A Guide to Your Professors and Courses

For the New York University Physics Major

1 Overview

This guide is intended as a sort of flotation device for the NYU physics major trying to navigate the waters of our curriculum. There are many courses offered by our department and only a limited time to take them. Therefore it is vital that you all have the best information to make the most out of your time here. You might not have time enough to take every course and so you should know exactly what you are getting yourself into when you decide on a schedule. All of the courses have their merits and all of the professors have there strengths. So sit back, get all the information, and make an informed decision for yourself. It is also important to note that for many, if not all courses, you will only have the option to take it with one professor.

There are several writers who contributed to this work. They are all identified in each of their reviews.

Writer 1: I am a graduating senior and I thought it would be a good idea to create this resource for future generations. I have gotten a lot out of the physics major and I hope my experience can help people in the future. I have recently accepted a position to attend UC Davis for experimental cosmology.

Writer 2: I am an NYU Physics Alumna, now attending graduate school in Physics and Astronomy at UC Berkeley. I took most of the courses listed here during my time at NYU.

Writer 3: This writer was a triple major in physics, mathematics and computer science. He is now a graduate student at University of Illinois Urbana-Champaign studying Astrophysics and Cosmology.

Writer 4: This writer was a physic major who went on to physics graduate school for condensed matter at University of Pennsylvania.

Writer 5: I am a graduate student at McGill. I do astro-particle physics.

Writer 7: Hi, it's me Iraj.

Writer 8: A rising NYU senior.

Writer 7919: This writer is a physics major who went on to study biophysics at UC Berkeley.

Writer 14: This writer aspires to be writer 7 and is additionally trying to explore all possible undergraduate states while interfering with herself along the way.

Writer 601 : This writer is a Physics and Computer Science Major.

2 Professors

This section is here to describe the individual style and methods of each professor as seen from the perspective of specified majors. May it serve you well.

2.1 Andre Adler

Courses: General Physics, Practicum in Teaching Physics

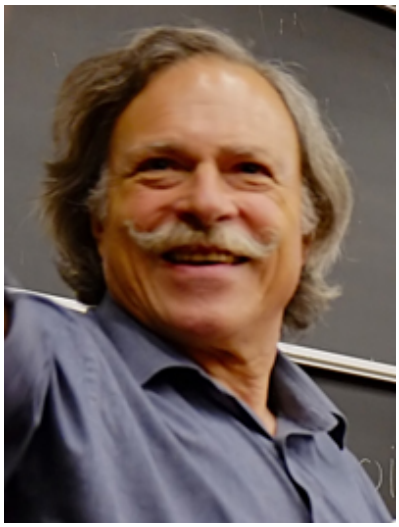
Writer 1: Adler generally only teaches General Physics so, as a physics major, you will probably never have him as a professor. He is a nice guy though and is usually nice to talk to. He has been at NYU since he was an undergraduate, so he knows the ins and outs of the department like no one else.

2.2 Michael Blanton

Courses: Astrophysics, Dynamics, Observational Astronomy

Writer 1: Blanton lectures using a sort of Socratic dialogue where he will ask and guide students through questions to present the material. This does mean that he will take attendance in that you must be there to be recognized when he calls your name. It also means that he really cares that his students learn the material.

2.3 Paul Chaikin



Courses: Physics II, Introductory Experimental Physics II, Condensed Matter, Solid State Physics

Writer 1: Chaikin is a gifted teacher who will take any course he is given and teach it at a level that keeps the material advanced and for the most part interesting. This often means his classes aren't easy but they are definitely worth taking. An example of this is when he used Purcell's, *Electricity and Magnetism* to teach Physics II. It is worthy of note that he understands the difficulty of his material and won't be too unjustly punitive to students grade-wise. I had him for condensed matter which had very challenging and rewarding problem sets. The lectures sometimes focused on minutia but at times were very informative.

He also is very good at calibrating exams to have the grade distribution he desires, which is of course a Gaussian centered around 50%. In an experimental class I took with him we had a take home midterm and he knew that members of the class had violated protocol and worked in groups simply from the statistical abnormality in the grade curve.

