# Fizz Course Review Guide

# Year 2 W1 Core

## MECH 260 Introduction to Mechanics of Materials

In this class you will review statics from PHYS 170 as well as begin learning about solid mechanics in order to solve statically indeterminate systems as well as material strength problems.

The workload in the class has varied year by year but generally it is weekly assignments which take no more than 3-4 hours apiece and 1-2 midterms.

Going into this course most do not know what exactly solid mechanics is and so can never be disappointed in that respect. In general though Mohr's circle is supposed to be covered but is almost never.

To be honest, this course, even for those who are mechanically inclined, is not that useful. The problem is that any interesting applications of the material are far more complex than the course has time to go into. It is helpful in providing context for future MECH courses such as 360 325 and 326.

Last year (2018), the course was taught by Ahmad Mohammadpanah Foroutaghe. He is a really nice prof, does a lot of demonstrations, and relates the material to his work, putting it in context. His exams are normally easy, and gives normal amounts of homework. He is always happy to help students outside of class, and gives bonus problems to help students boost their grades.

Previously a slog of a course due to a boring prof, Mech 260 has become an enjoyable class for your first semester of fizz. The course is easy enough to get a decent grade in and the material is not that complicated.

## ELEC 204 Linear Circuits

In years gone by when FIZZ had multiple specializations only those in the elec specialization had to take AC analysis while everyone had to take DC analysis. When the specializations went away in favour of technical electives there were too many courses in 2nd year to take. The ELEC department fixed this by making a new course ELEC 204 that was 4 credits and combined the two courses. In this course you learn basic DC and AC circuit analysis starting first behind but then overtaking the knowledge developed in 1st year.

This course, despite it being 4 credits, is typically considered to be very easy. Though I've been reliably told that the material has gotten harder over the last few years in general this course is an exercise in calculator proficiency. Usually there are weekly assignments as well 1-2 midterms.

The course does what it says on the tin, you set out to learn circuit analysis and in the end you do.

This course, while very extensive in terms of circuit analysis, suffers from lack of practical applications. I can say that after spending two co-op terms in electrical jobs I have never once had to use nodal analysis or solve a Y-Delta transformation. What this course is most useful for is providing a good grounding (excuse the pun) for more applied and useful circuits courses in the future such as ELEC 401, 404, or 451.

This course, like many from the ELEC department, has not had outstanding professors. For the last two years it has been taught by Professor Mirabassi who has not had great reviews but the consensus is he is not terrible.

Like a lot of the 2nd year courses this course is more about getting you ready for the meat of FIZZ than any sense of practical application. The course is generally quite easy and it is very possible to get a high mark. In terms of interest this course is low but it does provide fundamentals for the future

## ENPH 259 - Experimental Techniques

ENPH 259 in this Fizzer's opinion is true beginning of engineering physics for the 2nd years. Not just because it is one of two course that Andre himself endeavours to teach but like most course with code ENPH it truly feels like what eng phys is about. While other courses in the second year curriculum may teach you the grind (CPEN 221) or that not all courses are particularly fascinating (MECH 260) both important skills for the degree this course teaches not only practical lab experience but is the beginning of the eng phys comradery.

ENPH 259 is split into two parts, the first is communications taught by Andre and a variety of guest lecturers. While the second section is an electronics lab taught invariably by Dr. David Jones. The workload is small as it is only a 2 credit "lab" but the stuff you learnt in both sections are extremely helpful.

This course is perhaps the only venture into practical electronics design until ELEC 301. In this regard it is invaluable for the robot summer as 90% is issues in robots are caused by faulty circuits. As well, the communications section, while not quite as glamorous as transistor switches, is your best tool for coop as well as getting good marks in future project courses.

For the last 8+ years the course has always been taught by a group consisting of Andre, Davy Jones and someone else. All of them are generally considered good profs.

When I look back upon the courses from 2nd year I find myself coming back to this ones as the most typically fizz. The combination of having only fizz students as well as being taught by Andre himself brings it to near the top of the curriculum. This course has changed somewhat with final exams being removed and labs being swapped over the years but in the end it is a solid intro to proper lab work and a great opportunity to bond with your peers.

