# Term 1A

**CHE 100**

*This was an interesting course. This was the first Chemical Engineering related course I took. In terms of course content, I already forgot most of it. However. the one concept that is still deeply engrained in my memory is: process flow and equilibrium. CHE 100 does not require heavy mathematical skills nor extensive knowledge of chemistry. 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 teaching, they had 2 professors (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 roles. Every week there were mandatory tutorials. In the first half of the tutorial, the Professor held a quick review session on the concepts taught in class and in the second half was the weekly quiz. In my opinion, the quizzes were a good reflection of the material taught in class and forced you to study throughout the term.*

*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. I actually learned the importance of word automation, citation management, and figure/diagram creation from these labs. Although this was useful, it had little to no connection to Chemical Engineering which was very surprising for a first-year 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 us to design 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 himself, 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 that 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 current first years 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 breezed right through this course.*

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

*For the course structure, there were no labs but there were weekly online assignments, weekly tutorial assignments, 1 midterm, and 1 final. For the online assignments, there was usually 10 questions and you had 3 chances to submit each answer. These questions were the same as my peers but with just different numbers. I would advise that you work together as some of the questions are tricky and wordy. Also, seek help from the WEEF TA’s if you get stuck. For the 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 of hell week (I had written 4 midterms previously that week). The format changes pretty much every year but I would recommend that you study past finals as the types of questions do not 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. As an upper year looking back on my freshman self, these concepts were easy to grasp. However, in first year I just 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 early. This is a strand of math that is very important in engineering especially those who are in Electrical, Mechanical, and Mechatronics. 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, 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 too well in them because I didn’t do a lot of practice problems. My advice 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 and 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 professor Jordan Hamilton and I can say that is he one of the best professors I had in my undergraduate. His teaching is well known across the engineering and math faculty and he has a good sense of humor.*

*In this course you will start with the basics of calculus. This is because 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 in high school. I never learned integrals in high school, so I had to learn it by myself. Since university is fast paced, 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. Professor Rohan is a legend but unfortunately, he recently retired. You will hear many stories about his excellent teaching, his humor, and his willingness to help from other upper years. 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 sessions for those who were struggling. These were honestly a lifesaver as he went through the problems one by one and carefully explained every step and decision he made.*

*Now there are two major physics courses engineers take in the 1A term, 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 were given but you would solve them in a group setting. The marking scheme weighed the individual part to be 75% and the group mark to be 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 also 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. For the final exam, it was fair and was about 5 questions long. For many of us, this was the redemption option. If we scored higher than our midterm, professor Rohan would decrease our midterm weighting significantly and make our final exam weighting higher. I honestly studied so hard for his final and ended up with an 85+ after almost failing the midterm. When I mean almost failing, I don’t mean that I got 70-80’s. I literally mean that I got somewhere between 50-55.*

# Term 1B

**MATH 119**

*This is my first course review of my ECE undergrad. This is because I switched from Chemical Engineering to Computer Engineering in 1B.*

*MATH 119 is your typical Calculus 2 course and I would say that it is not a difficult course at all. We had a very nice prof (professor Brenda Lee) who was quite young compared to most professors I had. She was very kind, relatable, and wore cool graphic tees! She also posted all her notes before class and they were color coordinated and typed. In the lectures she would go through the notes. I would recommend printing her notes and annotating over them if you have her in the future.*

*As a Calculus 2 course, it was a continuation of MATH 117 (which I did not take, I took MATH 116 which is the easier version of it) The progression for most engineers is MATH 116 (Calculus 1) -> MATH 118 (Calculus 2). The slightly more difficult version taken by SE and ECE students is MATH 117 (Calculus 1) -> MATH 119 (Calculus 2). The key emphasis is slightly more difficult. 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 MATH 116 -> MATH 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 use these 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 since it focuses on proofs and set theory. This is one of the courses that you either love it or hate it. 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, during the 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 too 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. They were implementations of basic set theory concepts programmed in C++. These programming labs will take a little time if you are 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 any 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. This might be one of the most interesting course you take in 1B. It is an introduction 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, understands the needs of the students, and is very fair. I don’t have many complaints about this course. In fact, when I switched from Chemical Engineering to Computer Engineering this is one course I looked forward to.*