2.4 Kyle Cranmer

Courses: Physics I, Introductory Experimental Physics II

Writer 1: Cranmer has a gift, but unfortunately it isn't teaching at a basic level. He is also a talented researcher with a deep understanding of physics. He just isn't that great at conveying that deep understanding to intro students. I'm not saying his basic classes or exams are difficult, quite the contrary. But be prepared to learn the material on your own time. Mostly I think what makes him a great physicist is that he thinks about physics in a different way than other people and so his explanations of physics often fall flat.

Writer 7: Professor Cranmer made a bad first impression on me. He taught the introductory experimental physics lectures for my second semester, and many

people did not like that class too much. The problems with it were twofold: the class itself had an ill-defined curriculum to begin with, so the class did not have a set direction for most of the semester. Second of all, I later found out that Professor Cranmer's strengths are more evident in advanced classes. If you have the opportunity to take a graduate level class with him, he becomes a lot more coherent. Professor Cranmer taught two of the lectures in my graduate Particle Physics course, and he gave great insight into the world of statistics and experimental particle physics.

He also always hums a silly tune when he erases the chalkboard, which is funny.

2.5 Glennys Ferrar

Courses: Electricity and Magnetism, Astrophysics

Writer 8: Glennys is a really great researcher and does put in some effort to meet her students, hear their opinions, and just generally get to know them. However, her lectures were often confused and she didn't seem to have prepared much material, getting easily tripped up on simple questions. Also, she was inflexible with her homework assignment dates and often assigned questions that had serious flaws.

2.6 Marc Gershow

Courses: Physics III, Statistical and Thermal Physics

Writer 1: Gershow is good teacher who does his best to keep classes upbeat and interesting. He is also a fairly generous grader and writes some interesting problem sets. He also adheres to a fairly strict definition of how things should be done. This is not necessarily a bad thing in a professor who is there for you to learn from.

Gershow also reads a lot of novels, especially science fiction. It is often fun to talk to him about books or to get recommendations from him.

2.7 David Grier

Courses: Physics I, Quantum Mechanics, Statistical Mechanics

Writer 1: Grier has mastered the art of lecturing. His enthusiasm and love for the subjects he teaches is infectious and is in no small part responsible for the increase in the physics major retention rate over the last few years while he taught Physics I.

When you watch Grier teach, it seems almost like you are being told a story full of information rather than being lectured to. He also uses props and fun anecdotes that make the journey even more enjoyable.

I would recommend any course taught by David Grier.

(P.S. He also has great board work. He always erases vertically because it contrasts well with writing than horizontal erase strokes.)

2.8 Alexander Grosberg

Courses: Statistical and Thermal Physics, Condensed Matter Physics, Soft Matter

Writer 4: Grosberg is an artist of lecturing. His board work is the gold standard all other professors should strive towards. He will begin every lecture at the top left of one board, finish the lecture at the bottom right without erasing anything in between. He has been teaching these courses for long enough that he does not use notes, his grading scheme is set in stone and he has perfected the answer to any question. Grosberg encourages his students to ask and answer questions and then fluidly works in those answers into his lecture material.

His grading scheme is tuned to be fairly generous, but only because his problem sets are extremely difficult. Grosberg teaches advanced material and often does so without following any particular book. His lectures are elegantly simple but you will often

find that the problem sets take many hours to get something even approaching correct. Much of your learning will take place on the problem sets, applying the basic principles Grosberg covers in class in practical ways. The class is hard, particularly if you want to get above a B, but you will learn way more than you thought possible doing so. Getting an A in a Grosberg course almost certainly makes you an expert in that subject.

2.9 Andrei Gruzinov

Courses: Electromagnetism, General Relativity, Quantum Mechanics II

Writer 1: For Graduate General Relativity, Gruzinov had a very particular class structure. It centers around that he calls "shotgun grading." This entails students being randomly selected (or volunteering if you're brave) to present questions from that week's homework in front of the class. This structure has great advantages as it encourages students to work together and make sure that everyone understands the material. It also prepares students for speaking in front of a class, which is an extremely important skill.