## MATH 217 - Multivariable and Vector Calculus

Most Fizzers would agree that this course is important. You'll get varying degrees of how important depending on whom you talk to, but everyone can say that this is integral to PHYS 301 (electromagnetism). You will learn to extend the ideas from MATH 100 and 101 to multiple dimensions. This means functions of multiple variables, partial differentiation, optimization of functions of multiple variables, finding areas and volumes by multiple integrals, and the calculus of vector fields.

This course is not particularly difficult, but there is A LOT of material, and particularly in the last month, you need to really keep up because this is where it gets really important. It definitely earns its 4 credits; it has the material of 6 credits in it (MATH 253 and 317) but doesn't sacrifice expectations. Spend extra time doing practice problems from a good textbook (Stewart's Calculus is a classic) to master all of the skills.

I don't think that I have used the material in this class once in any of the engineering courses, but I use it frequently in the physics courses such as PHYS 301, 304, a little bit in MECH 280 and in MATH 305 and 400. In your electives, you will find it useful if you take PHYS 407 (general relativity), and MATH 401 (Green's functions).

Normally, the MATH department has very good professors. With 217 it can be a mixed bag. Dr. Ailana Fraser is the favourite, and Dr. James Colliander is not so popular due to his conceptual (example-less) lecture style and disorganization.

Doing well in this course paves the way to success in Fizz because of the ability to think geometrically and about objects in 2 and 3 dimensions. The applications are limitless if you know where to look, but beyond the basic computational ideas, you probably won't use it much if you do purely engineering work.

## MATH 255 - Ordinary Differential Equations

MATH 255 is the first in a sequence of 3 differential equations courses that you need to take (more if you decide to do the math minor!). Differential equations are the descriptors of nature; from the large scale to the small, almost everything in physics and engineering can be described by some kind of differential equation. Although that sounds really cool, this course isn't that great because its very formulaic. You learn to solve equations in certain forms and there isn't much creativity or imagination involved. This course builds on MATH 100 and 101, and also has certain connections to MATH 217 (exact equations, I'm looking at you!). Being good at this course is very useful when you move on to MATH 257 and 400, which are partial differential equations courses.

The course covers a variety of topics on solving linear and simple nonlinear differential equations, with applications mostly in simple harmonic motion or other simple mechanical systems. The profs for this course vary wildly year to year, so we don't have much to say about that. This course has content readily available online, so even if you get someone less than interested in teaching you, you shouldn't have a problem learning the material.

Unlike MATH 217, this material is sometimes used in engineering courses. Understanding RC circuits like in ELEC 204, or beam bending (the most tedious possible application of MATH 255) in MECH 260/360, and all the way up to control theory (MECH 466) relies upon a strong foundation in MATH 255. In addition to the engineering, PHYS 350, PHYS 304, and MATH 257 all use the linear second-order ODE (ordinary differential equation) part of this course, so learn it well!

## CPEN 221 - Principles of Software Construction

If your only other exposure to programming was in APSC 160, this course will be a huge jump in technical difficulty and workload. That being said, CPEN 221 is often cited as a crucial course for providing a solid foundation in coding ability. You will learn object oriented coding (OOC) in Java, writing specifications for software, unit testing, concurrent software, and other introductory software engineering concepts through multiple software projects (called MPs) done in partnerships.

Although a 4-month term is not sufficient to explore all these areas in depth, this course provides a solid foundation for learning more about software development and design in your time. Not only is this course great preparation for your first round of co-op interviews (if you're interested in software engineering positions), but being comfortable with coding is a generally useful skill to have for future projects (eg. programming your robot for ENPH 253!) throughout ENPH and beyond.

This course is also notorious for being the most time consuming and workload-heavy of all the second year courses. The projects are often lengthy and each introduces a new concept each time, and likely you will be teaching yourself Java along the way. Be prepared to spend a disproportionate amount of time on this course, but you will definitely appreciate what you have learned after completing the course. This course is taught by Professor Sathish Gopalakrishnan, who is always seeking to improve the course for students. Although most of the learning for this course is done outside the classroom while you work through the projects, the lectures can be useful for asking questions and getting clarification on software engineering concepts.

