

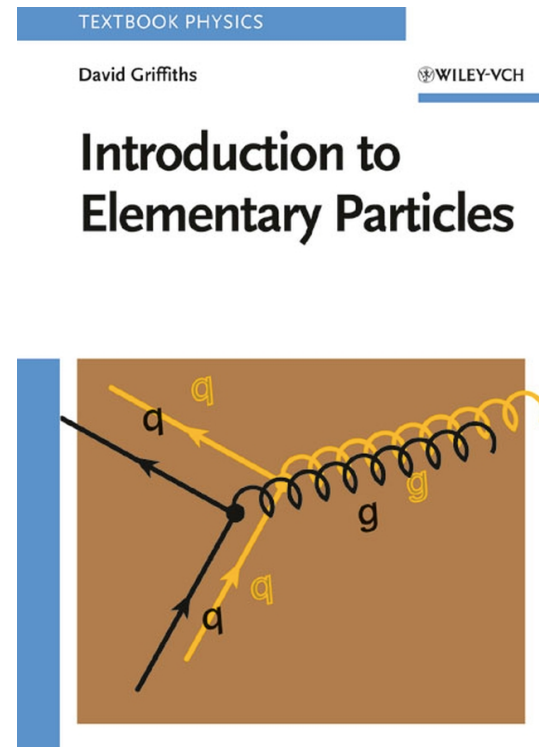
Welcome!

Physics 684: Introduction to high energy physics



Some practical information

- We meet here, La Tourette 201, Mondays and Wednesday, 1230 pm - 145 pm
- Griffiths Introduction to Elementary Particles is the required text
 - Expect a good, basic knowledge of quantum mechanics, though we'll hopefully cover everything you need to know
 - Plan on following the book quite closely, with some important exceptions (see next slides)
 - Useful formulas and equations and information in appendix at back of book cover

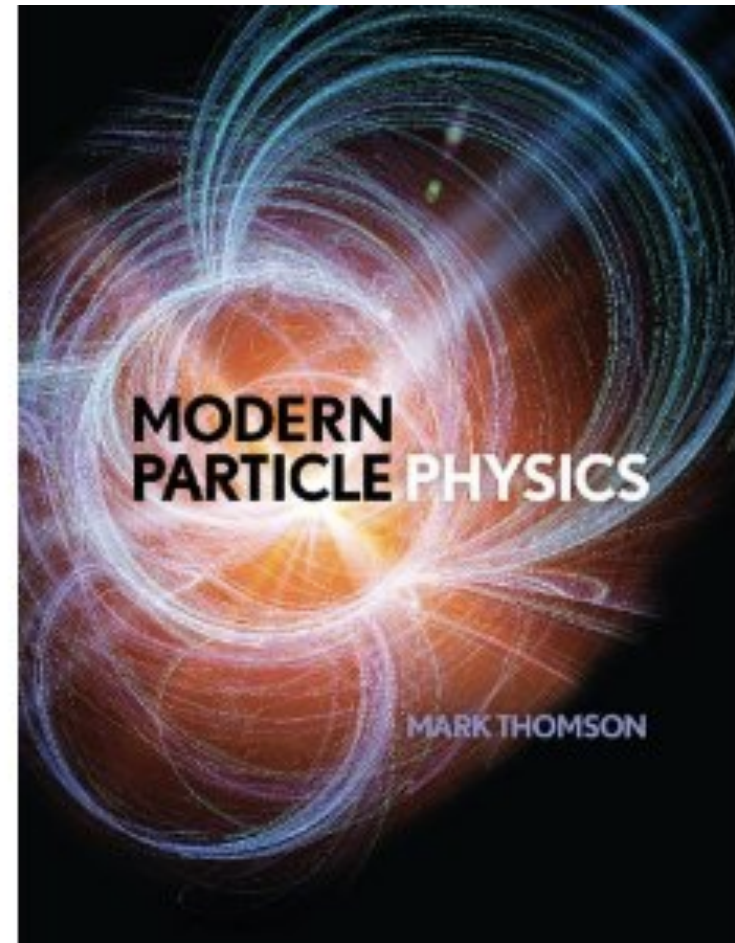


- Office Hours: Faraday 219
 - 2:00-3:00 pm Monday and 12-1 pm Friday; the same policies for masks and food as in the classroom apply in my office
 - **Or by appointment (in person or by video conference)**
- Preferred method of communication: email (jahred.adelman@niu.edu)
 - You can always try and stop by, but you will have better luck if you set up an appointment or come during the above times
 - I am not on campus every day

