-3 questions. You were given the entire 3 hours and you could collaborate and ask the TA for help. These are very beneficial and I would highly recommend that you go to them They are easy marks and they help you identify what areas you are struggling with and get the help that you need.*

*The midterm and the final were decent. I didn’t do too well on the midterm because it was the last exam The format changes pretty much every year but I would recommend that you study past finals as the types of questions don’t really change from year to year.*

**MATH 115**

*Linear Algebra was a very hard course for me. The main reason why I thought this course was so difficult was because I did not have a strong background with vectors and matrixes. Although looking back it is an easy concept to grasp, in first year I could not wrap my mind around these 2 concepts until the very end of the course.*

*Luckily, most of you guys would have seen matrixes and vectors in your high school so you would been introduced to these concepts that don’t look familiar to most students. This is a strand of math that is very important in engineering especially those who are in electrical, mechanical, and tron. This course sets you up for all the future math and physics courses so please pay attention in class and try to retain this information.*

*In terms of course structure there were weekly tutorial quizzes that you had to attend, 1 midterm, and 1 final. The weekly tutorial quizzes are usually a set of questions and you have 50 minutes to finish them. I personally didn’t do to well in them because I didn’t do a lot of practice problems. My advice that I would give you would be to review the course notes 1-2 days before the quiz and do a couple of practice problems. You will do infinitely better on the quizzes as the main reason for my poor performance was a lack of practice.*

*The midterm and final were fair and not hard by any means. A beneficial tip that I would give would be to focus more on problem solving. One of my biggest mistakes in undergrad was focusing too much on theory and small details. Because of this, I often found myself running out of time to attempt practice problems, mock exams, quizzes., etc. This is just general advice but keep in mind that everyone learns differently and has their own methods of studying. It is key to really understand how you study best and to set yourself up for success.*

**MATH 116**

*This was one of the best courses I took in 1A. We had Prof Jordan Hamilton and I can say that is he one of the best professors I had in undergraduate. His teaching is well known across Engineering and Math faculty and he has a good sense of humor.*

*In this course you will start with the basics of calculus as they want to ensure that everyone is on the same playing field. Then they will move into integrals which is a concept that* ***should be taught in high school.*** *For my class, about ¾ of the students learned how to work with basic integrals and was introduced to the concept early on. I had no background with working with integrals, so I had to learn it by myself as they skimmed through the introduction and went straight to problem solving. I would recommend that you at least know and understand what integrals are or brush up on your knowledge of them before taking this course. It will help you tremendously and you can breeze past this course and focus on the others.*

**PHYS 115**

Let me start off with saying that we had the best professor to teach PHYS 115. Prof Rohan is a legend but unfortunately, he is retired. You will hear many stories about his excellent teaching, his humor, and his willingness to help from the Engineering and Physics faculty. He is from the Physics faculty and I would say he is genuinely here to help the students. Because we did so poorly on the midterm, he hosted weekly Saturday session for extra help for those who were struggling. These were honestly a lifesaver as he went through the problems one by one and carefully explained every step he took.

Now there are two major physics courses engineers take, ECE 105 or PHYS 115. ECE 105 is the harder version of physics taken by ECE and SE students. For the other engineering programs like Chem, Mech, Tron, they will take PHYS 115. This course was hard for a lot of students. It takes your high school grade 12 physics and amplifies it a lot. You need to have strong computational skills and be able to draw diagrams and understand questions effectively.

The midterm was interesting. It was 10 questions that were multiple choice. The first 5 questions were basic theory and tested if you understood the concepts. The other 5 questions were heavier in computation and required a lot more work. As a result, the first 5 were weighed lighter than the second half of the midterm. The interesting thing about this midterm was that after we did the midterm, we redid it but in groups of 4. The same questions but instead you would solve them in a group of 4. The weighting scheme split such that the individual part was 75% and the group mark was 25%. In my term they wanted to test how a group would influence our individual ideas and if we could collaborate well. Luckily, I did not do so well in the individual part and by luck I was in a group that knew how to answer the questions, so I got carried.

