To schedule advising:
Via email: uadvising@physics.utah.edu
Via phone: (801) 581-6901
Online: www.physics.utah.edu/advising-schedule

Fall 2015
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**Majoring in Physics**

Welcome to the Department of Physics & Astronomy. Congratulations for choosing such an exciting and challenging program of study! If you like mathematics, computing, experiments, and wish to contribute to the future progress of humankind, the exciting intellectual adventure of physics or astronomy at the University of Utah will maximize your career options.

Our program is one of the most rigorous at the University and our students and faculty are exhilarated by the difficult challenge of figuring out how the world works! Studying Physics, Astronomy, and Mathematics is a very effective way to develop imagination, as well as critical and abstract thinking, whether or not you aspire to a career in science or technology. In addition, it is important to develop a solid understanding of principles that govern science and technology, so that as a society of well-informed citizens, we can make rational decisions on important issues, even as the pace of scientific and technological development continues to increase dramatically.

Studying Physics & Astronomy provides inherent pleasure and satisfaction, and additionally our graduates are prepared to pursue a variety of technical-related careers, ranging from academic or industrial scientist, to physician or patent attorney. If you aspire to a career in one of these areas, have something else in mind, or are simply intrigued by the challenge of mastering Physics, the faculty and staff of the Department of Physics and Astronomy are committed to helping you, our students, obtain the best education and training possible and to help you achieve success!

**Choosing Your Program of Study**

The Physics and Astronomy Department offers Bachelors of Science (BS) degrees in Physics and Physics Teaching, as well as minors in Physics, Physics Teaching, and Astronomy. Within the Physics BS program, students can elect to follow three distinct tracks: Physics, Applied Physics, and Bio-Medical Physics. Students pursuing a Bachelor’s degree may also elect to seek an Honors degree in collaboration with the Honors College.

To help students choose an appropriate course of study, the various options are briefly summarized below. For more detailed information on any of these program options, please contact an undergraduate advisor: uadvising@physics.utah.edu.

**Physics**

The physics track is the most mathematically and theoretically rigorous program designed for students intending to pursue a graduate degree in physics or a closely related discipline, or for students who are looking for the strongest challenge in their academic program. The hallmark course sequences of this program include the two-semester classical physics sequence, PHYS 4410/4420, and the two-semester quantum physics sequence, PHYS 5450/5460. These two sequences provide advanced and in-depth instruction in topics that are the most important for success in physics graduate studies. Due to the high level of rigor, many students in the physics program are also in the honors program and several of the courses offered in the physics track are designated as honors courses (or have honors sections). In addition, most students in the physics program elect to pursue research during their undergraduate studies, which is very important preparation for graduate work and therefore strongly encouraged.

Compared to the other tracks, successful students in the physics program are expected to develop a deeper understanding of theoretical physics, and stronger preparation for solving complex physics problems across a broad set of topics. Historically, strong physics students have been very successful at gaining entrance to a wide variety of physics graduate programs and pursuing careers as professional scientists.

**Applied Physics**

The applied physics track is designed to provide broad foundational exposure to physics principles in the context of technological applications. The applied track exchanges some depth in advanced classical and quantum physics for some coursework with more practical application. For example, in the applied track, advanced theoretical classical and quantum physics are covered in only two semesters (5010/5020), compared to four semesters in the pre-professional track. On the other hand, the applied track requires electronics and optics, which are recommended electives in the pre-professional track. Although the applied track is not specifically designed to prepare students for graduate school in Physics, many strong students in this program have been accepted to graduate programs in Physics and related disciplines. In addition, the applied track is a good launching point for a variety of technical professions and graduate programs such as law, business, technical writing, medicine, teaching, applications engineering, military service, and national security.
Successful students in the applied physics program are expected to develop a broad perspective on physics principles, while becoming familiar with the operation of and principles underlying an array of modern technologies. Historically, strong students in the applied physics track have been successful in pursuing a career in various technology-related professions including patent law, computer programming, information technology, and applications engineering.

**Bio-Medical Physics**

The bio-medical track is a very intensive program primarily designed to prepare students for medical, dental, optometric or pharmaceutical post bachelor’s schools. With appropriate modifications, this track is also appropriate for students who intend to pursue graduate studies in medical or biological physics. Students interested bio-medical research, who are not interested in medical school should meet with an advisor as early in their career as possible to make these modifications. To accommodate the addition of several biology and chemistry courses, this program has slightly altered physics and math requirements. With the additional biology and chemistry courses, the bio-medical track is highly prescribed, so students should ideally enter the program with strong math and science preparation to avoid remediation and delayed graduation. Most students in the bio-medical program also pursue volunteer work and/or laboratory research whenever possible to help prepare them for entrance to medical school. In addition to meeting with their academic advisor in physics, students interested in pursuing a medical career are encouraged to meet with the medical professional advisors at the University College. These advisors will help navigate the requirements for admission into a range of medical and other health professional schools.

Successful students in the bio-medical program are expected to gain a broad perspective on physics, biology, and chemistry and how these disciplines interact through the language of mathematics. They will also develop strong organizational and problem-solving skills and will be well prepared for medical school. Historically, strong bio-medical students have a high rate of acceptance to a wide variety of medical schools. Students who are in the process of applying for medical school admission are encouraged to also meet with Dr. Richard Ingebretsen (rich47@comcast.net) to review the application packet before it is submitted. Dr. Ingebretsen is a Professor (Lecturer) in the department and an MD with privileges at several area hospitals.