*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 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, 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, it barely has any similarities). 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 a countless number of errors. Ask the TA’s and your peers for help as they probably encountered the same error before you and it’ll save you a lot of time debugging.*

*For the midterm and final, they were fair. But I thought that 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 to 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 passionate teachers in the ECE undergraduate department. At the current time that I am writing this, he leads our cohort’s seminar session, and he is a great resource/mentor for any questions that you may have. He genuinely cares about the students and is 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 PHYS 115. 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%) couldn’t care less about physics, math, electricity & magnetism, etc. Instead, they care about being a software 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 because we didn’t study hard enough and learn the material well. A lot of us didn’t care about this course as it’s not related to programming. Consequently, our average tanked and was in the range of 50-55%.*

*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 (borderline passing). Like some of the other courses I have taken, there was an alternate marking scheme where if you did significantly better on your final exam then 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 the 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, the faculty thought it would be smart to have the first circuits course in 1B instead of 1A. This course starts off 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.)*

# Term 2A

**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/*](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 were 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 pure 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 sub-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*](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 are particularly hard and if you understand the concepts, you will do fine. Most of ECE 205 is differential equations, Laplace Transforms, and Fourier Transforms. 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/*](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, pipelining, 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 code. 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 240**

*Professor Peter Levine taught this course. If you are in ECE then you probably have heard rumours about this professor. I am not going to rant about him, but he is known to fail at least half of the class. Some students even call him the “gatekeeper”. In my class, there were probably about 15-20 students that were an upper year who failed the course and had to repeat.*

*ECE 240 is essential to electrical and computer engineers that want to work in the hardware field. In this course you learn about bode plots, passive and active filters, transistors, MOSFETS, and other common circuits that are in electronic systems. For most CE students, this is the last hardware course you will take, but for EE students there is ECE 340 which expands further into the domain of transistors. For the marking scheme, there were 2 lab quizzes, biweekly labs, 1 midterm, and 1 final. All assessments that Levine creates are unique, and you will not find any of his problems repeated. You must learn and understand the concepts, or you will be in a lot of trouble. The midterm average was low 50’s and this honestly scared a lot of students including myself. Levine’s exams test your understanding of the concepts not how well you can memorize solving certain types of problems. Do not slack off in this course or you will probably need to repeat this course in the future. Do all the practice problems and all the practice exams. Fun fact: He does not have any practice exams because he does not want anyone to know what types of questions he uses. All the practice exams I received were from upper years or from the years 2000-2010.*

*When I entered the final exam, for the first time in my life I was scared. I did well in the labs + lab quizzes but I had failed the midterm. I needed to redeem myself or else I would fail this course. The final had 9 questions and I was able to answer probably 5.5 questions. I luckily passed but I put in so many hours studying for ECE 240. Some of my close friends failed and will be repeating. It did not help that we had to write ECE 222, ECE 204, and ECE 240 in the span of 2 days. I barely slept and drank at least 5 red bulls within 2 days. I do not recommend this, but I just wanted to put in perspective how hard this course was.*

**ECE 250**

*This course is one of the most important courses you will take if you are a Computer Engineer that wants to focus on software jobs. In this course you will learn about common search/sort algorithms, data structures, dynamic programming, algorithm analysis, and graph theory. These concepts that you learn are vital to your career as a software developer and will help immensely in technical interviews.*

*In terms of course structure we had labs, 1 midterm, and 1 final. For labs, they were mostly just implementation of the concepts we learned in class. For example, we had to implement the functionality of a hashtable. These labs were not too hard but were time consuming as we wrote them in C++. For the midterm, it was quite difficult. A lot of us got destroyed in the midterm because it was the first time we had to write code out by hand. White-boarding and writing your solutions instead of coding is a valuable skill so I would recommend that you practice solving questions in this format as much as possible. The midterm average was in the 50’s and because of this our professor gave us a chance to speak 1 on 1 with her to discuss any problems we had with the marking. Unfortunately, over 80+ people showed up and ~5 people were able to get their marks changed. Please take this course very seriously and do not slack off.*