For Graduate E&M he taught the class slightly differently because there were so many people. The homeworks were graded and there was a midterm and final. The tests are graded out of 5-8 points and he only grades the answer, not the work.

Gruzinov teaches extremely difficult material and his classes are correspondingly difficult. Since he usually teaches field theories he almost always uses Landau-Lifshitz, Vol 2: *The Classical Theory of Fields*. Lectures are usually supplementary material to Landau that assume you have already read the text. Whatever he's teaching, it won't be an easy class, but it will be a fun and memorable class.

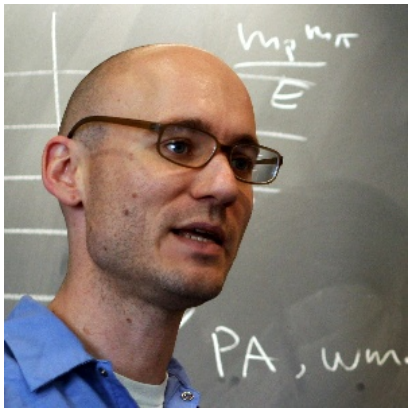
2.10 Andy Haas

Courses: Advanced Experimental Physics, Computational Physics

Writer 601 Had him for Computational Physics (undergraduate version 2016). Classes were small, 8 people per class. While the syllabus structure was well designed to cover a lot of subjects, classes themselves were very amorphous, and did not go much into any kind of understanding. Instead classes focused on getting an experience of many different topics you can pursue yourself if interested. Lessons often seemed to be ad-hoc, and designed to complete the syllabus not to provide an understanding. In class he would demonstrate his own simulations, but was often unable to actually help students to achieve an enough of an understanding to reproduce similar results - personally, I would always implement it a different way from him. Most of the learning that occurred was through doing homeworks.

2.11 David Hogg

Courses: Physics I, Electricity and Magnetism II



Writer 2: Amazing teacher. One of those professors that convinces you to be a physics major. We need people like him teaching Physics 1. You can tell when he teaches that he really loves the material, which translates to enthusiasm. In Physics 1 every exam question will be a variant of a problem you have done in class or on the homework, so make sure you really understand everything you've done. For E&M 2 be prepared to learn all of the useful bits of Jackson. Also be prepared for Hogg to make up the course as he goes along. You get the sense that he assigns problems he would like to know the answer to, so might as well make his students do it.

2.12 Andy Kent

Courses: Physics II

Writer 1: Kent provided good and thorough explanations for the material in Physics II. He was always interested in what he was teaching and really cared that the students understood. He was excellent at answering questions during lectures and made the transitions smoothly between planned and improvised lesson planning.

One of his fun quirks was that he often would have a beverage and, mid class, raise it to his lips then put it back down without actually taking a sip and carry on with his lecture.

2.13 Matt Kleban

Courses: Quantum Mechanics, Quantum Field Theory

Writer 1: Kleban is a very talented professor and educator. He presents complex information in a clear manner that was extremely helpful. He gives problem sets which are very informative and guides you through the course material. His hints on the homework tend to be less helpful but the questions themselves are great. However, the thing that I think shines brightest about his skills as a teacher were his exams. All the questions on his tests were very well formatted so that if you had sufficient understanding of the material then the test was doable or even trivial, but if you didn't understand the concepts, then you would be hard pressed to solve them. He does not allow a formula sheet but his tests were presented in such a way that that you would never need one if you knew what you were doing. This does not mean the tests were easy, or even fairly

graded, but merely that they were a very well-made gauge of understanding rather than memorization.

Writer 5: Prof. Kleban is a phenomenal teacher. A class he teaches is probably a class worth taking. He is very good at tailoring his lessons to his students and can typically answer any question at the level that it is asked - this makes a lower-level class more tedious and an upper-level class much more interesting. Kleban problem sets/tests are a learning experience and you can sometimes feel the light bulb go on in your head. They are also a constant reminder that you are still learning and know very little, which is good to get used to if you plan to continue doing physics. I had to miss a Kleban class once and Im still upset about it.