**Physics Teaching**

The Urban Institute for Teacher Education and the Department of Physics & Astronomy offer a state-approved certification program in secondary teacher certification. Candidates seeking certification in secondary education complete the approved physics teaching major and the required pre-professional and professional education courses. The physics education major has fewer required courses in the major than the other programs to allow for students to complete their education requirements. Alternately, students with a physics degree, may seek a graduate degree in educational studies simultaneously with the secondary certification program. The application deadline to the secondary education program is February 1st and is typically completed during the third year of the BA/BS degree. Admission to the graduate program in educational studies is by separate application.

Successful students in physics teaching and educational studies are recommended for the Utah Basic Certificate in secondary education grades 6 thru 12. The certification is granted by the Utah State Board of Education. Students interested in secondary education certification should contact the Secondary Education Advisor, SAEC 2264, (801)581-6818.

**Minors**

In addition to these majors, the Department of Physics & Astronomy also offers minors in Astronomy, Physics and Physics Teaching. These programs are designed to enhance a student’s undergraduate experience by providing foundational exposure in these areas. Usually a minor is not adequate preparation to pursue graduate work in this area. Students seeking technical degrees in other STEM fields will find they have completed many of the required and prerequisite courses for these minors. Therefore, they are able to obtain the minor with only a few additional courses. Students majoring in non-technical fields may find they have additional prerequisite coursework before working on their minor program.

**Honors Program**

The Physics & Astronomy Honors Program is designed to give a richer educational experience to students in the University of Utah’s Honors College pursuing their Bachelors of Science degree at the University of Utah. The program helps students who are focused on graduate school engage in serious research and take classes in an accelerated curriculum. The centerpiece of an honors degree in physics is a project culminating in the submission of a written thesis and the presentation of the student’s work in a public forum. The honors degree is conferred by the Honors College. The
requirements for fulfilling an honors degree include maintaining a GPA above 3.5, taking courses through the Honors College, taking honors physics courses, and completing a thesis project.

For a complete description of the Physics Honors Program, contact the Honors Advisor, Dr. Anil Seth aseth@astro.utah.edu, (801) 585-7793 or visit www.physics.utah.edu/honors.html. Transfer students should meet with an advisor as soon as possible to create an individual plan to fulfill the required honors physics courses.

### Preparation

The time needed to finish a physics degree, and the probability of success within the program, depends in some measure on a student’s pre-college preparation. The best high school preparation is to develop as much proficiency as possible in math, science, and writing. In addition, students will need to develop the strongest, most disciplined study habits and eliminate procrastination: physics is one of the most rigorous majors at the University of Utah. Finally, students should be highly motivated and exceptionally curious about the physical principles that make the world work.

### Advanced Placement

Many high schools offer Advanced Placement (AP) courses in Physics, Math, and Chemistry. The following table summarizes the relationship between scores on various AP exams, and the appropriate placement within the undergraduate curriculum. Although advanced placement scores may allow students to place out of particular university courses, this is not necessarily recommended in all cases. In general, University Math and Science courses are more rigorous than the corresponding AP courses in high school. Thus, students looking for the strongest challenge in their academic program and the best preparation for upper division (3000-level or higher) undergraduate courses, may elect to decline the placements suggested by the table below.

<table>
<thead>
<tr>
<th>Test</th>
<th>Score</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math AB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>MATH 1210</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>MATH 1220 (or 1250)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>MATH 1250 (or 1220)</td>
</tr>
<tr>
<td>Math BC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>MATH 1220</td>
</tr>
<tr>
<td></td>
<td>4 or 5</td>
<td>MATH 1260 (or 2210)</td>
</tr>
</tbody>
</table>

**NOTE:** MATH 1250-1260 covers in two semesters roughly the material covered by MATH 1210-1220-2210 in three semesters. The MATH 1250-1260 sequence also covers the material in a more in-depth and theoretical manner.

<table>
<thead>
<tr>
<th>Test</th>
<th>Score</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>CHEM 1210</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>CHEM 1220</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>CHEM 2310</td>
</tr>
</tbody>
</table>

**NOTE:** AP placement does not affect the requirement to take the accompanying lab classes, CHEM 1215 and CHEM 1225. Also, students interested in applying to medical school must take their chemistry classes in college: they cannot take advantage of Advanced Placement.

<table>
<thead>
<tr>
<th>Test</th>
<th>Score</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics B/Physics 1&amp;2</td>
<td>3, 4, or 5</td>
<td>PHYS 2210</td>
</tr>
<tr>
<td>Physics C (Mech/E&amp;M)</td>
<td>4 or 5</td>
<td>PHYS 3210</td>
</tr>
</tbody>
</table>

**NOTE:** AP placement does not affect the requirement to take the accompanying lab classes, PHYS 2215 and PHYS 2225.

Table 1: AP Placement Matrix
**Introductory Classes**

The Physics major curriculum is largely cumulative in the sense that the competencies gained in the early part of the program are continually utilized, expanded, and built upon in more advanced coursework. Thus, it is critically important to establish a sufficiently firm foundation at the very start of the program. Students interested in pursuing a Physics major, but who have not taken any previous Physics or Calculus courses are strongly urged to contact a Physics Advisor for proper assessment and placement: uadvising@physics.utah.edu.