# Year 2 Summer Core

## MATH 257 - Partial Differential Equations

If you thought MATH 255 was recipe based and you learned how to solve only a few types of problems, but over and over again, get ready for a course that has even more of that. This is the second in the differential equations sequence, and it starts with a topic from ordinary differential equations before diving into partial differential equations. I was not a fan of this course because of how much it's a "turn the crank" style; there is no imagination involved, similar to 255.

In this course, you start off by exploring special functions which are solutions to particular differential equations found in mathematical physics (electromagnetism, quantum mechanics). Next, you move on to Fourier series, which are the most important topic in the course. You will use Fourier series EVERYWHERE. You will probably learn Fourier series again in at least 5 other courses (including MATH 307, ELEC 221, MATH 400, PHYS 301, PHYS 304), which is a testament to their ubiquity throughout the physical sciences and engineering. The rest of the course is centred around solving boundary value problems via the technique of separation of variables applied to three canonical examples: the heat/diffusion equation, the wave equation, and Laplace's equation.

This course is useful in PHYS 301 and 304 for its partial differential equations, and almost everywhere else for the Fourier series. It's a fantastically valuable skill to be able to think in the frequency domain. The most popular professor for this course is Dr. Anthony Pierce, but because this course is now taken in the summer, you probably won't get him; he normally teaches this course during the first winter semester. Sometimes, Dr. Ian Frigaard teaches this course, and I'm not a big fan of his math teaching; the work he does is in fluid mechanics and thus the course is barely a math course at all. It feels like an engineering course. We don't really have anything to say about other professors who teach the course.

## PHYS 250 - Introduction to Modern Physics

This course is terrible. I'm not sure if it's terrible because of its syllabus, professor, or inability to update any of its content *cough* homework sets, or all of the above. Despite being called "modern physics", this course is outdated in every single way. The course tries to teach the concepts of modern physics without going into any depth. This feels unsatisfying because you don't learn how to justify anything, and it is difficult to actually understand the concepts with all the hand-waving.

The course is almost useless because the quantum mechanics that is covered is done again, but much better, in PHYS 304, and the special relativity component is a review of high-school special relativity. Special relativity is done much better in PHYS 401. PHYS 250 also has some material about lasers, which you probably won't understand properly unless you take PHYS 402 (as an elective). This course is essentially pitched to a much weaker audience than is the Fizz crowd. It feels like a modern physics course for a non-physics major.

Dr. Oliver Steltzer-Chilton has been consistently teaching this class. His lectures aren't terrible, but he uses recycled slides (which are a big no-no for any physics class) and ancient online homework. You won't learn anything from either the lectures or the homework. The good thing is, you probably won't need to put much time into the course to get a decent mark. A true disappointment for the first physics class you take as a Fizzer.

## ENPH 270 - Mechanics II

I remember once that Andre said this course would be useful for robots because the movement of robot arms can be described using the movement of rotating bodies discussed in this class. I don't think that's true. This class is neither useful for PHYS 350 (applications of classical mechanics) nor an interesting extension of PHYS 170. The course covers topics like acceleration of rotating members and non-inertial reference frames. Unfortunately, it doesn't properly treat topics such as the Coriolis effect or other famous problems in classical mechanics.

The prof for this course is normally Dr. Michael Hasinoff, which some of you will remember from PHYS 158 as being rude from time to time. However, he is much better for ENPH 270 and respects you better than he did during 158. Unlike the other physics courses during this summer, he at least uses the chalkboard, but you do also have to do Mastering Engineering again… so make sure you save your accounts from PHYS 170.

## ENPH 257 - Heat and Thermodynamics

This course should not be called "Heat and Thermodynamics". This is not a good course, but what makes this course worse is that it doesn't live up to expectation. Most of us go into the course expecting to really master the thermodynamics that we didn't understand during PHYS 157, but this is definitely not the case. Instead, there are a bunch of disjoint topics, each of which is covered in no real depth, and none of which are evaluated in the homework or exams.

