



DEPARTMENT OF PHYSICS
AND ASTRONOMY
272 PHILLIPS HALL
CAMPUS BOX 3255
CHAPEL HILL, NC 27599-3255

T 919.962.2079
F 919.962.0480
clemens@physics.unc.edu
www.physics.unc.edu

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Dr. Erika Lindemann
Associate Dean for Undergraduate Curricula
Office of Undergraduate Education
3018 Steele Building, Campus Box 3504
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-3504

CHRIS CLEMENS
Department Chair

Dear Erika,

As you know, the Department of Physics and Astronomy has been engaged in a thorough review of its undergraduate curricula over the past year and a half. During this time, our Undergraduate Affairs and Studies committee broke into four subcommittees, expanded to include approximately 60% of the faculty, and held over thirty meetings: Faculty involvement was both broad and deep.

The Undergraduate Affairs and Studies committee then made a number of recommendations, for course revisions, for new courses, and for changes to our BS options, our BA options, and our minors. Our faculty voted on these recommendations over the course of two, heavily attended faculty meetings, where the votes for what we are now submitting were unanimous or near unanimous.

The new courses and course revisions have been submitted via CRAS. The changes to our BA options and minors were submitted in October. With this letter, we are submitting the changes to our BS options.

A summary of these changes, which apply to both our Standard Option and our Astrophysics Option, is as follows:

1. We are replacing our three-semester introductory sequence (116/117/128), where modern topics such as relatively and quantum mechanics are taught in the third semester, but for the most part only taken by physics majors, with a two-semester introductory sequence (118/119) in which these very popular topics are taught throughout. This new sequence is in accordance with IUPP recommendations and will take advantage of our SCALE-UP facilities. We believe that this change will better serve other departments that require our introductory physics courses, as well as generate more physics majors for ourselves. For additional information, and rationale, see attached document.

2. We are replacing our 1-credit lab on modern topics, 128L, with a 2-credit lab on experimental techniques, 281L. This course will better prepare our students to engage in research, and to engage in research earlier in their undergraduate careers. It will also be communication intensive (CI), addressing an identified weakness among our students. For additional information, see attached document.
3. We are adding a 3-credit elective on physical computing, 231, which will also better prepare our students to engage in research. In particular, this course will give our students highly employable skills with 21st-century technologies, including programming micro-controllers, sensors/transducers, Raspberry Pi, Netduino Plus 2, Python, C#, CircuitLab, Solidworks 3D CAD, and 3D printers. This course will evolve with time, keeping abreast of the latest technologies. For additional information, see attached document.
4. We are replacing our second-semester advanced lab, 482L, which is not taught in a way that is compatible with the new learning contract rule, with faculty-mentored research, 395 (previously an elective). We have beefed up 395 to include writing and presentation requirements. For additional information, see attached document.
5. After consultation with the math department, we have decided to make MATH 528 and MATH 529 electives in our curriculum instead of requirements. These courses can only be scheduled after our students need many of these topics in our advanced courses; consequently, we teach much of this material in our advanced courses already. However, we want to continue to include these courses as electives, in particular for our more theory-oriented students who could benefit from a deeper treatment.
6. We are adding ENGL 303 “Advanced Expository Writing in the Natural Sciences” as an elective, again to address this identified weakness among our students. We have also added a statement encouraging, but not requiring, students to take ENGL 105I “Writing in the Natural Sciences” instead of regular ENGL 105.
7. Finally, we have increased the number of required electives by one course.

Overall, these changes reduce the number of courses that we require, for both our Standard Option and our Astrophysics Option, by two courses. This will make it easier for students to begin a B.S. in Physics and Astronomy in their third semester; currently this is nearly impossible. Given that students who do not test out of first-semester calculus are not permitted to schedule first-semester physics until their second semester, this will effectively double our window for recruiting physics and astronomy majors.

In particular, this benefits students from groups that are currently underrepresented in physics and astronomy, such as women and minorities, who traditionally take longer to decide to pursue a degree in physics and astronomy.

This also creates more time for our students to engage in research, and to accomplish more in this arena before they graduate, including more honors theses completed. Better fostering a culture of research among our undergraduates is one of the drivers behind our new curriculum.