There are alternate starting points to help students better prepare for the main introductory sequence (PHYS 2210/2220 or 3210/3220). For example, students who have not previously taken any Physics coursework, should consider starting with PHYS 1500 before progressing to PHYS 2210 or 3210. Similarly, students who lack sufficient preparation in algebra or trigonometry should begin their math coursework with MATH 1050 and 1060 (or MATH 1080) before enrolling in MATH 2210 (Calculus I), which is a prerequisite for PHYS 2210 or 3210. Students should contact the Mathematics Undergraduate Advisor for more details on the proper sequencing of Math courses: advisor@math.utah.edu.

**Transfer Students**

The State of Utah maintains strict articulation regulations that allow students to transfer some coursework between the various public institutions of higher education (e.g., U. of Utah, Utah State U., Weber State U., Utah Valley U., Salt Lake Community College). Nevertheless, as each institution maintains somewhat different standards and utilizes distinct teaching approaches, transfer students should meet with an advisor before enrolling at the U. or as soon as possible upon arrival: uadvising@physics.utah.edu. Currently, the Department of Physics at the University of Utah recognizes the PHYS 2210, 2215, 2220, 2225 major-track sequence from other public higher education institutions in Utah, as well as selected private institutions. Other courses may also be accepted, see your schools “Getting Ready Guide” or the articulation tables in the “Transfer Guide” for specific courses. If your course is not on this list, or if you are transferring from a non-public institution or from out of state, some transfer coursework may still be accepted. Again, students are encouraged to contact an advisor.

**Course Sequencing**

Because the physics curriculum builds on previous levels of understanding, and because not all courses are offered each semester, sequencing and planning of courses is essential. In addition to assumptions about the level of physics knowledge, there is also an assumption of mathematical background. Therefore, students need to organize their schedules so that they are able to meet the prerequisites for each of the necessary courses.

**Preferred and Alternative Mathematics Sequences**

Physics and Astronomy are rigorous science disciplines that are built on mathematical models and whose results are often communicated using the language of math. Furthermore, all Physics courses related to a major or minor program assume the student has obtained some level of math proficiency, as reflected in the recommended or required prerequisites. Thus, students pursuing any degree from the Department of Physics and Astronomy must develop proficiency with a broad range of mathematical principles and develop expertise in applying those principles to physical problems and situations. Students are strongly encouraged to begin the math sequence as soon as possible in their college career (if not before, e.g., via high-school AP classes and examinations). Students are encouraged to meet with both Math and Physics advisors to select an appropriate Math sequence: advisor@math.utah.edu AND uadvising@physics.utah.edu.

In general, the Math sequence is divided into five subdisciplinary areas, some of which include multi-course progressions: Calculus, Linear Algebra, Ordinary Differential Equations, Partial Differential Equations, and Complex Variables/Analysis. There are many ways to meet the requirements for each of these areas.

In the State of Utah, the normal calculus sequence is MATH 1210/1220/2110. This is sequence will give students a strong understanding of calculus and will adequately prepare them to take additional math and physics courses. These classes are offered at multiple times and students should be able to find a class that will fit their schedule. Students with strong AP Calculus scores will be allowed to enroll in the MATH 1250/1260 sequence, which is both more rigorous and more theoretical than the normal calculus sequence. Students who have already started taking the engineering sequences would be best served by completing these sequences to avoid redundancies and missed topics. However, these students will need to meet with an advisor to discuss the differences in the sequences.

The University of Utah offers a single semester, 4 credit, course in linear algebra and ordinary differential equations, MATH 2250. This class is primarily taken by engineering and physics majors, in order to quickly meet the prerequisites for upper
division courses in these majors. This class does not give the same level of depth and understanding that a student will gain by taking these subjects separately, MATH 2270: Linear Algebra, and MATH 2280: Ordinary Differential Equations. Students who enter the program with strong math backgrounds may benefit by taking the two semester sequence, instead of the one semester course. The primary concern with taking this route, is that students will not be able to take upper level physics courses until they have completed both semesters, which may delay their graduation.

There are several courses a student could take to fulfill the partial differential equation requirement. Most students will take MATH 3150, which is a 2 credit class that can be taken concurrently with the complex analysis class, MATH 3160. Students who elected to take the engineering calculus sequence will be required to take MATH 3140. This class goes into more depth than MATH 3150, however it also includes vector calculus. So a student who has already completed MATH 2210 or MATH 1260 will find that part of the course redundant. However, either class will fulfill the requirement. Students may also elect to take MATH 5440, an upper division math class that will be much more in depth and more rigorous than the standard MATH 3150.

Finally, students are required to take a complex analysis class, MATH 3160. This is also a 2 credit class, and can be taken concurrently with MATH 3150. Students seeking a more in depth and rigorous math course may elect to take MATH 4200.