Like MATH 115 (Linear algebra) we had weekly tutorial quizzes. There were 1 or 2 questions per week that had to deal with the class concepts. These quizzes are meant to test if you understand the material in class and if you can apply them to problems. The final exam was fair and was about 5 questions. For many of us, this was the redemption option. If we scored higher than our midterm, Professor Rohan decreased our midterm weighting significantly and made our final higher. I honestly studied so hard for his final and ended up with an 85+ after almost failing the midterm.

**MATH 119**

This is the first course review for my ECE undergrad. This is after I switched from Chem Engineering to Computer Engineering in 1B. This is your typical calculus 2 course and I would say that it isn’t a difficult course at all. We had a very nice prof (Professor Brenda Lee) who was quite young compared to most profs I had. She was very kind, relatable, and wore really cool graphic tees! She also posted all of her notes before class and they were color coordinated and typed. In the lectures she would go through the notes. I would recommend printing the notes and annotating over them if you have her in the future.

As a Calc 2 course, it was a continuation of Math 117 (which I did not take, I took 116 which is the easier version of it) The progression for most engineers is Math 116 (Calc 1) -> Math 118 (Calc 2). The slightly more difficult version taken by SE and ECE students is Math 117 (Calc 1) -> Math 119 (Calc 2). The key emphasis is slightly more difficulty. In Math 119 you will learn more about spherical and cylindrical coordinates which are needed in ECE 106 (Electricity and Magnetism) You will also learn how to handle double and triple integrals plus some additional concepts. Those who take the 116->118 path do not learn about these concepts until 2A.

MATH 119 and the math you do in ECE 106 are closely related. I remember that we learned some of the concepts in the math course and in the same day, we would require the techniques in the electricity and magnetism course. In terms of the course structure, it was composed of weekly/biweekly assignments, 1 midterm and 1 final. You will see that this is a common trend for most ECE courses that I will talk about. I don’t have a lot of criticism for this course and in fact it was one of the easier 1B courses I took.

**ECE 108**

*This is the first discreate mathematics course that you will take. It is not a traditional mathematics course but instead proofs and set theory focused. This is one of the courses that you either love it or hate it. For me personally, I hated it so much. This was the second time that this course was offered, and it had a lab portion as well. My professor was Professor John G. Thistle and let me say that he is the most monotone professors ever. He posts lectures on learn before class starts, however, in lecture all he does is read from the slides and write down the exact same material on the board. When asked questions, he doesn’t seem to confident in answering them and often goes on tangents that leave you more confused than you started with. My recommendation is just to skip his lectures as they don’t provide too much value and just learn from the slides. The lectures will not provide you with any additional information.*

*For the labs, they were not really related too much to the course content just basic set theory concepts programmed in C++. These programming labs took a little time if you were not too familiar with C++, so I would recommend starting these as early as possible. Since this course is a different branch of mathematics that you probably have never experienced before, take full advantage of tutorial times and office hours. During tutorials, we went through examples and how to prove/solve them.* ***This is one of the biggest complaints I have with Professor Thistle’s teachings. He goes pretty heavy on concepts and explains them in great detail, but he rarely goes through any examples which makes proofs on the midterm/assignments/exams extremely hard as we don’t have the practice.*** *Also, his assignments are often worded poorly or contain concepts that haven’t been taught yet. He had to extend the deadline on many assignments because the due date was set before we even learned the concepts required to solve the questions.*

*I really disliked this course and the way it is taught/structured. Since it was the second time it was offered, I will give it some slack and hope that it has improved.*

**ECE 124**

This is first digital circuits course that you will take. I will say that is might be one of the most interesting 1B courses that I have taken. It is the introductory to how digital circuits work, and you will learn the basic hardware components such as: multiplexors, adders, counters, state machines, etc. You will also learn boolean algebra and VHDL which is a hardware description language used to work with FPGA’s.