The course has two disjoint components: the lecture and the lab. The lectures are all over the place and one never feels like the course has a goal of what it wants to teach you. The lecture topics range from steam engines to the Earth to heat transfer in a rod to the Maxwell-Boltzmann distribution. There are also tutorials during which you will strengthen your MATLAB skills to solve some simple thermodynamics problems, and will expose you to some of the lab topics.

The labs are the more valuable but also more frustrating part of the course. The labs consist of heating up a brass rod, and then measuring thermal properties of it. The I/O and the thermocouples for measuring are unreliable and frustrating, but the modelling part is definitely easier because the heat equation is covered in MATH 257. The labs serve a decent introduction to experimental physics, but unfortunately, this is definitely not the most interesting area of physics to be doing experiments in.

The course is consistently taught by Dr. Chris Waltham, of whom many people aren't fans. The lab notebooks are generally marked very harshly, and he always uses slides, which destroy any physics lecture. Dr. Waltham can be a bit gruff at times. If you like acoustics, Waltham is the man to ask; when he came to UBC he was initially working in neutrino oscillations, but has since transitioned to musical acoustics research.

## ENPH 253 Introduction to Instrument Design

Now here is the big one, though it's named "Instrument Design" it should really be called ROBOTS!!!!!! While ENPH 259 begins your journey in ENPH, this is really the course that makes it all come together. Even years after completing the course you trade war stories with your partners and opponents about the ordeal you all endured.

In the lectures you continue the communication portion from ENPH 259 as well as learn basic concepts for building the robots. While the lectures are informative, the real meat of the course is the lab work. Though officially it's only 4 hours a week this in reality is a dramatic understatement for time commitment. The first half of the course is devoted to lab work which prepares you for the common errors you make during the build phase. Once the month of June is over it's full steam ahead for robots. This is where you pull the 12 hour days 5 days a week to desperately build a fully autonomous robot.

The course is "taught" by Dylan, Andre, Miti, and Bernhard but in reality this courses is 100% self taught. It is an amazing experience that truly gets your engineering brain working. Though if I can give one piece of advice, the best strategy is to spend more time on design then you think. The best robots I've seen were those that spend two week not building and just thinking about what could go wrong.

The competition changes year to year but current trends are towards obstacle courses with recent examples being Star Wars and Mission Impossible themed challenges. It's hard to overstate the magic of seeing your robot first score a point or even tape follow. To those taking this course next, good luck and I hope you have a great time.

# Year 3 W1 Core

## PHYS 301 - Electricity and Magnetism

This is the first real physics course you take in Fizz. In this course, you get to apply all the math you've learned so far (vector calculus, partial differential equations, etc.) to actual physics problems. It has a reputation for being very difficult, and I think that part of that is because many people are still not comfortable with the vector calculus from MATH 217, but don't worry, you'll soon get up to speed (by necessity) in PHYS 301.

A lot of this course may feel like repetition from PHYS 158, but this isn't so for the science students also in this class; it is more of a jump for them than it is for you. The topics that are covered are electrostatics (Coulomb's & Gauss's laws), magnetostatics, and a little bit of electrodynamics. The difference between this class and first year physics is that the approach is more advanced and, because you're equipped with more advanced math, the problems are more complicated. One of the new things is the method of images, which is a new way to solve electrostatics problems in the presence of conductors, and also using Laplace's equation in boundary value problems to find complicated potentials.

The prof for this course seems to vary year to year and seems to be getting better, but regardless of who it is, you'll need to solve problems on your own. The lectures generally have more theory and fewer examples than what you'll be used to, which means you'll have to solve more problems on your own. This makes the course much more enjoyable than other physics courses thus far, but also more difficult.