For students interested in pursuing medical school or another health profession, MATH 4600 is substituted for MATH 3150 and 3160. This class, while not covering identical topics as MATH 3150 and 3160 will still expose students to the advanced math needed to succeed in advanced physics courses, in the context of medicine and physiology.

After completing the mathematics requirements for a physics degree, students will find that they can earn a math minor with only a few additional courses. In addition, as many of the required physics classes count towards allied credit for a math degree, students often seek double majors in math and physics.

### Prerequisites for Physics Courses

The following table summarizes the physics and mathematics prerequisites for the required and strongly recommended courses for a physics major. The actual required classes may vary depending upon the program of study. Failure to adhere to these prerequisites will likely lead to knowledge gaps and difficulties with advanced coursework. For courses without an explicit mathematics prerequisites, assume the prerequisite for the physics prerequisite. Note: Equivalent courses will satisfy prerequisite requirements: PHYS 3210/3220 will satisfy the 3210/3220 requirement, PHYS 2210/2220 will satisfy the 2210/2220 requirement, etc. For specific questions about equivalent courses, contact your academic advisor, uadvising@physics.utah.edu.

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Name</th>
<th>Prerequisites</th>
<th>Semester*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1110</td>
<td>Physics of the Human Body I</td>
<td>MATH/other</td>
<td>X</td>
</tr>
<tr>
<td>1500</td>
<td>Prep for College or University Physics</td>
<td>MATH 1050, 1060</td>
<td>X</td>
</tr>
<tr>
<td>1970</td>
<td>Undergraduate Seminar I</td>
<td>MATH 1050, 1060</td>
<td>X</td>
</tr>
<tr>
<td>1980</td>
<td>Undergraduate Seminar II</td>
<td>MATH 1050, 1060</td>
<td>X</td>
</tr>
<tr>
<td>2210</td>
<td>Physics for Scientists and Engineers I</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>2215</td>
<td>Physics Laboratory for Scientists and Engineers I</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>2220</td>
<td>Physics for Scientists II</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>2225</td>
<td>Physics Laboratory for Scientists and Engineers II</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>2500</td>
<td>Foundations of Astronomy</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>3060</td>
<td>Intro to Astrophysics</td>
<td>ASTR/PHYS 2500</td>
<td>X</td>
</tr>
<tr>
<td>3111</td>
<td>Physics of the Body II</td>
<td>CHEM 2310/2320, BIOL 220</td>
<td>X</td>
</tr>
<tr>
<td>3150</td>
<td>Energy and Sustainability</td>
<td>MATH 1210</td>
<td>X</td>
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<tr>
<td>3210</td>
<td>Physics for Scientists I (Honors)</td>
<td>MATH 1210</td>
<td>X</td>
</tr>
<tr>
<td>3220</td>
<td>Physics for Scientists II (Honors)</td>
<td>MATH 1210</td>
<td>X</td>
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<td>Course Code</td>
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<td>Prerequisites</td>
<td>Notes</td>
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<tr>
<td>3410</td>
<td>Modern Optics</td>
<td>MATH 2210*</td>
<td>PHYS 2220, 2225*</td>
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<tr>
<td>3610</td>
<td>Electronics for Scientific Instrumentation</td>
<td>MATH 2210*</td>
<td>PHYS 2220, 2225</td>
</tr>
<tr>
<td>3620</td>
<td>Data Acquisition for Scientific Instrumentation</td>
<td>MATH 2210*</td>
<td>PHYS 2220, 2225</td>
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<tr>
<td>3719/3729</td>
<td>Undergraduate Laboratory</td>
<td></td>
<td>PHYS 3740, 3760*</td>
</tr>
<tr>
<td>3730</td>
<td>Introduction to Computing in Physics</td>
<td>MATH 2250</td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>3740</td>
<td>Introduction to Quantum Theory and Relativity</td>
<td>MATH 2250</td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>3760</td>
<td>Principles of Thermodynamics and Statistical</td>
<td>MATH 2250</td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>4060</td>
<td>Observational Astronomy for Scientists</td>
<td></td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>4080</td>
<td>Introduction to Cosmology</td>
<td></td>
<td>PHYS 3740, 3760</td>
</tr>
<tr>
<td>4210</td>
<td>Optics in Biology</td>
<td></td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>4230</td>
<td>Properties and Functions of Processive Molecular</td>
<td></td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>4310</td>
<td>Physics in Biology</td>
<td></td>
<td>PHYS 2220</td>
</tr>
<tr>
<td>4410</td>
<td>Classical Physics I (Honors)</td>
<td>MATH 2250, 3150 *</td>
<td>PHYS 3220</td>
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<tr>
<td>4420</td>
<td>Classical Physics II (Honors)</td>
<td>MATH 3150</td>
<td>PHYS 4410</td>
</tr>
<tr>
<td>4910</td>
<td>Technical Communication &amp; Scientific Judgment</td>
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<td>Instructor consent</td>
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<tr>
<td>5010</td>
<td>Theoretical Classical Mechanics and Quantum</td>
<td>MATH 3150</td>
<td>PHYS 3740</td>
</tr>
<tr>
<td>5020</td>
<td>Electricity and Magnetism and Statistical</td>
<td>PHYS 5010, 3740, 3760*</td>
<td>X</td>
</tr>
<tr>
<td>5110</td>
<td>Introduction to Nuclear and Particle Physics</td>
<td></td>
<td>PHYS 3740, 3760*</td>
</tr>
<tr>
<td>5450</td>
<td>Introduction to Quantum Mechanics (Honors)</td>
<td>MATH 3150, 3160</td>
<td>PHYS 3740, 4410</td>
</tr>
<tr>
<td>5460</td>
<td>Quantum Mechanics and Statistical Mechanics (Honors)</td>
<td>PHYS 3760, 4420, 5450</td>
<td>X</td>
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<tr>
<td>5470</td>
<td>Introduction to Atomic Physics</td>
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<td>PHYS 5010 or PHYS 5450</td>
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<td>5510</td>
<td>Solid-State Physics I (Honors)</td>
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<td>PHYS 3740</td>
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<tr>
<td>5520</td>
<td>Solid-State Physics II (Honors)</td>
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<td>PHYS 5520</td>
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<td>5570</td>
<td>Galaxies</td>
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<td>PHYS 5010, 5020</td>
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<tr>
<td>5580</td>
<td>Cosmology</td>
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<td>PHYS 5010, 5020</td>
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</table>