When I will diverge from Griffiths

- In terms of material, it is very well explained, but we'll go a bit more in depth on certain topics (and skip others), and fill in the gaps in between equations
- I'll use slightly different notation (natural units!)
- Will cover detectors a bit
- We'll end with some discussion of "real" LHC analyses

Will also be mined for some extra material



What we will cover (partially following Griffiths)

1. Some history of particle physics
2. Particle dynamics and a Standard Model (SM) overview
3. How do particle detectors work? Modern particle physics experiments
4. Relativistic kinematics
5. On symmetries
6. Bound states
7. Feynman rules
8. Quantum electron dynamics, QED
9. Quantum chromo dynamics, QCD (short version)
10. Weak interactions
11. Gauge theories and the Higgs mechanism
12. "Real" particle physics @ the LHC
13. Neutrinos and flavor physics

With roughly 1 problem set per 1-2 topics above

- Problem sets every 1-2 weeks, each with the same weight: combined total, 70% of grade
 - All to be due 1 week after they are given, in class, after assignment
 - To be distributed after we finish 1-2 chapters/topics
 - Start the HW early! If you get stuck and need help, please come by during office hours
 - Please ask for help if you don't understand solutions after they are posted (we'll briefly go over them in class, but not over everything)
- Final presentation: 30% of grade
- Late homework/exams NOT accepted without valid note or excuse (for sure not if you don't talk to me as soon as possible)

- Final will be a bit different than the usual exam, and will be focused more on “real” particle physics
 - Based on presentations in class (your presentation, and the questions you ask of others during their presentations)
- Dates and schedule TBD

30% of total grade

- After weighting problem sets and final presentation, the grades will be:
 - A: 93-100%
 - A-: 87-93%
 - B+: 82-87%
 - B: 74-82%
 - B-: 67-74%
 - C+: 60-67%
 - C: 55-60%
 - D: 50-55%
 - F: 50% or less

I reserve the right to shift this scale, but only in the direction that helps you

- I don't want to keep you from working with others, but any work that you hand in must be your own
 - Solutions found on the web are a form of plagiarism
 - **THESE EXIST AND HAVE TYPOS THAT I CAN RECOGNIZE!**
 - “Can I copy your solutions?” is plagiarism
 - Using solutions from students who took this course in previous semesters is also plagiarism
 - And “Tell me the Answer” is academically dishonest, as well
 - You will anyway not get credit for answers without showing your work
 - I do want you to help your classmates, however... and don't forget that office hours are there for those who need assistance, too

The class

- All slides (with potential small exceptions at the end of the semester) are already available:
 - http://nicadd.niu.edu/~jahreda/phys684_spring2022/ Write this down now :)
 - Should not be considered a substitute for attendance, but can hopefully help you in preparations for homework
 - **Goal: You should not be worried about copying down every formula, but rather instead be focused on paying attention**
 - **Syllabus located on course website**
- We may also work out some problems together in presentations here or on blackboard/whiteboard
 - So you can see that I can also get stuck :)

- Please come to class (shouldn't need to ask this of you, but I state it anyway)
 - You can't hand in homework without being here
 - The problems that we go over will be important to follow and understand
 - I am not taking attendance - but this course should be fun, and you will not learn as much if you don't come to class

- Cell phones need to stay in your pocket and be turned off
 - If your phone rings, we will know it was you (this class is that small)
 - If you have family or others personal issues - keep your phone on vibrate if possible, and if you need to take a phone call, step out of the classroom quietly

Seems silly, but mostly - be respectful!

The pandemic (and its continuation) ... sucks.

