PHYSICS, B.A.

Physics is the branch of science that studies the nature of matter, energy and space-time at the most fundamental level. It provides a foundation for all the natural sciences and engineering disciplines. Physics has brought such revolutions as relativity, quantum mechanics and the Big Bang theory, profoundly altering the way mankind views the universe.

Physicists have played a major role in the discovery of many phenomena leading to whole new technologies. The invention of the transistor, by physicists, has made the modern computer possible, while the development of lasers has led to diverse applications ranging from supermarket scanners to laser surgery. The physicist is a versatile problem solver and able to excel in many technical fields.

A degree in physics from Saint Louis University leads to a broad-based understanding of natural phenomena, analytical and computer skills, measurements and their limitations, experience with electronics and the operation of sophisticated equipment, and the ability to formulate and solve technical problems.

Physics is a great major for students who are curious about the universe and want to learn how everything works. Many physics students also have a strong interest in mathematics, computers and other sciences, as well as a strong desire to understand why the universe behaves the way it does. They are interested in questions such as: Why do elementary particles behave the way they do? What is the world made of? What is the nature of light? How did the universe begin, and what will eventually happen to it? Some of our students pursue double majors in fields such as mathematics, computer science or an engineering field or take the courses required for entrance to law school or medical school.

Curriculum Overview
The B.A. in Physics from the College of Arts and Sciences combines a firm grounding in physics with a broad liberal education. The curriculum also satisfies all of the requirements for a minor in mathematics.

Students of the physics program gain a solid foundation in analytical, computational and laboratory skills through course work in mathematics, computer science and physics. The physics curriculum includes courses in classical mechanics, quantum mechanics, electricity and magnetism, thermodynamics and statistical mechanics, as well as optics, electronics and modern physics.

The required courses listed below are accompanied by the College of Arts and Sciences core. This degree is conferred by the College of Arts and Sciences.

Fieldwork and Research Opportunities
Benefits of the physics program include several internship and career opportunities. The physics department employs some of its students as teaching and research assistants during the summer. Students have held summer internships at NASA-Langley, the Argonne National Laboratory and other laboratories. They have worked both during the summer and during the academic year at local industries such as Boeing, Lichtenborck Technologies and Anheuser-Busch. Numerous opportunities exist for summer research in basic and applied physics in national laboratories and in National Science Foundation-sponsored programs at universities throughout the United States.

The program stresses undergraduate research and applications of computers in physics. New state-of-the-art research facilities at SLU allow for students to work directly alongside faculty members on research projects.

Careers
Graduates with a bachelor’s degree in physics from Saint Louis University enter a variety of careers that depend on the technical skills they have gained in college. They are employed in product development and quality control in large industries such as RCA, Boeing or Lockheed-Martin. They are computer specialists at Anheuser-Busch and other companies. Some are now involved in the marketing of technical products, while others occupy management positions. A few graduates have entered military careers. Students frequently earn double majors, combining physics with mathematics, computer science or chemistry.

Admission Requirements
Freshman
Begin your application for this program at www.slu.edu/apply (http://www.slu.edu/apply.php). Saint Louis University also accepts the Common App.

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. Solid academic performance in college preparatory course work is a primary concern in reviewing a freshman applicant’s file.

To be considered for admission to any Saint Louis University undergraduate program, the applicant must be graduating from an accredited high school, have an acceptable HiSET exam score or take the General Education Development (GED) test. Beginning with the 2021-22 academic year, undergraduate applicants will not be required to submit standardized test scores (ACT or SAT) in order to be considered for admission. Applicants will be evaluated equally, with or without submitted test scores.

Begin Your Application (http://www.slu.edu/apply.php)

Transfer
Begin your application for this program at www.slu.edu/apply (http://www.slu.edu/apply.php).

Applicants must be a graduate of an accredited high school or have an acceptable score on the GED. An official high school transcript and official test scores are required only of those students who have attempted fewer than 24 transferable semester credits (or 30 quarter credits) of college credit. Those having completed 24 or more of college credit need only submit a transcript from previously attended college(s). In reviewing a transfer applicant’s file, the office of admission holistically examines the student’s academic performance in college-level coursework as an indicator of the student’s ability to meet the academic rigors of Saint Louis University.

International Applicants
Begin your application for this program at www.slu.edu/apply (http://www.slu.edu/apply.php).

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency (http://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency/)
- Proof of financial support must include:
A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

Scholarships and Financial Aid
There are two principal ways to help finance a Saint Louis University education:

- **Scholarships**: Awarded based on academic achievement, service, leadership and financial need.
- **Financial Aid**: Provided in the form of grants and loans, some of which require repayment.

For priority consideration for merit-based scholarships, apply for admission by Dec. 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

For information on other scholarships and financial aid, visit the student financial services office online at https://www.slu.edu/financial-aid/.