2.14 Andrew MacFadyen

Courses: Introduction to Fluid Mechanics, Computational Physics

Writer 1: MacFadyen is a competent professor, lecturer, and researcher. His lectures were always clear and informative. I will say that his tests did leave something to be desired as they often emphasized memorization over understanding. I also kind of wish he had taught our fluid dynamics class with an emphasis on programming from the get go. We did do fluid programming at the end, but I think that the concepts in his course were very accessible from a programming perspective and that his skill as a teacher was much more impressive when teaching programming.

Writer 2: His computational class is extraordinary. It will be mostly project based and will put you in a position where if you put the effort in you could be ready to jump into computational research at the end of the semester.

2.15 Tim Maudlin

Courses: Philosophy of Physics

Writer 1: Tim Mauldin believes in the hidden variable theory of quantum mechanics. It's a view that many physicists considered before the 1960's, including Einstein. While this theory has been widely considered to be invalidated by Bell's Theorem, it still might hold true if you don't mind losing the predictive nature or locality of quantum mechanics. Philosophically this might not be a problem.

Mauldin is a professor of philosophy, so if you go in for that sort of thing then you should consider taking his course. You won't even be expected to do difficult math.

2.16 Allen Mincer

Courses: Introductory Experimental Physics I

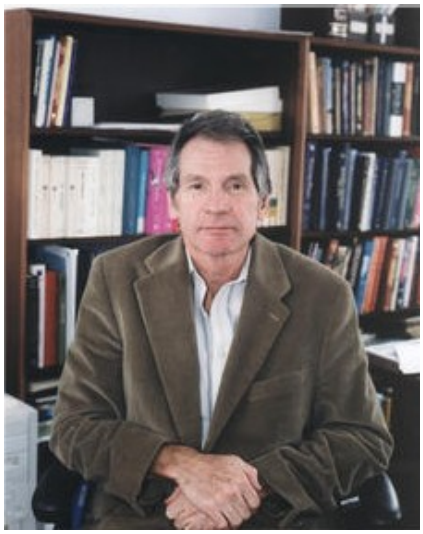
Writer 14: Allen Mincer is a kind hearted soul who I have never in my undergraduate time caught not smiling. Professor Mincer was in my experience excited about any topic that was covered throughout Introductory Experimental Physics I, whether it be computer science, error analysis, or the long list of etceteras. Mincer is particularly good at breaking down seemingly abstruse concepts to their basis for students who have never seen them before, while simultaneously understanding that some students are seeking more interesting flairs to the topics at hand, and is sure to include entertaining, seemingly planned tangents. With Allen Mincer, you need not expect any wild turns and tricks thrown at you, what you see is what you get, and overall I would say he is a fair Professor when it comes to both examinations and grading. In regards to an introductory course, I would highly recommend Allen Mincer as a professor.

2.17 Frank Moscatelli

Courses: Physics III, Intermediate Experimental Physics I, Classical and Quantum Waves

Writer 1: Frank is entertaining to say the least. He will intermix jokes into his lectures that make them enjoyable. That being said, I am not sure that his lectures really granted too much additional insight into the subject matter than the derivations in the text he used. This is still useful to someone who learns better through lectures rather than text and of course he is also able to answer most questions in class. We have had complaints about the courses he teaches, but this is partially because of the quantity of courses he was teaching at the time. If you have any one professor for all of your classes for over a year, that is a problem.

2.18 Peter Nemethy



Courses: Readings in Particle Physics, Electricity and Magnetism II

Writer 7919: Peter Nemethy is a good lecturer and a very likeable person– the thought of him smiling sadly at an empty room will be an effective motivator for you to get out of bed and attend every last 9:30 session. His classes tend to move a little on the slower side, which makes them a welcome companion to an otherwise heavy course load. (You may be disappointed, however, if your other classes are also light.) Overall, Nemethy is excellent at teaching, and while you won't always be challenged, you will always learn.