## MECH 360 - Mechanics of Materials

This course is essentially a continuation of MECH 260. Whether you liked MECH 260 or note you find the course quite a bit repetitive. It was once said that the course is "all the greatest hits of beam bending in MECH 260 but just slightly more complicated". The only truly new topic is the introduction of energy methods to solid mechanics as well as a discussion of buckling.

Despite it being ostensibly more difficult due to the more advanced subject year by year this course ends up being quite easy with minimal work with usually two midterms and a few assignments.

By the end of the course you have covered almost every chapter in Hibbler with only some very advanced topics saved for those who are hardcore enough to take MECH 460. The professor has changed each year but looking back on the last couple of year it has trended to either mediocre to slightly bad in terms of teaching quality.

Despite it being core for mechanical engineering it in fact is not that useful for mechanical work except for the section of buckling. The problem, as with 260 is that it is to theoretical to properly get into designing structures. However this might change very soon since the direction that mech is planning is to revamp the course to be more in alignment with 260 325 and 326 so that there is less overlap. For the time being however it is still essentially all the same things over again that you saw in 260 and will see in 325 and 278/279.

## MECH 325 - Mechanical Design I

If I had to choose one course that I think most fizzers would agree is bad I think with 80% accuracy would choose MECH 325. The course teaches you the beginnings of being a mechanical engineer by covering half of the legendary textbook “Shigley’s Mechanical Engineering Design”. You cover gears, flexible drives, bearing and fasteners as well as hydraulics. In a perfect world this material would be part of some the most fascinating lectures throughout FIZZ but alas we must live in reality.

The reason is the structure of how the material is taught. You have reading quizzes where you must memorize 50 pages of textbook in order to recall small useless facts and the group design assignments which always end up taking many hours to wrangle your team together. This is amplified by the teaching of Mr. Jon Mikkelson who has been with the course for the last 4 years. He tends to not prepare you for the exams and midterms and requires you to present the design assignments in the most useless of poster sessions. The calculation invole extensive reading and interpretations of tabulated values and equations all of which are empirical and have no physical intuition to satisfy our physics curiosity

Now if you are mechanically inclined it is possible to look past the course’s fault and appreciate the material as it is one the two most important courses for mechanical engineering (the other being MECH 326). Any design work you will ever do will involve this material and it is because of this that the course is here to stay.

### ELEC 221 - Signals and Systems

This course is useful not only in electrical engineering, but also in mathematics and physics. This is an introductory course to signal processing, which is an integral

In the past few years, students have been very disappointed by the professor, Paul Lusina, whose webwork is full of errors, among other things.

Honestly, Lusina is not that bad. I think people go into the course biased against him and they just carry on with their shittalk because it gives them something to complain about together and a source of blame for their own confusion. Lusina, while disorganized, was incredibly patient and receptive to our criticism, and dealt with basically being bullied and constantly hounded with emails trying to passive-aggressively point out every little error there was. And yet he would say things like “Thank you all for the continued feedback. I’m working very hard on improving the course”. Some of the lectures were bad but some of them were pretty good, and I feel like people just tried their hardest to be confused by little typos and errors that you could reason out yourself if you really tried to understand the material.

## Year 3 W2 Core

### APSC 278 - Engineering Materials

This course is the epitome of a waste of time. I can’t think of a single student who has a positive comment about this course other than “at least it’s easy”. It feels like a high-school course, but we’re in third year Fizz at this point. The only place where I could see it having any value is in first year, but, as it stands, the only lecture you need to go to is the midterm. There are very few courses from which I learned so little and paid so little attention, I might as well not have taken the course, but APSC 278 certainly falls into that category.

The course is a survey course of different areas of materials science and materials engineering. It starts out by discussing some high-school chemistry like covalent and ionic bonding. It also goes into a little bit of high-school physics when discussing resistivity, a little bit of PHYS 157 by discussing Young's modulus, and then finally some new(ish?) material when discussing crystal structures. Then, it goes into fracture mechanics, or, when materials break due to some loading. Next, it continues to phase diagrams (phase transitions, liquid to solid etc.), and heat treating. The last few topics are concrete (truly disgusting that we have to learn about this), polymers, and composites. I think there's a lecture on wood too.