*After the midterm we learned about graphs, dynamic programming, and NP complexity. These concepts are pretty difficult so make sure you understand them well. The final was just as hard as the midterm so keep that in mind when you study. The hardest concept I struggled with would be dynamic programming. Essentially dynamic programming is an optimization on plain recursion. Practice DP problems as much as possible and do not just memorize solutions.*

**ECE 290**

*From what I heard, ECE 290 is no longer being offered to ECE 2023 and beyond. Because of this, I will keep my course critique short. ECE 290 is about engineering profession, ethics, and law. Essentially, you learn about what it means to be a professional engineer and you will have brief overview about Ontario/Canadian Law. You also learn about contracts, obligations, and ethical decision making. The mark distribution in this course was weekly quizzes, 3 essays, and 1 final. These were not too hard and many students in my class skipped these lectures. Our prof was professor Dwight Aplevich (who retired but came back to teach) and he taught the course well by telling a lot of stories about his past experiences and popular engineering news articles.*

# Term 2B

**ECE 207**

*ECE 207 is basically another calculus course. The course is about continuous and discreate signals which require all the math you learned in MATH 116/MATH 117, MATH 118/MATH 119, and ECE 205. I personally considered this course as Calculus 4 because you need to have a strong calculus foundation and understand Laplace/Fourier transform well. There was a lot of calculations and little tricks to solve problems in this course so be diligent when studying. There were weekly assignments, 1 midterm, and 1 final. The weekly assignments were graded in the following manner: There were a total of 7-10 questions, if you attempt more than 5 you get 50% and for the remaining 50%, the TA’s will randomly mark 1 of the other assigned problems. Honestly, I thought that the assignments and midterm were fair, and most students scored reasonably well (> 70%). However, the final exam was hard and long. A lot of student’s marks dropped significantly because the wording of the problems was tricky and if you could not use a trick to help reduce the problem, you were not able to solve the question without a ton of work. This is the lowest mark I have gotten in all my undergrad and my final mark actually dropped about 20% since the midterm. The professor that taught this course was professor Mohamed-Yahia Dabbagh and he did a good job teaching. His final exam was extremely hard, but this may have been because our assignment and midterm marks were high.*

**ECE 208**

*If you have not read my course critique on ECE 108 please do so first. ECE 208 is a continuation of ECE 108. You will learn certain proof systems such as the Hilbert and Gentzen system, predicate logic, set theory, etc. This course was taught by professor John Thistle who also taught ECE 108. Personally, from the ECE 108 days, I think everyone in my class would say that he has certainly improved. He uses more examples, speaks slower, and tries to crack jokes here and there. However, he still teaches the same way: He puts all his lecture notes on LEARN and during the lecture he reiterates the notes by writing them out on the board.*

*There were weekly assignments, 1 midterm, and 1 final. I think that most of us thought the grading was fair and the difficulty of problems were not too hard. The reason most of us dislike this course is because it is not a traditional strand of math that engineers work with. Most of our courses are applications of theory/equations. However, Discrete Mathematics and Logic 2 is about intuition and coming up with proofs that may be abstract and hard to think of. This is not the type of problems that many of us like and it is hard to wrap our minds around proofs that require a lot of creativity to craft. Again, like all my course critiques, this was just my personal experience with this course. ECE 208 is a new course and during my year it was the second iteration of the course. I am confident that in the future, it will improve and get a lot better as we provided a lot of feedback to the ECE department.*

**ECE 224**

*This course was the first course you learn about embedded systems. It is a very interesting course and we had professor Bill Bishop. He is a wonderful professor who is very clear in his teaching and is generally a friendly guy. Also, he is the writer of “The Road to Engineering” which talks about his reflections on engineering admissions and engineering life at the University of Waterloo.*