Learning Outcomes
1. Graduates will be able to understand the principles of physics and apply these principles to problems of fundamental and practical interest.
2. Graduates will be able to design and conduct experiments and analyze and interpret data.
3. Graduates will be able to collaborate effectively on teams.
4. Graduates will be able to communicate effectively and professionally in oral and written formats.
5. Graduates will be able to know about contemporary issues in science and technology.
6. Graduates will be able to understand the numerical formulation of scientific problems and be able to solve such problems utilizing at least one programming language or environment.

Requirements
Physics students must complete a minimum total of 62 credits for the major.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>PHYS 1110</td>
<td>Introduction to Physics (as a career)</td>
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</tr>
<tr>
<td>PHYS 1610</td>
<td>Engineering Physics I</td>
<td>4</td>
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<tr>
<td>&amp; PHYS 1620</td>
<td>and Engineering Physics I Laboratory</td>
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<tr>
<td>PHYS 1630</td>
<td>Engineering Physics II</td>
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<td>and Engineering Physics II Laboratory</td>
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<tr>
<td><strong>Required Physics &amp; Mathematics Courses</strong></td>
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<tr>
<td>MATH 2660</td>
<td>Principles of Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3120</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3550</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4310</td>
<td>Introduction to Complex Variables</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 2610</td>
<td>Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 2620</td>
<td>and Modern Physics Lab</td>
<td></td>
</tr>
<tr>
<td>PHYS 3110</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 4210</td>
<td>Electricity &amp; Magnetism I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 4610</td>
<td>Quantum Mechanics</td>
<td>3</td>
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<tr>
<td><strong>Additional Requirements</strong></td>
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<tr>
<td>Select two upper division physics courses from the following:</td>
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<tr>
<td>PHYS 3120</td>
<td>Advanced Classical Mechanics</td>
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<tr>
<td>PHYS 3310</td>
<td>Optics</td>
<td></td>
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<tr>
<td>PHYS 3410</td>
<td>Thermodynamics and Statistical Mechanics</td>
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<tr>
<td>PHYS 3510</td>
<td>Analog &amp; Digital Electronics</td>
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<tr>
<td>PHYS 3610</td>
<td>Modern Physics II</td>
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<tr>
<td>PHYS 4010</td>
<td>Nanoscience and Nanofabrication Frontiers</td>
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<td>PHYS 4020</td>
<td>Experimental Physics</td>
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<td>PHYS 4210</td>
<td>Electricity &amp; Magnetism I</td>
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</tr>
<tr>
<td>PHYS 4620</td>
<td>Application of Quantum Mechanics</td>
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<tr>
<td><strong>Senior Inquiry</strong></td>
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<td>Select one of the following:</td>
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<tr>
<td>PHYS 4840</td>
<td>Senior Inquiry: Thesis</td>
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<tr>
<td>PHYS 4880</td>
<td>Senior Inquiry: Research Project</td>
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<tr>
<td>PHYS 4890</td>
<td>Senior Inquiry: Comprehensive Examination</td>
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<tr>
<td><strong>General Electives</strong></td>
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<tr>
<td>Total Credits</td>
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Continuation Standards
Students must have a grade point average (GPA) of 2.00 in Physics major coursework to be retained in the major.

Bachelor of Arts Core Curriculum Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>Core Components and Credits</strong></td>
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<tr>
<td>Foundations of Discourse (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foundations-discourse/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foundations-discourse/</a>)</td>
<td>3</td>
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<tr>
<td>Diversity in the U.S. (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/cultural-diversity/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/cultural-diversity/</a>)</td>
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<tr>
<td>Global Citizenship (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/global-citizenship/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/global-citizenship/</a>)</td>
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<tr>
<td>Foreign Language (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foreign-language/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foreign-language/</a>)</td>
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<tr>
<td>Fine Arts (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/fine-arts/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/fine-arts/</a>)</td>
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<tr>
<td>Literature (<a href="http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/literature/">http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/literature/</a>)</td>
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Mathematics (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/mathematics/)  3
Natural Science (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/sciences/)  6
Philosophy (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/philosophy/)  9
Social Science (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/social-science/)  6
Theology (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/theology/)  9
World History (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/world-history/)  6

Total Credits  57-66

Graduation Requirements

• Complete a minimum of 120 credits (excluding pre-college level courses [numbered below 1000]).
• Complete either the College of Arts and Sciences Bachelor of Arts or Bachelor of Science Core Curriculum Requirements
• Complete Major Requirements: minimum 30 credits required.
• Complete remaining credits with a second major, minor, certificate, and/or elective credits to reach the minimum of 120 credits required for graduation.
• Courses listed under the intensive English program do not count toward graduation requirements. EAP 1500 College Composition for International Students (3 cr), EAP 1900 Rhetoric & Research Strategies (3 cr) and EAP 2850 Nation, Identity and Literature (3 cr) count toward graduation requirements as equivalents to Department of English courses.