The course was taught by Professor Catherine Gebotys and she is honestly a sweetheart. She knows her material very well, she is very understanding of the students, and she is very fair. I don’t have many complaints about this course, in fact, when I switched from Chem Engineering to Computer Engineering this is one of the courses I looked forward too.

There are also labs in this course which allow you to write VHDL code and work with FPGA’s. These labs are not easy, and they do consume a lot of time especially the last project. I remember that when I worked on the last project, there were no seats in the lab, and it was fully packed the entire time. As a word of advice from an upper year, do not leave this lab to the last minute. You will run into a lot of problems working with the FPGA’s and VHDL (as it is not your typical programming language). Also working with Altera Quartus Prime (the IDE that you use to program the FPGA’s with your VHDL code) is a little tricky to work with and you will encounter errors that you have no idea where its coming form. Ask the TA’s and your peers for help as they probably encountered the same error before and it’ll save you a lot of time debugging.

For the midterm and final, they were fair. But, some of the questions were long and time consuming. Make sure you practice a lot so that you can fly by these questions that just require a lot of work but are not too complicated. There were also ungraded assignments, and I recommend that you do all of them since they are similar the types of questions in the exam.

**ECE 106**

This was probably the toughest course in 1B hands down. This course is about Electricity and Magnetism and you will learn about how electric fields and magnetic fields work. This course was taught by Professor Saini who I think is one of the smartest and clearest teachers in the ECE undergraduate department. At the current time that I am writing this, he leads our cohort’s seminar and he is a great resource/mentor for any questions that you may have. He genuinely cares about the students andis also very passionate about the course. However, he is known to be a gatekeeper. His exams really test your understanding of the material and just pure memorization will not work in this course.

This course pairs well really with MATH 119 as the concepts you learn in Calculus will be needed to calculate fields around 3D objects. This course has weekly quizzes so make sure you attend the tutorials. For the midterm, the format is similar to ECE 105. There is an individual midterm that you write and after that you will get in groups (based on your own choice) and solve a set of different questions together. Obviously from year to year, the format may change, and I am just writing down my own experiences.

After I wrote the midterm, I truly understood why previous upper year feared ECE 106. At least in my cohort, a lot of the students (probably 60+%) do not really care about physics, math, electricity & magnetism, etc. Instead they care abut being an engineer and programming. You may ask why I brought this up and the answer is that many of my peers including myself scored way lower than we wanted to in the midterm because we didn’t study hard enough and learn the material well or cared. The average was in the range of 55-60%.

When the finals came around, I had to grind as hard as possible. I was in the danger zone since my midterm mark was so low. Again, there was an alternate marking scheme where if you did significantly better on your final the weightings of the midterm and final would be adjusted. When I heard this, I packed my books and my laptop and studied in the library for what felt like an entire week. I did all the previous midterms & finals on the ECE drive and kept reviewing my concepts until I was able to teach my friends with ease. Luckily, my efforts paid off and I was able to pull an 85%+ despite the course being notoriously hard and a horrendous midterm mark.

**ECE 140**

This is the first linear circuits course that you will take. For some reason as an Electrical/Computer Engineer, they thought it would be smart to have the first circuits course in the 1B term instead of the 1A term. This course starts of with the fundamentals and you will move on and tackle more complex circuits with the methods that you learn: node analysis, circuit analysis, superposition, etc. Circuits is not intrinsically difficult and many of my classmates found this course to be easy if you have a strong foundation in circuits.

The math required in this course is not hard at all, it is very basic math. There are a lot of calculations and you need to be good at working with system of equations and solving for unknowns. By doing practice problems and improving your speed, it will improve your marks tremendously. Quite often, I knew all the concepts and the different methods needed to solve the questions, however I was slow at solving them. “Practice makes perfect” is the best advice that I can give in this course.