*This course has a lot of content to learn so you will be in for a ride. Professor Bishop teaches with slides so you can print them out before hand and just annotate on top of them while he teaches. The course has no assignments, but it had a lab component. This lab component takes up a lot of time so please be cautious of this. You need to write your programs in C (which might not be familiar to a lot of students) but it is the best language to work with when you interact with hardware and embedded systems. The final lab project is a MP3 player which is known to take a very long time to do. Personally, I spent 20+ hours on that lab so do not do this last minute. This is the same advice I have given to all hardware courses and their labs: ECE 124 & ECE 222. For the midterm and final, professor Bishop posts an abundance of practice exams so you will have plenty of practice. These exams are fair as you have at least 10+ exams to practice on. Overall, it was a great introductory to embedded systems.*

**ECE 252**

*ECE 252 is all about system programming and concurrency. In this course you will learn how to program in C, learn about mutexes, multi-threading, concurrency, etc. This is actually a very important course if you want to become a successful programmer or work with embedded systems in the future.*

*We had professor Jeff Zarnett teach us and all of the course notes can be found on his Github:* [*https://github.com/jzarnett/ece252*](https://github.com/jzarnett/ece252) *He has very detailed notes and examples that go along well when he teaches. I would recommend spending 20-30 minutes reading the lecture notes before you attend class because there is a lot to cover and you may not be able to keep up with his speed.*

*There were no assignments but there was a lab component. Like most courses, the lab component was related to the course content. An example would be: Design a multi threaded web crawler that goes on the internet to find/download strips of PNG’s and concatenate them in order to make a full picture in the shortest amount of time possible. These labs were gruesome. They took a long time to implement because a lot of us were not familiar with programming in C. Please work on these labs whenever you get the chance because C is a tricky language, and you will run into problems that languages like Java or Python handle for you. An example would be freeing and allocating memory. I will not spoil too much but keep in mind these labs will take a lot of your time.*

*The midterm and final were painful. Professor Zarnett really likes to make wordy problems that have a lot of background story. For example, for a written coding question about concurrency he made up an entire story about Chef Ramsey. His questions are loaded with irrelevant information and you will not have time to read everything. This was one of the biggest complaints I had with the course. The questions professor Zarnett makes up are sometimes convoluted with his background story which can confuse you if you are not a native English speaker. Please be aware of this and filter out unnecessary information if you have professor Zarnett for ECE252 or any course.*

**ECE 298**

*ECE 298 was interesting. It was a prototyping lab where they give you 5 projects and you pick one of the 5 ideas to build out. This course was new and it was introduced in the curriculum so that students have more experience designing and prototyping before they did their FYPD in 4th year. In this course, you learn a lot about connecting your hardware and software together with microcontrollers, so it is very good to put on your resume! My partner and I built a home security system that uses ultrasonic sensors, LEDs, reed switches, and mic for concurrently monitor 4 rooms. You can check out on my project on Github:* [*https://github.com/Matt-Tang/Home-Security-System*](https://github.com/Matt-Tang/Home-Security-System) *There is no midterm or final. All you need to do is build out the project within the 4 months and submit certain design documents, PCB design, etc. along the way. We had professor Derek Wright who organized this course and he did an amazing job! You have little to no guidance when building this project out and you can build the project out however you like as long as you fulfill the functional requirements. This makes it extremely stressful but trust me, when you get the final project done, you would have grown so much as an “engineer”. You will feel empowered and be proud that you were able to build a resume worthy project by yourself or with a partner!* 😊

**CLAS 104**

*This is the first elective I was able to take in my entire ECE undergraduate. This is one of the bird courses as suggest by many people at Waterloo. I took this course online and I thought it was a bird course as long as you put in some hours. I ended with the course with a mark of 95+ and I was able to finish the final exam (100 MC questions) in 30 minutes. My strategy was just to cram online practice problems the day before the exam. It proved to be effective, but this might not be an optimal strategy if you are not good at memorizing short term. The course has online modules and weekly quizzes based on the assigned readings. It has 1 midterm that was about 75 questions and 1 final that was 100 question. There is not too much to say about this course as it is an introductory to Classical Mythology, but I would say this is an easy & fun elective to take. It felt refreshing learning about non-engineering/math content.*