* recommended corequisite
‡ subject to change

Table 2: Physics Prerequisites and Expected Schedule

Major and Minor Requirements

The following pages list the specific course requirements for each of the physics and astronomy tracks, emphases and minors. Honors degrees and teaching licensure have additional requirements through the Honors College and the Urban Institute for Teacher Education, respectively. Physics and Astronomy majors and minors must complete all General Education, Bachelor's Degree, and College of Science requirements.

Academic Standards

The University of Utah requires all students to meet the following list of academic standards to be eligible for graduation:
- Minimum 122 semester hours.
- 40 upper-division semester hours.
- Residency hours: 20 of the last 30 credit hours must be from the University of Utah.
• 2.0 minimum cumulative GPA.  
• Apply for graduation 2 semesters prior to the expected graduation date.

Physics and Astronomy majors and minors must have a GPA of at least 2.0 in the major. All required physics, math, astronomy, chemistry classes and other allied classes must be passed with at least a C- grade. The credit/no credit option may not be elected for any course used to fulfill the degree requirements for a major or a minor.

General Education and Bachelor’s Requirements

The University of Utah has established the following General Education and Bachelor’s Degree Requirements.

- American Institutions (AI)
- Writing (WR)
- Intellectual Exploration (IE), 8 classes:
  - 2 Fine Arts (FF),
  - 2 Humanities (HF),
  - 2 Social/Behavioral Sciences (BF),
  - 2 Physical/Life Sciences (SF). This is fulfilled by the requirements for the major.
- Quantitative Reasoning, 2 classes (QA, QB). This is fulfilled by the requirements for the major.
- Upper-division Communication/Writing (CW)
- Diversity (DV)
- Upper-division International Requirement (IR)
- Quantitative Intensive Requirement, 2 classes (QI). This is fulfilled by the requirements for the major.
- BA Language Requirement (for BA students only).

Planning

Notes:

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
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The following chart lists the required classes for the physics major, with prerequisites and co-requisites indicated by arrows. Students are encouraged to plan their own schedule, taking into account: total course load, type of class work, type of class, level of rigor, time constraints (homework/study time, family time, work time, recreation time, etc.) and planned date of graduation. Remember, many classes are only offered once a year, and most classes have prerequisites. Students should plan on meeting with an advisor at least once a year to plan out the following year’s course of study.
Applied Physics Major Requirements

The following chart lists the required classes for the applied physics major, with prerequisites and co-requisites indicated by arrows. Students are encouraged to plan their own schedule, taking into account: total course load, type of class work, type of class, level of rigor, time constraints (homework/study time, family time, work time, recreation time, etc.) and planned date of graduation. Remember, many classes are only offered once a year, and most classes have prerequisites. Students should plan on meeting with an advisor at least once a year to plan out the following year’s course of study.
Bio-Medical Physics Major Requirements

The following chart lists the required classes for the bio-medical physics major, with prerequisites and co-requisites indicated by arrows. Students are encouraged to plan their own schedule, taking into account: total course load, type of class work, type of class, level of rigor, time constraints (homework/study time, family time, work time, recreation time, etc.) and planned date of graduation. Remember, many classes are only offered once a year, and most classes have prerequisites. Students should plan on meeting with an advisor at least once a year to plan out the following year's course of study.
The following chart lists the required classes for the physics teaching major, with prerequisites and co-requisites indicated by arrows. To earn the teaching certification, students must complete the secondary education certification program through the Urban Institute for Teacher Education. Students are encouraged to plan their own schedule, taking into account: total course load, type of class work, type of class, level of rigor, time constraints (homework/study time, family time, work time, recreation time, etc.) and planned date of graduation. Students need to plan the educational requirements and certification year into this schedule as well. Remember, many classes are only offered once a year, and most classes have prerequisites. Students should plan on meeting with an advisor at least once a year to plan out the following year’s course of study.
Physics & Astronomy Minor Requirements

Students in the physics track with an astronomy minor, are well prepared to pursue graduate work in astronomy and astrophysics. Students in other technical fields will find that they have met most, if not all, the prerequisites for the astronomy minor in their major degree requirements. Students in non-technical fields may also enjoy a minor in astronomy, however, this may require the student completing additional prerequisite courses.