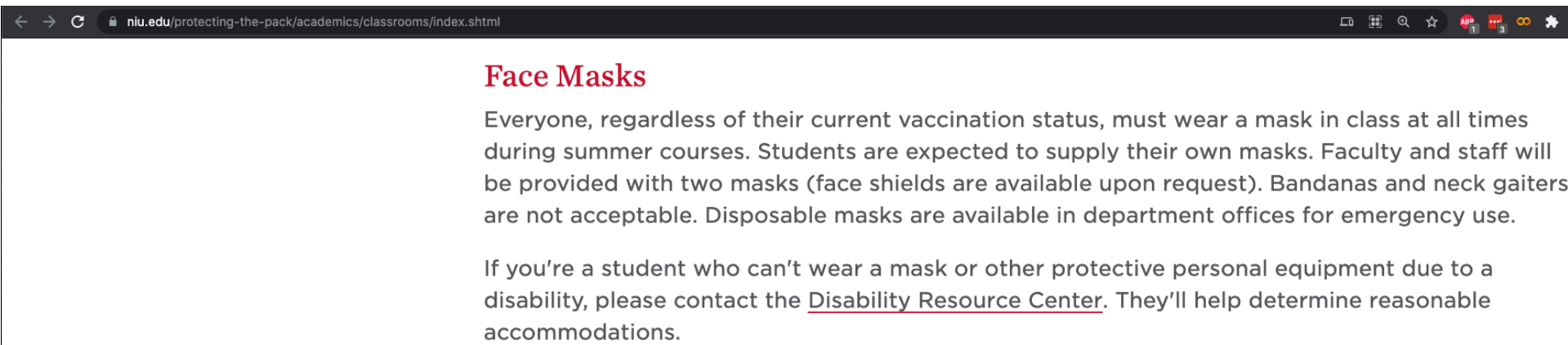
That is the best word that I can come up with

If you have any health-related issues, please stay home and contact NIU's COVID helpline (815-753- 0444) to report your symptoms and get advice (and then contact me)!

If you have any mental health issues, please seek help+keep me posted. If your loved ones need help, please help them+keep me posted.

If you know anyone eligible for vaccines that isn't vaccinated, please encourage them to get a vaccine. And a booster!

<https://www.niu.edu/protecting-the-pack/academics/classrooms/index.shtml>



The screenshot shows a web browser window with the address bar containing the URL [niu.edu/protecting-the-pack/academics/classrooms/index.shtml](https://www.niu.edu/protecting-the-pack/academics/classrooms/index.shtml). The page content includes a section titled "Face Masks" in red text. Below the title, there are two paragraphs of text. The first paragraph states that everyone must wear a mask in class at all times during summer courses, and that students are expected to supply their own masks. The second paragraph states that if a student cannot wear a mask due to a disability, they should contact the Disability Resource Center.

Face Masks

Everyone, regardless of their current vaccination status, must wear a mask in class at all times during summer courses. Students are expected to supply their own masks. Faculty and staff will be provided with two masks (face shields are available upon request). Bandanas and neck gaiters are not acceptable. Disposable masks are available in department offices for emergency use.

If you're a student who can't wear a mask or other protective personal equipment due to a disability, please contact the [Disability Resource Center](#). They'll help determine reasonable accommodations.

Wear a real mask, wear it all the time, wear it over your nose and mouth. If you don't like this, join the club.

If you don't agree to these rules, you shouldn't be here

My 4-year-old son wears a mask all day at school non-stop. He knows how to wear it over his nose. And doesn't whine or complain about it. I hope you're all at least as grown-up than he is

<https://www.niu.edu/protecting-the-pack/academics/classrooms/index.shtml>

Classroom Procedures

The following guidelines help keep classrooms clean and safe:

- Classrooms have been scheduled at 75% or less of normal capacity.
- Food and drinks are not allowed in classrooms.
- Classrooms are thoroughly cleaned daily.
- Disinfecting wipes are available in classrooms for individual use.

Refusing to Wear a Mask

If a faculty member, instructor or graduate assistant asks you to wear a mask in class and you refuse, you'll have disrupted the educational environment. They can ask you to leave and/or cancel class and will notify their department chair. The chair will follow the Classroom Disruption process outlined in the undergraduate catalog (refer to [Academic Regulations](#)). You may lose the privilege of attending or receiving credit in the class.

Violators may be reported to Student Conduct, and I reserve the right to require masks in class the entire semester even if mandates get lifted

About me ... and you

- I am indeed a particle physicist working on measurements of and searches for new physics with Higgs bosons using the ATLAS experiment at the LHC (at CERN)
 - I'll try and point out my research during the class, as appropriate

NIU@CERN!
(I wasn't at CERN for that photoshoot, and this is a bit old, it's hard to gather people for photos!)



About me ... and you

- I'll try to update my teaching style as the semester goes on, based on my experience, observations and your feedback
 - If I am going too fast... or too slow, or if my style (or handwriting) is incomprehensible, please speak up



We are small enough - time to
introduce yourselves (and
apologies in advance when I
forget your name)

Any questions?