# Term 3A

**ECE 306**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*ECE 306 is one those courses you just have to take. No one really wants to take it, but it’s a course needed for our engineering accreditation. It starts off with basic probability and transitions to conditional probability and independent variables. You then start learning about random variables, probability distribution functions, etc. In terms of difficulty, some of my classmates thought that this course was a walk through the park. For others, this course was hard to grasp conceptually. I know for myself that probability is one of those concepts that I struggle with. It is an abstract topic that either you understand, or you don’t. This was apparent for the quizzes, midterm, and final. Either you got full marks for your solution, or you got 0 marks. It was very hard to get part marks because if you understood the underlying concept, you should be able to solve the question easily. If you didn’t know where to start, writing down formulas and concepts wouldn’t have gotten you any marks. The entire course was 4 quizzes, 6 reflections, 1 midterm, and 1 final. The reflections were just 1-page responses to famous probability problems such as the Monty Hall Problem and the 3 Prisoner Problem. The reflections were easy marks and were probably included in the marking scheme to bring up our marks.*

*This is just one of those courses that you need to get through so don’t be too upset if your final mark isn’t too high. Try your best to understand the concepts and theorems at a fundamental level instead of just memorizing them. This will help you recognize what tools are needed to solve a question and help improve the speed of your problem solving.*

**ECE 327**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*ECE 327 was taught by professor Nachiket Kapre who was an amazing professor. In my term, he won the Engsoc Teaching award for teaching ECE 327. Traditionally, 327 is a course that should be done in the lab because you write Verilog code and work with FPGAs. Due to COVID restrictions, we did all hardware labs virtually via docker images that could run digital hardware simulators. 327 consisted of 4 labs and 4 quizzes. In the labs, you write Verilog code and work towards designing a systolic matrix multiplication kernel that is used in Google’s Tensor Processing Unit (TPU). Regarding the quizzes, they were open book and lasted usually for 2-3 days. There are usually 5-6 questions which consisted of but not limited to: Designing hardware to fit design specifications, performing timing analysis, optimizing hardware by using pipelining and scheduling techniques, etc. ECE 327 is honestly a fun course that is very involved. A lot of the knowledge from ECE 124 (yes, a first-year course!) is required. At the end of the course, there is a challenge where you compete with your classmates to see who can optimize their design the best. Some of my classmates were very competitive and even read research papers to obtain the highest optimization score. Anyone looking into working with FPGAs in the future needs to pay attention in this course! It will teach you how Google’s Tensor Processing Unit (TPU) and NVIDIA’s Graphic Processing Unit work at a fundamental level.*

**ECE 351**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*ECE 351 was one my favourite courses. In this course you learn about how the programs that you write are compiled and converted into instructions for the CPU to execute. You need to dedicate a lot of time to this course as it is heavy on knowledge and application. In fact, half of the course relied on implementing the concepts you learned from the lectures in the labs. Throughout each lab, you will slowly create a compiler for a subset of VHDL (compiler written in Java) and you will see how code gets compiled in the different phases. ECE 351 consisted of 9 weekly quizzes, labs, and 3 exams. The weekly quizzes were all MC questions based on the lecture content. The 3 exams were just bigger quizzes and had a similar format. They often reused the weekly quiz questions in the exams so there were a lot of free marks. Honestly, I really liked 351 a lot. There is no doubt in my mind that anyone looking for a software related job in the future should pay attention to this course!*

**ECE 380**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*ECE 380 is probably the last required math/calculus course of your undergraduate. For those that want to only pursue software related jobs, this is a blessing for you. ECE 380 is an extension of ECE 207 which is taken in 2B. 380 focuses heavily on control systems, transfer functions, block diagrams, stability, and feedback. In this course you focus on analyzing control systems and designing some of them by yourself. This is a vital course if you want to do any type of robotics in the future. The concepts that you learn in 380 is needed to correct a robotic arm in surgery from overshooting. ECE 380 is not super hard but it’s not super easy either. There are only 4 quizzes and 5 labs in this course so there’s not a lot of room for mistakes. The labs require you to use MATLAB which is interesting because almost 80% of the class were beginners or never used MATLAB before. It wasn’t a very interesting course in my opinion, but control systems and control theory are crucial if you want to work with any moving parts (ex: UAV, airplanes, drones, etc).*