Students who are working on technical majors, such as chemistry, math, or engineering, may benefit from a minor in physics, as the PHYS 2210/2220 sequence is already required for their major. Students in non-technical fields may also enjoy minoring in physics, if they are sufficiently curious about how the world works.

Students seeking a teaching degree in another discipline might wish to consider a physics teaching minor. Students completing the requirements for a physics teaching minor, in addition to a teaching major in another discipline and the secondary education certification program through the Urban Institute for Teacher Education, will be qualified to apply for a secondary education physics endorsement.

Students may obtain proposed minor approval from their academic advisor, uadvising@physics.utah.edu. Courses cannot count towards both the physics and the astronomy minor. To avoid any problems, those wanting to declare double majors or minors must inform both advisors.

Astronomy Minor Requirements

The astronomy minor program is designed to provide foundational exposure to astronomy and astrophysics for students interested in pursuing a professional career in astronomy, or for those simply curious about the Universe and how it works. Astronomy is a profound and fundamental science that has never ceased to fascinate the general public and attract the imagination of students. An astronomy major program is under development and currently we offer our students the opportunity to explore astronomy and astrophysics through a minor degree program.

Astronomy minors must complete all general education and College of Science requirements and have a GPA of at least 2.0 in physics, astronomy and math courses combined. All physics, astronomy and math classes must be passed with at least a C- grade. The credit/no-credit option may not be elected for any course used to fulfill the degree requirements for an astronomy minor.

To obtain an undergraduate minor in astronomy, a student must complete 17 hours of approved course work. Students must complete ASTR 2500, ASTR 3060 and 11 hours of additional approved coursework. Please see the Astronomy Minor page in the General Catalog for a specific listing of courses. Classes counted towards the physics minor cannot be counted towards the astronomy minor.

Successful students in the astronomy minor program are expected to gain a strong background in astronomy, such that when combined with a physics major, is sufficient to pursue graduate work in astronomy and astrophysics.

Physics Minor Requirements

The physics minor program is designed to provide foundational exposure to physics for students wishing to supplement their major program of study. Generally, it should not be considered sufficient preparation for graduate studies in physics or a related field.

Physics minors must complete all general education and College of Science requirements and have a GPA of at least 2.0 in physics courses combined. All physics and math classes must be passed with at least a C- grade. The credit/no-credit option may not be elected for any course used to fulfill the degree requirements for a physics minor.

To obtain an undergraduate minor in physics, a student must complete at least 16 hours of approved course work. Courses approved for the minor include PHYS 2210, 2215, 2220, 2225, and many of the courses with a listing of 3000 or above. Please see the Physics Minor page in the General Catalog for a specific listing of courses. Two essentially similar courses (e.g., PHYS 4410 and 5010) cannot both be counted toward the minor. Classes counted towards the astronomy minor cannot be counted towards the physics minor.

Successful students in the physics minor program are expected to be conversant and familiar with basic foundational physics topics, and to demonstrate rudimentary problem solving skills.
Physics Teaching Minor Requirements

The physics teaching minor program is designed to meet the State Office of Education Physics Teaching Endorsement requirements, assuming the candidate has already met the Secondary Education Teaching Certification requirements. This should not be considered sufficient preparation for graduate studies in physics or a related field.

Physics teaching minors must be attached to a teaching degree in another discipline. Students must complete all general education and College of Science requirements and have a GPA of at least 2.0 in physics courses combined. All physics and math classes must be passed with at least a C grade. The credit/no-credit option may not be elected for any course used to fulfill the degree requirements for a physics teaching minor. A GPA of 3.0 is required for admittance to the secondary education licensure program.

To obtain an undergraduate minor in physics teaching, a student must complete the following requirements: Calculus I – III or equivalent, Linear Algebra and Differential Equations, Intro Physics with Calculus and the accompanying labs, PHYS 3740: Intro to Quantum and Relativity, EDU 5170: Secondary Science Methods, and one additional elective physics course. Please see the Physics Teaching Minor page in the General Catalog for a specific listing of courses that will fulfill these requirements.

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Student Resources

- **University College**: 450 SSB, (801)581-8146 advising.utah.edu
  Advisors help students with University graduation requirements, policies and procedures, selecting classes, or deciding on a major. Once students find an advisor they trust and feel comfortable with, they are encouraged to continue to work with that same person for future questions and/or concerns.

- **Departmental Advisors**: [www.utah.edu/academics](http://www.utah.edu/academics)
  Each academic department has an advisor who can provide information regarding requirements for that major. Addresses and phone numbers are provided in the class schedule at the beginning of each departmental listing.

- **Center for Student Wellness**: North Campus: 328 SSB, (801)581-7776 wellness.utah.edu
  South Campus: 555 Foothill Blvd, Level 1, (801)585-5294
  Provides information, resources and solutions for wellness-related issues.

- **Child Care Coordinating Office**: Main Campus: 408 Union, (801)585-5897 childcare.utah.edu
  Upper Campus: 2907 HSEB, (801)587-9654
  Provides information on types and availability of childcare to students.