Our former lab director, Jon Nakane, teaches part of this class, and he's fantastic, but not even he can make this course bearable.

## APSC 279 - Engineering Materials Laboratory

This course probably shouldn't even be worth 1 credit. You spend 15 minutes every two weeks doing the pre-lab quiz and post-lab quiz, then 2 hours performing an activity in a group of six, but only one student actually gets to do the activity. You probably won't have to do anything more than stand and watch for 2 hours. If you're sneaky, you may be able to sign your name on the attendance sheet at the beginning and then get out of there without losing attendance points.

## PHYS 304 - Introduction to Quantum Mechanics

This is one of the best courses I took. It was taught well and the material was fantastic. This course will remedy all of the disappointment of PHYS 250 and actually teach you how to solve simple problems in quantum mechanics. You will get to use all of your ODE and PDE knowledge, as well as be able to apply ideas from linear algebra. For some, this is the first time they really understand what vector spaces are all about.

The course begins by introducing the idea of a wave-function, then moves onto simple quantum mechanical problems in one dimension. Then, you'll get a taste of the mathematical formalism of quantum mechanics before moving onto three-dimensional problems and the angular momentum algebra.

A lot of the math that you'll see in this class also appears in PHYS 301, so that should be familiar to you. The differential equations in this class also crop up throughout physics, if you continue in this area. Most people agree that Dr. Marcel Franz is a very good prof. Although he's not the most exciting prof to listen to, he's very clear and he lectures straight from the textbook, so it is easy to follow along. Dr. Ariel Zhitnitsky is legendary with his "5 second question!"s, and his pace is too fast for some, but he will definitely make you excited about the subject. Dr. Jeff Young also sometimes teaches the course, and he usually gives a doozy of a final exam.

## PHYS 350 - Applications of Classical Mechanics

This course is really supposed to be good. I think it definitely is too, provided the right prof teaches it. This course is the last of your classical mechanics courses, and it really prepares you for more advanced topics in physics. It has a completely different flavour than your classical mechanics courses thus far. It has less number crunching (always a good thing) and more advanced math. This comes about from the Lagrangian formalism.

This course teaches the Lagrangian formulation of classical mechanics, whereby everything is represented with energies; there aren't nearly the same amount of vectors in this course as in PHYS 170 and ENPH 270. The course covers the basics of the calculus of variations and its applications to Lagrangian mechanics, coupled oscillators, small-angle approximations, orbital mechanics, the inertia tensor and rigid body rotation, and if you're lucky, you might get to Hamiltonian mechanics and canonical transformations.

Sometimes, there is a project associated with the course in which you'll work in groups to do an interesting simulation or something else approved by the instructor.

## MATH 305 - Applied Complex Analysis

This is one of the coolest courses in Fizz. In this class, you extend your knowledge of calculus to functions of complex variables; the domain is now two-dimensional! This has certain analogies to multivariable calculus, but the structure of the complex plane is different from the structure of the two dimensional real numbers. What this allows is really strong theorems that can be used for things from solving PDEs to evaluating really weird integrals.

## MATH 307 - Applied Linear Algebra

This course suffers from the problem of too many topics at once. You learn some important concepts that expand on the introduction from MATH 152. The problem is that there are so many things introduced that there is not enough time to cover anything in detail. The workload is typically quite low with it being on par with any of your standard 2nd math courses. The professor has changed every semester and no one has gotten glowing reviews. I think that in general the course isn't well organized with the topic varying wildly for pure theory of matrix subspaces to solving chemical equations by row reduction. Additionally you have to write Matlab by hand APSC 160 style which isn't fun. I think the course is useful but it still is frustrating to complete.

## MECH 280 - Introduction to Fluid Mechanics

If there are two branches of classical mechanics with stuff involving particles and solid bodies on one side the other side involves continua mechanics, or the mechanics of flow and large number of particles. This course is the first introduction to the field continuum mechanics through fluids.