**ENVS 200**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*ENVS 200 in my opinion is a decent bird course. It’s not a super easy bird course where you can spend minimal effort, but it doesn’t require you to use much brain power. It was a busy term as there were labs, discussion questions, assignments, 1 midterm, and 1 final. The content itself wasn’t intense but you needed to spend a lot of time doing all of these tasks. Fun fact: In the start of the term, they revealed a statistic that showed that about 40% of the class was ECE students. ENVS 200 is similar to EARTH 121 in my opinion. If you put in some effort, > 80% is attainable. Also, if you don’t care about learning, ENVS 200 would be a good elective for you to take.*

**EARTH 121**

*This course was done virtually so my critique may not be an accurate representation of this course.*

*To be honest, I took this course during coop, so I tried to put in minimal effort. Of the 13 weeks in the term, I only read the first week’s content. From what I saw, the modules were clear and designed for online teaching. There were 10 field journals, 4 quizzes, 3 discussion questions, and 3 assignments. Nothing about this course is inherently difficult and if you put in some effort, > 80% is easily attainable. I would highly recommend this course if you don’t care about learning and just want an easy NSE (Natural Science Elective) to take. Like many others have said, EARTH 121 is a bird course.*

# PD Courses

**PD 5**

*This was an easy PD course as well. It focuses on project management and planning. Like PD 5, there was weekly assignments (usually 2-3 open questions) based on the assigned reading. This PD was interesting because you get to learn about how to plan projects effectively and how good decision making is vital. You learn about how stakeholders impact projects, different communication styles, and how to plan for the unexpected. Overall, there was 6-7 assignments and you only need a 50% to pass the PD course. I highly recommend that you take this course as there are not any essays or big projects that you need to work on.*

**PD 8**

*This is one of the easiest PD courses out there. It focuses on intercultural skills and how different cultures have different workplace interactions and work styles. This course has weekly assignments which are usually 2-3 open ended questions based on the assigned reading. You only need to get 50% in total and you do not have to pass the last assignment to pass the course. Personally, I was able to finish these assignments in half an hour or less every week, so it was not too much of a time sink. The course content was also interesting to read because you get to see how different parts of the world have different work styles that are drastically different than the ones we accustomed to.*

**PD 6**

*This was the last PD course I took. In the term I took it, they were piloting a new course structure. Along with the original PD 6 content, there was an additional work term reflection built into the course. This means that in 1 coop term, I wrote 2 work term reflections (1 normal one, 1 from PD 6). These work term reflections asked similar questions and you could write about your experience in the same coop term. This made it super easy to reuse the same content in both reflections.*

*In terms of PD 6 content, it focused on problem solving. There were 5 assignments in total (almost biweekly), and you needed to get 50% in the assignments and 50% in the work term reflection to pass. PD 6 taught different problem-solving tools such as concept maps, Disney’s creative strategy, and TRIZ (Theory of Inventive Problem Solving). Since you could obtain a PD credit and get a work term reflection done in 1 course, this made PD 6 a worthy PD course to take. This was a perfect opportunity for me because I was able to obtain my last PD credit and finish my last work term reflection.*

# Other Courses

**COMP 206**

*I took this course at Athabasca University because I was missing the ECE 150 credit when I transferred from Chemical Engineering to Computer Engineering. This course was online, and it was an introductory to C++. There were 3 assignments, and 1 Final exam. The final exam was just the assignment questions with small modifications. This course was very easy and the online modules that came with the course was detailed and descriptive. It taught a lot about the fundamentals of C and how C++ evolved from it. In my opinion, I do not think that COMP 206 is a course equivalent to ECE 150 but apparently Waterloo thinks so. The assignments were trivial if you have some basic programming experience. For example, one the assignment questions were opening a file and writing some content into it.*