- **Counseling Center**: 426 SSB, (801)581-6826 counselingcenter.utah.edu
  Provides help with personal problems and self understanding.

- **Center for Disability Services**: 162 Union, (801)581-5020 disability.utah.edu
  Provides support to students with all types of disabilities.

- **Financial Aid and Scholarships**: 105 SSB, (801)581-6211 financialaid.utah.edu
  Federal and State Financial Aid, clearinghouse for available scholarships across campus.

- **LGBT Resource Center**: 409 Union, (801)587-7973 lgbt.utah.edu
  Provides education, information and advocacy services.

- **RespectU**: 200 Union, (801)585-5994 respectu.utah.edu
  Provides support, resources and proactive measures to address bias in the campus community.

- **Student Advocacy**: 234 Union, (801)581-2788 www.asuu.utah.edu/boards
  Offers resources and referrals regarding rights and legal issues.

- **Student Health Center**: Madsen Health Ctr, Level 1, 555 Foothill Dr. (801)581-6431 studenthealth.utah.edu
  Provides low-cost medical care to students. Student health insurance available.

- **Women's Resource Center**: 411 Union, (801)581-8030 womenscenter.utah.edu
  Support programs and services are available to men and women. Individual and group counseling and a wide array of programming for students, faculty and staff including specific programming relevant to nontraditional single parents.

  Works with students to develop a lifelong love, loyalty and excitement towards the University of Utah.

- **Associated Students of the U of U (ASUU)**: 234 Union, (801)581-2788 www.asuu.utah.edu
  Almost 200 students participate in student government. Students plan events and activities, administer the budget and sit on committees and boards with administrators and faculty.

- **Bennion Community Service Center**: 101 Union, (801)581-4121 bennioncenter.org
  Students can volunteer for or initiate and lead community service projects.

- **Campus Recreation**: 102 Nielsen Field House (801)581-3797 campusrec.utah.edu
  Facilities include the Nielsen Field House ((801)581-8898). Use is free with student ID.

- **Dean of Students Office**: 270 Union, (801)581-7066 deansoftstudents.utah.edu
  Advises many student leadership organizations.

- **Fraternities and Sororities**: 270 Union, (801)581-8061 fraternityandsororitylife.utah.edu
  The University of Utah Greek system consists of 6 sororities and 9 fraternities.

- **Housing and Residential Education**: BP, Bldg 822, (801)587-2002 housing.utah.edu
  Provides On-Campus housing for students: residence halls, apartments, and Living Learning Communities.
This page contains information about various academic support services, major and career opportunities, classes and workshops, computer centers, and student organizations available at the University of Utah.

**Major & Career**
- Intramural Sports: 214 HP E, (801)581-3797 campusrec.utah.edu/programs/intramural-sports
- MUSE Project: 2705B M Lib, (801)587-3177 muse.utah.edu
- Student Organizations: 334 Union, (801)581-2788 www.asuu.utah.edu
- Sustainability Office: 1024 Annex, D. Wing, (801)585-9352 sustainability.utah.edu
- Center for Ethnic Student Affairs (CESA): 235 Union, (801)581-8552 www.diversity.utah.edu/students/cesa
- Center for Teaching & Learning Excellence: 2705 M Lib, (801)581-7597 ctle.utah.edu/undergrad-students
- TRIO/Educational Opportunities Programs: 2075 Annex, (801)581-7188
- Academic Support
- Writing Center: 426 SSB, (801)581-8746 lep.utah.edu
- Math Tutoring Center: 450 SSB, (801)581-8474 tutoringcenter.utah.edu
- Chemistry Tutoring Center: 330 SSB, (801)581-6153 tutoringcenter.utah.edu
- Career Services: 350 SSB, (801)581-6186 careers.utah.edu
- National Student Exchange (NSE): 280 Union, (801)581-7069 nse.utah.edu
- Study Abroad: 159 Union, (801)581-5849 www.learningabroad.utah.edu
- Preprofessional Advising: advising.utah.edu/preprofessional
  - Pre-Law: 450 SSB or 256a OSH, (801)581-8168
  - Pre-Medical, Pre-Dental, Pre-Optometry, Pre-Veterinary, Pre-Podiatry, Pre-Physician Assistant, Pre-Physical Therapy, Pre-Pharmacy, Pre-Chiropractic: Bldg. 44, Room 206, (801)581-5744
- Undergrad Research Opportunities Program (UIROP): 404 Sill, (801)581-8070 www.urop.utah.edu
- Classes:
  - Ed. Psych. 2600: Strategies for College Success (3 credits)
  - Ed. Psych. 3960: Successful Career Planning (1 credit)
  - Writing 1010, 2010: Appropriate class should be taken as soon as possible. (3 credits)
  - Writing 1060: Methods and Technologies of Library Research (4 credit)
  - UC 1010: A Successful Start at U (1 credit)
  - UC 1020: Introduction to PREMED Preparation
  - ESL 1040, 1050, 1060: Placement exam available (801)581-8047

**Intramural Sports**
- 214 HP E, (801)581-3797 campusrec.utah.edu/programs/intramural-sports
- 75 competition sports activities are available for students (novice, intermediate, and expert divisions).

**MUSE Project**
- 2705B M Lib, (801)587-3177 muse.utah.edu
- My U Signature Experience: students can engage in many campus and community activities.