2.19 David Pine

Courses: Introductory Experimental Physics I, Classical and Quantum Waves

Writer 1: Pine has a vision for what the physics curriculum should be and went above and beyond to make it a reality–writing his own comprehensive textbooks and designing his own courses. That being said, his courses have seemed to suffer without him there to teach them. Other professors either don't really seem to understand the need for the courses or simply don't know how to navigate the text book errata like Pine does (which makes sense because he wrote them).

Pine is a great lecturer, able to keep a class' attention very well. His python manual is an invaluable resource that I use to this day.

2.20 Josh Ruderman

Courses: Electricity and Magnetism, Particle Physics

Writer 1: I had Josh on his first semester at NYU for E&M. He showed us that he is a capable professor who understands how to teach beyond the book. One of the most notable features of his class was his concise board work. Every lecture was predicated with a clear summary of what it intended to teach, which made the classes easy to follow and allowed for the planned preparation of questions. His exams were very concept oriented and required a good understanding of the subject while not being exceedingly difficult.

2.21 Tycho Sleator

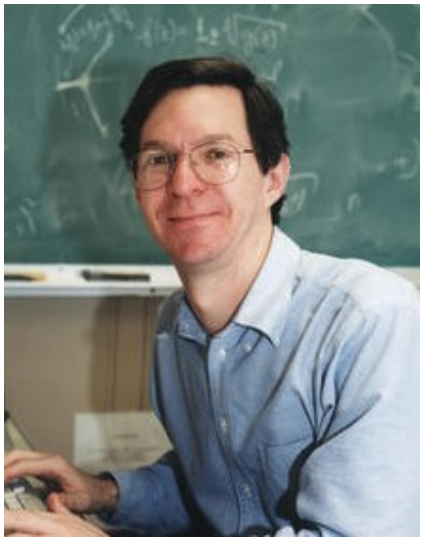
Courses: Advanced Experimental Physics

Writer 1: I think the experience I had that most sums up Tycho is when a friend and I were freshmen and walking up the stairwell. Tycho comes bolting down passed us and says, "There are cookies in 424!" And a few moments later I feel my phone buzz as I receive an email telling me the same.

Tycho is a generous teacher and seems to have a very good outlook on life. One time it was time to hand in our lab report for Advanced Lab and I asked Tycho if he wanted the report now or at the end of the class, and he said, "How about the end of the week?" Best unintentional extension ever.

Tycho also possesses a hand held time machine that allows him to travel the eons and learn valuable life lessons about family and the perils of forcing high expectations onto children.

2.22 Alan Sokal



Courses: Dynamics

Writer 1: Sokal is a professor who gained a great deal of renown due to the Sokal Affair where he simultaneously exposed a lack of integrity in social scientific journalism and reminded social scientists why they don't like physicists.

Sokal was a fantastic instructor. His was the only 8:30am class for which I ever recall being excited. His explanations of new concepts were clear and to the point. It also helps that Lagrangian mechanics was the first truly perspective changing concept I encountered in the Physics major, but his class really encouraged me to pursue physics further. He generally taught out of assorted books but would supply printed out copies of necessary materials to each student. This was sometimes disorganized but compassionate to the student as we would have

had to buy many books. His problem sets were some of the most difficult and most rewarding I had encountered to that point. Working through his homework definitely provided you with an understanding of all the material you needed to know.

The only downside to a Sokal course is that he does not really curve the course. He might drop an exam grade here and there but that isn't really the same thing. His tests are generally open book and open note but this too is not necessarily a good thing. His tests are challenging and they expect you to compute answers which on the homework probably would have taken you twice as long. I would encourage students to take classes with Sokal. He is an insightful professor and a delightful person (even if he thinks falsifiability is wrong which is weird).

2.23 Andrew Wray

Courses: Quantum Mechanics II

Writer 7: Chaim Weizmann, the first president of Israel, once sailed across the ocean with Albert Einstein. On the voyage, Einstein tried to explain the theory of relativity to him. When asked about this later, Weizmann reportedly said "I did not understand his theory, but he certainly convinced me that he did."

I took Quantum Mechanics II with Wray. I did not understand what he was trying to teach, but he certainly convinced me that he did.