In addition to those courses, six credits from EAP/MLNG courses at the 1000 level or higher may count toward graduation requirements
• Achieve at least a 2.00 cumulative grade point average, a 2.00 grade point average in the major(s) and a 2.00 grade point average in the minor/certificate, or related elective credits.
• Complete department/program-specific academic and performance requirements.
• Complete at least 50% of the coursework for the major and 75% for the minor/certificate through Saint Louis University or an approved study abroad program.
• Complete 30 of the final 36 credits through Saint Louis University or an approved study abroad program.
• Complete an online degree application by the required University deadline.

Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.
### Social Science
<table>
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<tr>
<th>Course</th>
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<th>Credits</th>
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### Year Four

#### Fall

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>PHYS 4610</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Open Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MATH 4310</td>
<td>Introduction to Complex Variables</td>
<td>3</td>
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<tr>
<td>PHIL 3000 or 4000 Level Course</td>
<td></td>
<td>3</td>
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<tr>
<td>Fine &amp; Performing Arts</td>
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#### Credits
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#### Spring

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<tr>
<td>Open Elective</td>
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</tr>
<tr>
<td>PHYS 4880</td>
<td>Senior Inquiry: Research Project</td>
<td>3</td>
</tr>
<tr>
<td>Cultural Diversity – Global Citizenship</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>THEO 3000 or 4000 Level Course</td>
<td></td>
<td>3</td>
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<tr>
<td>Open Elective</td>
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#### Credits
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#### Total Credits
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### Preprofessional Health Studies Track

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<tbody>
<tr>
<td>CHEM 1110</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1115</td>
<td>and General Chemistry 1 Laboratory</td>
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<tr>
<td>ENGL 1900</td>
<td>Advanced Strategies of Rhetoric and Research</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1510</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 1240</td>
<td>General Biology: Information Flow and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>&amp; BIOL 1245</td>
<td>and Principles of Biology I Laboratory</td>
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</tr>
<tr>
<td>PHYS 1110</td>
<td>Introduction to Physics</td>
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#### Fall

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<th>Course</th>
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<tbody>
<tr>
<td>PHYS 1610</td>
<td>Quantum Mechanics</td>
<td>3</td>
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<tr>
<td>PHYS 2620</td>
<td>Modern Physics Lab</td>
<td>1</td>
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<tr>
<td>Foreign Language</td>
<td></td>
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<tr>
<td>PHYS 3110</td>
<td>Classical Mechanics</td>
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<td>MATH 2660</td>
<td>Principles of Mathematics</td>
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<tr>
<td>BIOL 3040</td>
<td>Cell Structure &amp; Function</td>
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<tr>
<td>&amp; BIOL 3060</td>
<td>and Cell Structure &amp; Function Laboratory</td>
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#### Credits
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#### Year Three

#### Fall

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<tbody>
<tr>
<td>CHEM 2410</td>
<td>Organic Chemistry 1</td>
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<td>CHEM 2415</td>
<td>Organic Chemistry 1 Laboratory</td>
<td>1</td>
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<tr>
<td>PSY 1010</td>
<td>General Psychology</td>
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<tr>
<td>SOC 1100</td>
<td>Introduction to Sociology</td>
<td>3</td>
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<tr>
<td>MATH 3550</td>
<td>Differential Equations</td>
<td>3</td>
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<tr>
<td>PHIL 1050</td>
<td>Introduction to Philosophy: Self and Reality</td>
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#### Credits
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#### Spring

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<tbody>
<tr>
<td>CHEM 2420</td>
<td>Organic Chemistry 2</td>
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<td>CHEM 2425</td>
<td>Organic Chemistry 2 Laboratory</td>
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<td>PHYS Upper Level Course</td>
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<tr>
<td>MATH 3120</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
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<tr>
<td>THEO 1000</td>
<td>Theological Foundations</td>
<td>3</td>
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<tr>
<td>PHIL 2050</td>
<td>Ethics</td>
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#### Credits
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#### Year Four

#### Fall

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<tbody>
<tr>
<td>PHYS 1610</td>
<td>Quantum Mechanics</td>
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<td>PHYS Upper Level Course</td>
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<tr>
<td>MATH 4310</td>
<td>Introduction to Complex Variables</td>
<td>3</td>
</tr>
<tr>
<td>Literature 2000 Level</td>
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<tr>
<td>HIST 1110</td>
<td>Origins of the Modern World to 1500</td>
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<td>THEO 2000 Level Course</td>
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#### Credits
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#### Spring

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Cultural Diversity – Global Citizenship (also fine arts)</td>
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<tr>
<td>PHYS 4890</td>
<td>Senior Inquiry: Comprehensive Examination</td>
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<tr>
<td>PHYS 4210</td>
<td>Electricity &amp; Magnetism I</td>
<td>3</td>
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<td>THEO 3000 or 4000 Level Course</td>
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<tr>
<td>HIST 1120</td>
<td>Origins of the Modern World (1500 to Present)</td>
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<td>Literature 3000 or 4000 (also US Div.)</td>
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#### Credits
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