**Student Organizations**
- 334 Union, (801)581-2788 www.asuu.utah.edu
- There are over 200 student organizations for you to join, or you can form your own.

**Sustainability Office**
- 1024 Annex, D. Wing, (801)585-9352 sustainability.utah.edu
- Students have the opportunity to engage in research in sustainability as well as education.

**Center for Ethnic Student Affairs (CESA)**
- 235 Union, (801)581-8552 www.diversity.utah.edu/students/cesa
- Offers support for minority groups.

**Center for Teaching & Learning Excellence**
- 2705 M Lib, (801)581-7597 ctle.utah.edu/undergrad-students
- Student Course Feedback and educational research opportunities.

**Commuter Services**
- Offers support for minority groups.

**Computer Centers**
- There are over 20 open-access labs across campus, including the 1st floor of the Marriott Library, 130 WEB and 161 Union. The Marriott Library (801)581-6494 offers instructional workshops free to students. (ID required)

**Dean of Students Office**
- 270 Union, (801)581-7066 deansofstudents.utah.edu
- Administers student conduct and advocates for students.

**Learning Enhancement Programs**
- 426 SSB, (801)581-8746 lep.utah.edu
- Center offers Supplemental Instruction for certain lower division courses and a learning skills class. (See section on Classes and Workshops.)

**Testing Center**
- 498 SSB, (801)581-8744 testingcenter.utah.edu
- Administers a wide range of standardized tests as well as the University’s writing and math placement exams for students.

**TRIO/Educational Opportunities Programs**
- 2075 Annex, (801)581-7188 trio.utah.edu
- Programs and services for students with low income, first-generation college students, and students with disabilities.

**Veterans Support Center**
- 418 Union, (801)587-7722 veterancenter.utah.edu
- Provides a variety of support services to veterans.

**ASUU Tutoring Center**
- 330 SSB, (801)581-6153 tutoringcenter.utah.edu
- Provides individual and group tutoring in a variety of subjects.

**Chemistry Tutoring Center**
- Free tutoring offered for General and Organic chemistry HEB 1316, M-F 9 a.m. to 4 p.m. American Chemical Society Student Affiliates (uofuacsst@gmail.com)

**Math Tutoring Center**
- 155 TBR Math Center, (801)585-9478 www.math.utah.edu/ugrad/tutoring.html
- Math tutoring in algebra, trigonometry, and calculus during all available hours. See schedule for other subjects.

**Writing Center**
- Marriott Library: 2701 M Lib, 2nd floor, (801)587-9122 writingcenter.utah.edu
- Business Building: 1272 SFEBB
- Individual peer-tutoring to develop writing skills for all subjects, not just writing classes. Graduate and Faculty level centers are also available.

**University College**
- 450 SSB, (801)581-8168 advising.utah.edu
- Assist students with exploring and deciding on an undergraduate major.

**Counseling Center**
- 426 SSB, (801)581-6826 counselingcenter.utah.edu
- Provides a safe space for U students, staff, and faculty to explore personal, academic, and career concerns.

**Careers Services**
- 350 SSB, (801)581-6186 careers.utah.edu
- Students have access to a comprehensive career library and a computer program (SIGI Plus) for investigation of career paths. The center also provides opportunities for part time employment, internships, and cooperative education experiences.

**International Student and Scholar Services**
- 420 Union, (801)581-8876 www.internationalcenter.utah.edu
- Primary campus contact for international students, scholars, and alumni.

**National Student Exchange (NSE)**
- 280 Union, (801)581-7069 nse.utah.edu
- Students have the opportunity to attend a participating university for up to a year in the US and Canada.

**Study Abroad**
- 159 Union, (801)581-5849 www.learningabroad.utah.edu
- Offers educational experiences abroad, and information on work opportunities abroad.

**Preprofessional Advising**
- Advising: advising.utah.edu/preprofessional
  - Pre-Law: 450 SSB or 256a OSH, (801)581-8168
  - Pre-Medical, Pre-Dental, Pre-Optometry, Pre-Veterinary, Pre-Podiatry, Pre-Physician Assistant, Pre-Physical Therapy, Pre-Pharmacy, Pre-Chiropractic: Bldg. 44, Room 206, (801)581-5744
  - Help students prepare for advanced degrees in law and health professions.

**Undergrad Research Opportunities Program (UIROP)**
- 404 Sill, (801)581-8070 www.urop.utah.edu
- Gives undergraduates an opportunity to explore career opportunities by working with faculty members on research projects.

**Classes**
- Ed. Psych. 2600: Strategies for College Success (3 credits)
- Ed. Psych. 3960: Successful Career Planning (1 credit)
- Writing 1010, 2010: Appropriate class should be taken as soon as possible. (3 credits)
- Writing 1060: Methods and Technologies of Library Research (4 credit)
- UC 1010: A Successful Start at U (1 credit)
- UC 1020: Introduction to PREMED Preparation
- UC 1050: Major Exploration; Undecided? This class is designed to assist you.
- ESL 1040, 1050, 1060: Placement exam available (801)581-8047

**Non-Credit Workshops (call department for details on time/place):**
- Career Development: Counseling Center
- Major Exploration: University College Advising