2.24 Alexandra Zidovska

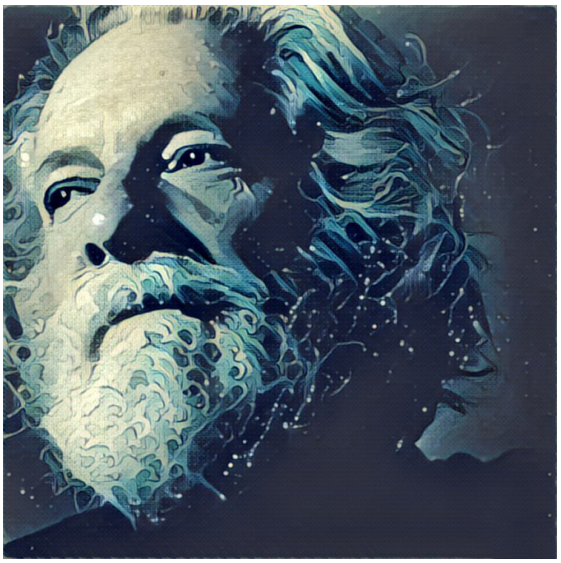
Courses: Biophysics, Physics II

Writer 1: Zidovska is a very energetic lecturer who seems to really enjoy the subjects she teaches. In her Biophysics class she mostly taught from powerpoint presentations with accompanying handouts. While this is not the most engaging format the material presented was interesting enough to retain my attention. Her homework was different than most classes and mostly entailed reading and analyzing to scientific papers. This made

grading a little more subjective but also was
a good way of simulating an important part
of working as a scientist. The midterm and final were a paper and presentation respectively. Oral presentations are an important part of being an academic that are not nearly emphasized enough. Zidovska does a good job of bringing some of the less focused on, but no less important parts of being a physicist to the foreground. She also sometimes teaches underclassmen classes such as Physics II. I'm sure that in these she has a different teaching style but the same enthusiasm.

2.25 Dan Zwanziger

Courses: Mathematical Physics, Dynamics, Introduction to Fluid Dynamics, Quantum Field Theory



Writer 1: Zwanziger will teach you Quantum Field Theory in the same tone, and as if it was the same difficulty as the definition of a vector. He is an entertaining and engaging professor. I'm just not sure he ever fully understands what the class understands. An example of this is when he gave us a lecture in Math physics assuming we were all comfortable with Einstein summation notation (a topic that had yet to even be introduced to us) but spent a great deal of time going into detail on how to solve an exponential integral. I think the reason for this is that all of these concepts are things he has known and understood longer than any of us have been alive, and therefore to him, QFT and integration by parts are equally mundane. I hope to someday have that kind of understanding.

This also shines through on his exams. His exam questions can be as trivial as finding the slope of a line, or virtually impossible without a deep understanding of the subject. That is not to say that they are bad tests, merely that they vary wildly.

When he taught me QFT, his homework was not collected or graded (and no solutions were available. I believe severely hampered my ability to learn the material, compared to if I received actual feedback (or even eventually figured out if my solutions were correct).

3 Courses

* denotes a required course

3.1 Physics I*

Writer 1: Physics I is an introduction to Newtonian mechanics for the new physics major. The class varies greatly based on who is teaching it. The common wisdom is that if you can only skip Physics I but not Physics II then this class is still worth taking to keep up with your peers. However, if you can skip both Physics I and II then you might want to consider doing so.

With Professor Grier, the class uses *University Physics* by Young and Freeman and is taught in a standard lecture format with homework assigned from Y&F, a recitation section, and tests written by the professor. The tests are generally received as challenging but fair.

With Professor Hogg, the course is taught slightly differently. He employs the modeling method approach to teaching physics where students are given the tools for solving physics problems such as dimensional analysis and then given assignments that lead them towards a conceptual understanding of physical concepts. Hogg does not always use a text for this class and so writes his own assignments and tests. The modeling method of course has mixed reviews from students but in the end prepares them for their journey as a physics major.