You start by reviewing basics fluid properties that were covered in PHYS 157 then you go into the momentum balances and dynamics before learning the most important equation in the subject, the Navier-Stokes. After this it depends on the professor, in years gone by under Dr. Frigaard topics including scaling and pipe flow were discussed at the end but under Dr Elfring it seems that the content has gotten more theoretical.

Unfortunately as the course is an introduction there is not many applicable topics covered and it really becomes the stepping stone to 380 if you want to go deeper into fluid. However all things considered this course is generally considered to be good and does what it sets out to to introduce the wild and wonderful concepts of fluids mechanics and this respect it is a success.

### CPEN 312 - Digital Systems and Microcomputers

TODO

## Year 4 W2 Core

### MECH 466 - Automatic Control

TODO

### ELEC 341 - Systems and Control

This course is more or less a direct continuation of ELEC 221. Besides reviewing signals & systems, the Laplace transform, and working in the frequency domain, it covers system modelling, state-space models, feedback, second-order systems, and stability.

Despite being a 4 credit course, the workload is not at all intense. Homeworks are optional (though helpful for the midterms), and there are three midterms (with your two best scores taken for marks). A final project is offered but is optional.

The course does deliver on its promise of teaching you systems and control, but can be quite frustrating. Similar to ELEC 221, it takes a mathematical approach to describe its content but doesn't dive deep enough into the theory to satiate the curiosity of many Fizzers. You also don't go into very real-world examples, which can make it challenging to find the concepts applicable. Those who have taken the course and will go on to work with control systems later will have a decent idea/background about how a system might be designed, but will need to learn the next steps and how to implement such a system themselves. The final project involves working with Simulink, which might help remedy the skill gap.

The course has been taught for the past few years by Dr. Edmond Cretu in the second semester. He is not a terrible lecturer and explains the concepts relatively well, but it can be a struggle to maintain your attention through the 2 hour lectures. It is much more effective to learn the material on your own time, as the pace of the course can also be very slow.

Overall, the course provides a sufficient background in control theory, and would be helpful to those who would want to take electives further into the subject such as ELEC 441. However, those aiming to just fulfill the program requirements might take more out of MECH 466.

### MATH 400 - Applied Partial Differential Equations

TODO

### PHYS 401 - Electromagnetic Theory

TODO

### MATH 318 - Probability with Physical Applications

TODO

### ENPH 459 - Engineering Physics Project I

TODO

## Year 5 W1 Core

### MATH 406 - Numerical and Approximate Methods in Applied Mathematics

This is a great course, out of all the options for the numeric methods requirement this one has the most positive reviews post completion. It essentially condenses both MATH 405 and MATH 401 into one course (217 style) to form a better version of both of them. You learn interpolation and integration and other fundamental numerical methods as well as Green's functions and calculus of variations. The most important part though is combining the two subjects to do genuinely beautiful mathematics.

The workload in tough with being the hardest I ever worked in a MATH course but there is no midterm of final which makes up for it since it is easy to get above 95%. This course is fundamental for any engineer or physicist since it teaches you the way FEM works or how to solve any general 2nd order linear ODE. In the end all the topics covered are useful in some ways.

The course the brainchild of Dr. Anthony Peirce, he teaches it every year and designed specifically for ENPH students to take and who once said that Fizzers were his favourite students. He is a fantastic prof and manages to make every lecture and homework to be enchanting.

If I haven't made it clear enough above this is a fantastic course and that if you have the opportunity to take it I cannot recommend it enough.

### MATH 405 - Numerical Methods for Differential Equations

TODO

### PHYS 410 - Computational Physics

TODO

### APSC 450 - Professional Engineering Practice

TODO

### ENPH 352 - Laboratory Techniques in Physics

TODO

### ENPH 479 - Engineering Physics Project II

TODO

## Year 5 W2 Core

### PHYS 403 - Statistical Mechanics

TODO

### PHYS 408 - Optics

TODO

### ELEC 301 - Electronic Circuits

TODO

### ELEC 481 - Economic Analysis of Engineering Projects

TODO

### MECH 431 - Engineering Economics

TODO