From my own experiences, I was not able to solve all the midterm questions. I left the last question empty which was the one that was worth the most marks. After the midterm, I knew that the speed at which I was solving questions was not fast enough. I kept practicing circuit questions and really strengthened my fundamentals to solve faster. When I wrote the final, I was able to finish at the halfway mark because I practiced like crazy. There are also labs in this course which you will be given a tool kit with some basic circuit components. These labs were easy and are mark boosters. All you had to do was show up, build some simple circuits and apply the knowledge you learned in class to answer some questions (ex: what is the voltage at this node, what is the current flowing in this path, etc.)

**ECE 204**

This course was taught by Professor Douglas Wilhelm Harder. He is well known through the ECE department for his interesting personality. ECE 204 is about Numerical Methods used for approximations, estimations, and error analysis. To be honest, I can see the appeal to this course and the importance but for some reason our class hated this course. You can see the course material and lecture content here: <https://ece.uwaterloo.ca/~ece204/>

This is just my opinion, but I really did not enjoy this course at all. I found that it was just a bunch of random information crammed together. Although we are provided with the lecture notes, there were a lot of mistakes and contradicting statements which made learning the information difficult. Also, when I took this course it was the second iteration and there were no practice problems. For the midterm, all we had were some concepts to study from and 1 practice midterm. The tutorials were taught by Professor Harder who often went on tangents or had to reteach the concepts in the lecture because majority of the class was confused on the course material.

In terms of the course breakdown, it consists of 1 midterm and 1 final. There were no assignments, barely any practice question, and just the lecture pdfs on the website linked above. Honestly, I see the intention for this course but in my term, it was executed poorly. I hope that since it has been through a couple of streams it has improved.

**ECE 205**

ECE 205 is Advanced Calculus 1 but most people treat this at the third calculus course for ECE students. For the Computer Engineers, this is the last calculus course you will take but for Electrical Engineers, there is one more in 2B. The professor that taught this course was Professor Eduardo Martin-Martinez and of all the professors I have had, he is near the top of the list. He is very funny, considerate of the students, super passionate about math and his teaching style is enjoyable. He makes sure that the students understand the fundamentals and always tries to break down harder problems into smaller easier problems. He is all about setting students up for success and his midterms/exams reflect that.

The lecture notes are found online: <https://sites.google.com/site/emmfis/teaching/math-211> and these are very clear. Like most courses, the structure is weekly assignments, 1 midterm and 1 final. None of these very particularly hard and if you understand the concepts, you will do fine. Most of ECE 205 is differential equations, Laplace Transform and the Fourier Transform. These concepts are vital in the rest of your ECE career so please make sure you understand them well. I have nothing but high praise for this course and this professor!

**ECE 222**

This course is an extension of ECE 124. If you have not already, please read my course critique on ECE 124 before reading this one. Professor Catherine Gebotys taught this course and our class loved her. She is generally a kind person and is very knowledgeable in the field. Her course notes can be found on her website: <https://ece.uwaterloo.ca/~cgebotys/NEW/ECE222/>.

In this course you will learn about RISC-V which is an open source instruction set architecture. In other words, it is a type of hardware language where we can interact directly with the processor and its registers. In the past, ARM architecture was taught but as the technology advances RISC-V has become the new standard of teaching for ECE 222. This course was fun because we started to dive into what Computer Engineering is about. We learned about how a processor works, registers, and how instructions are carried out in a processor.

This course had a lab, midterm and a final. The labs were where we programmed the FPGA’s with RISC-V instructions. These labs were frustrating but quite rewarding when you got them done. My advice from ECE 124 labs also extends to ECE 222 labs: Get them done early because the labs become packed with students as the deadline approaches. For the midterm, it was quite easy, and the class average was high. For the final exam, I found it extremely long. There were a lot of questions and although the level of difficulty was not that high, the questions were time consuming. For this course you need to understand your concepts well and be able to problem solve quickly as there are an array of question types that can be asked.

**ECE 250**