3.2 Physics II*

Writer 1: Physics II is an introduction to electricity and magnetism for second semester physics majors. It is kind of like an E&M class without the actually necessary calculus.

With Professor Kent the class was fairly standard. There was a recitation, weekly problem set, one midterm and a final.

3.3 Physics III*

Writer 1: Physics 3 is kind of a catch all for all the basic things you didn't learn in Physics I and II. This includes optics, thermodynamics, wave equations, etc. It is generally a course where the material will be revised in later classes.

3.4 Introductory Experimental Physics I*

Writer 1: The NYU physics major is unique for its devotion to lab courses. We have five lab courses in our sequence which is more than basically any other university. This has sometimes been criticized as a little bit of a waste of time, but it is also one of our greatest

strengths. The labs do need revision, but ideally our lab sequence prepares us for the world of experimental physics extremely well.

When taught correctly this course can be very informative and a great deal of fun. It is divided into a lab and lecture section. The lab section is a pretty simple physics lab, similar to ones you might have had in high school. The lecture section usually focuses on error propagation and also serves as an introduction to python programming.

3.5 Introductory Experimental Physics II*

Writer 1: This course varies wildly. The lab section is standardized, but the lab manuals often have errors and are sometimes unclear. Make sure you understand what you are supposed to be doing in the labs. The lecture section completely changes based on who is teaching it and has no standardization. Any given professor teaches whatever they want which can have varying outcomes for the students.

3.6 Intermediate Experimental Physics I*

Writer 1: See Introductory Experimental Physics II

3.7 Intermediate Experimental Physics II*

Writer 1: See Introductory Experimental Physics II

3.8 Advanced Experimental Physics*

Writer 1: Advanced lab is one of the better lab courses offered. This time you are given four weeks for each lab which actually gives you the chance to fully study and understand what is going on. Additionally there is no lecture section.

3.9 Classical and Quantum Waves*

Writer 1: CQW is a hallmark of the NYU physics degree for better or for worse. Originally the brainchild of David Pine, this course is an in depth study of harmonic oscillators and really brings home the idea that everything is a spring. EVERYTHING is a spring. Without Pine the class sometimes suffers as the textbook is incomplete and written by Pine, so while he knows the parts which need to be reinforced in lecture and where the book needs to be clarified, other professors might not. It is also a little bit of a silly quirk of the NYU major

3.10 Mathematical Physics*

Writer 1: This class is basically a compilation of a bunch of little math concepts outside the realm of the required Calculus courses but still necessary to the physics major. Some of

these concepts are briefly looked at in the math major but many are not. There are many subjects in this class as simple as notation that you might have a hard time learning if you avoid this class.

Writer 3: Can be excused from if pursuing math degree as well .. but seriously consider whether you'll get the same practice. It might be worth auditing.

3.11 Quantum Mechanics*

Writer 1: Quantum mechanics is one primary fields upon which all modern physics is based. As such it is a required class and rightly so. It can vary based on who is taking it, but you have to and it is incredibly informative.

3.12 Quantum Mechanics II

Writer 1: This class teaches some of the higher level QM topics. It is definitely useful material especially if you plan to attend graduate school. Historically however, it is not guaranteed that taking this course guarantees that you will learn the material. This is largely based on who is teaching the course.

3.13 Electricity and Magnetism*

Writer 1: This is a pretty fun course with most professors. It is your first real field theory class even if it isn't taught as one. Not only is it useful because it covers one of the most fundamental forces of reality, but the math involved is especially useful for later classes such as GR.

3.14 Electricity and Magnetism II

Writer 1: This class isn't always offered and you usually need to petition to get it. It teaches some of the higher level E&M concepts and might be useful. However it is worth noting that you will likely be able to take graduate Electromagnetism instead which teaches a lot of the same material but at a higher level. I especially recommend this option if Gruzinov is teaching the class, but I am biased.

3.15 Readings in Particle Physics

3.16 Dynamics

Writer 1: This class is not technically required for the major but it should be and is a *must-take* for anyone looking to go to physics graduate school. This is the only course in the

curriculum that properly introduces and explores the Lagrangian and Hamiltonian formulations of mechanics, both of which are absolutely essential knowledge for a full theoretical understanding of physics.