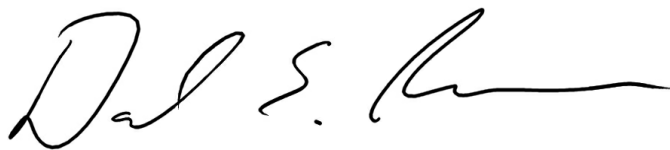
All of our undergraduate advisors are aware of these changes, and in fact contributed to them significantly. Current students will be advised that they may follow the new requirements, but that they are not required to.

Thank you for working with us these past months on our submission.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Clemens', with a long horizontal flourish extending to the right.

Dr. J. Christopher Clemens
Professor and Chair
Department of Physics and Astronomy
University of North Carolina at Chapel Hill

A handwritten signature in black ink, appearing to read 'D. Reichart', with a long horizontal flourish extending to the right.

Dr. Daniel E. Reichart
Bowman and Gordon Gray Professor and Associate Chair
Department of Physics and Astronomy
University of North Carolina at Chapel Hill

Here is the text that we want to appear in the undergraduate bulletin (new courses pending approval have been marked with an asterisk):

Majoring in Physics and Astronomy: Bachelor of Science

B.S. Major in Physics and Astronomy: Standard Option

Core Requirements

- PHYS 281L*, 301, 311, 312, 321, 331, 341, 351, 395 (optional for UNC BEST students), 481L, and 521
- Three additional courses chosen from ASTR (numbered above 300), ENGL (303), MATH (528 and 529), and PHYS (231* and numbered above 300).

Additional Requirements

- CHEM 101/101L and 102/102L
- MATH 231, 232, 233, and 383
- PHYS 118* and 119*

B.S. Major in Physics and Astronomy: Astrophysics Option

Core Requirements

- ASTR 519
- PHYS 281L*, 301, 311, 312, 321, 331 (project on an astrophysics topic), 341, 351, 395, and 521
- Two additional courses chosen from ASTR (numbered above 300), ENGL (303), and PHYS (231*).
- One additional course chosen from ASTR (numbered above 300), ENGL (303), MATH (528 and 529), and PHYS (231* and numbered above 300).

Additional Requirements

- ASTR 102 and 301
- CHEM 101/101L. CHEM 102 and 102L are recommended but not required.
- MATH 231, 232, 233, and 383
- PHYS 118* and 119*

As part of these course requirements, candidates for the B.S. degree must earn grades of C (not C-) or better in at least 18 credit hours of courses that are listed under Core Requirements.

It is strongly recommended that students planning to major in physics fulfill the Foundations requirement in English Composition and Rhetoric by enrolling in ENGL 105I "Writing in the Natural Sciences."

Most students will find it advantageous to defer some of the General Education requirements to the junior and/or senior year(s).

Here is the text that currently appears in the bulletin, for reference:

Majoring in Physics and Astronomy: Bachelor of Science

B.S. Major in Physics and Astronomy: Standard Option

Core Requirements

- MATH 528 and 529
- PHYS 301, 311, 312, 321, 331, 341, 351, 481L, 482L, and 521
- Two courses selected from physics courses numbered above 300 (including 395) and from ASTR 291 and 390

Additional Requirements

- CHEM 101/101L and 102/102L
- MATH 231, 232, 233, and 383
- Introductory sequence: PHYS 116, 117, and 128/128L

B.S. Major in Physics and Astronomy: Astrophysics Option

Core Requirements

- MATH 528 and 529
- PHYS 301, 311, 312, 321, 331 (with project on an astrophysics topic), 341, 351, and 521
- ASTR 519
- Two courses from ASTR 501, 502, 503, 505

Additional Requirements

- ASTR 102 and 301
- CHEM 101/101L. CHEM 102 and 102L are recommended but not required.
- MATH 231, 232, 233, and 383
- Introductory sequence: PHYS 116, 117, and 128/128L

As part of these course requirements, candidates for the B.S. degree must earn grades of C (not C-) or better in at least 18 credit hours of courses that are listed under Core Requirements (not including MATH 528 and 529).

Most students will find it advantageous to defer some of the General Education requirements to the junior and/or senior year(s).

Various substitutions can be made, with the approval of the student's advisor, for required physics courses in the sophomore, junior, and senior years. PHYS 671L and/or 672L may be substituted for other laboratory courses (PHYS 481L, 482L), and courses chosen from PHYS 352, 415, 543, 545, 573, 594, and ASTR 301, 501, 502 may be substituted for PHYS 331 or 521.