3.17 Statistical and Thermal Physics*

Writer 1: Another required class that if pretty useful for higher level classes. The statistical side of physics is extremely important and is at the basis of what is probably most of physics research today.

3.18 Quantum Information and Quantum Computing

3.19 Condensed Matter Physics

Writer 1: This class is usually taught by Chaikin. It covers a lot of material across the field of condensed matter. It was at times very difficult and challenging. It is taught at a relatively high level and requires knowledge of statmech, CQW, and QM.

3.20 Solid State Physics

See Condensed Matter Physics

3.21 Introduction to Fluid Dynamics

Writer 1: This class varies wildly year to year mainly because it oscillates between the physics and math department every two years. I took it in a physics year and it was fairly enjoyable. Fluid mechanics is a valuable subject that really isn't covered elsewhere. If you don't take this course you should at least read about fluid mechanics somewhere to see if you are interested.

3.22 Philosophy of Physics

"I am convinced that the philosophers have had a harmful effect upon the progress of scientific thinking in removing certain fundamental concepts from the domain of empiricism, where they are under our control, to the intangible heights of the *a priori*." - Albert Einstein

3.23 Astrophysics

Writer 1: Astrophysics is a general introduction to the ideas and topics of astrophysics. It is sometimes a little less in depth than I would have liked, but if I had taken it as a sophomore it would have been very enjoyable.

3.24 General Relativity

Writer 1: I took the Undergraduate version of this course with Patrick Cooper who is no longer at this university and the graduate version with Gruzinov. General relativity is probably my favorite higher level physics course. It teaches you Einstein's theory of gravity through differential geometry. It is extremely complex and you will definitely learn a lot. You should probably take dynamics and E&M before GR but you can probably get by without it. some people have.
Writer 2: You should **definitely** take E&M and Dynamics before GR. As writer 1 says it is possible without it but then you are focused on catching up on the field theory aspects of mathematics instead of giving yourself time to understand one of the most difficult topics faced by a typical physics undergraduate. Because of this some professors will not let you take GR until you complete the pre-reqs.

3.25 Quantum Field Theory

Writer 7: Taking Quantum Field Theory is an exciting prospect for many undergraduates. These days, if you want to do high energy theory in graduate school, it is becoming more and more expected that you will have taken a year of quantum mechanics and at least a semester of QFT. The problem is that there are few good ways to prepare for it as an undergrad. It is a second year graduate course, so they will expect you to know grad QMI and II, graduate E&M, graduate Dynamics. The course moves fast and the professors often do not spend too much time grading homeworks or giving pedagogical help.

But there are a few ways to soften the landing: taking both semesters of quantum in undergrad, taking the class with a friend, and preparing over the summer before QFT1 by thoroughly reading a graduate quantum text (like Sakurai). I found that General Relativity/E&M helped a lot too, because they made me more comfortable with concepts like Lorentz invariance and tensor gymnastics. Of course, a strong understanding of classical field theories in Lagrangian formalism would be useful too (read Landau volume 2, at least the first few chapters). Even with all this help though, QFT will still make you feel pretty dumb. The trick is to remember that most of the people who you see doing it every day have taken the sequence several times. You are taking it for the first of many times, and it's okay if some of the topics go over your head. Grad courses rarely fail people, but it's also not likely that any undergrad will get an A in this course, so be ready for that too. The course is fascinating though, and if you are at all planning on doing particle physics you will have to learn this stuff anyway, so take it!

3.26 Observational Astronomy

Writer 2: This class can be a lot of fun but really isn't for the major. Learn the basics of how telescopes work, astronomical distance units, and a little bit about the astronomical

objects you can see from Manhattan. Which there are not very many of. This class has a lecture section as well as a lab where you go onto a rooftop and attempt to see stars and planets through a telescope through the light pollution. Not very useful in the long run, but can be fun if you're looking for credits or a GPA boost. This class also counts toward the astronomy minor.