## Physics - Computational Emphasis

### Freshman Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</table>
| Math 1371 Calculus I  
*(placement into course, or pre-req)* | Math 1372 Calculus II  
*(1371)* |
| Phys 1301W Intro Physics I  
*(&Math 1371)* | Phys 1302W Intro Physics II  
*(1301, & Math 1372)* |
| CSE 1001 1st Yr Experience | CSCI 1113 Intro to C/C++  
*(Math 1371)* |
| Liberal Education course or Writ 1301 | Liberal Education course or Writ 1301 |
| Liberal Education course | Liberal Education course |

### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</table>
| Math 2373 Lin Alg/Diff Eq  
*(1372)* | Math 2374 Multivariable Calc  
*(1372)* |
| Phys 2003 Phys III: Waves, Optics  
*(1302, Math 1372)* | Phys 2601 Quantum Physics  
*(2503, &3605, &Math 2373)* |
| Phys 2201 Thermo & Stat Phys  
*(1302, Math 1372)* | Phys 3041 Math for Physics  
*(1302, Math 2373)* |
| CSci 1913 Intro Alg, Data, Prog  
*(1113)* | Phys 3605W Modern Phys Lab  
previously 2605 (&2503)* |

*Not required for students admitted prior to Fall 2017; recommend as a Tech Elective.

### Junior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</table>
| Phys 4001 Analytical Mech  
*(2503 or 2601, 3041, Math 2374)* | Phys 4101 Quantum Mech  
*(2503 or 2601 or Chem 4501 or 4502)* |
| Phys 4051 Experimental Phys I  
*(3605 or equiv lab exp or instr consent)* | Phys 4052W Experimental Phys II  
*(4051)* |
| Technical Elective I | Technical Elective II |
| Liberal Education course | Liberal Education course |

### Senior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</table>
| Phys 4002 Elect & Magnetism  
*(2503 or 2601, 3041, Math 2374)* | Technical Elective III |
| Phys 4201 Stat Therm Phys  
*(2601)* | Technical Elective IV |
| Computational Elective  
select from Ast 4101, Phys 4041, Chem 4021, or AEM 5253 | Open Elective  
*(If needed to reach 120 credits)* |
| Open Elective  
*(If needed to reach 120 credits)* | Open Elective |

### About This Plan

- This plan is not a contract. Curriculum can change. The APAS is the official method for tracking completion of University degree requirements.
- Shaded courses are only offered in the indicated semester.
- Course pre-requisites and co-requisites (designated by &) are listed below the course number and title.
- Students may take either the CSE-only or University-wide versions of math courses (Math 1371/1271, 1372/1272, 2373/2243, 2374/2263).
- Students who have completed the required courses for admission to this major (indicated with double boxes on plan) and have a 3.2 UM-TC technical GPA at the end of the fall semester will be guaranteed admission. All other students who have completed the required courses will be considered for admission on a space-available basis. Admission following the spring semester is only based on space availability. The major application database is available at z.umn.edu/csemajorapp.

### Total Credits Needed for Degree: 120

### Department Contact Information

- Website: www.physics.umn.edu/undergrad/
- Main Phone: 612-624-7375
- Main Office: 130 Tate Hall
- Director of Undergraduate Studies: Jeremy Mans
- Departmental Contact: physics@umn.edu

### University Degree Requirements

All students must complete the following Writing & Liberal Education requirements, as noted on their APAS report.
See link for full Core & Theme names: z.umn.edu/liberaleducation

### Writing Requirements:

**Freshman Writing:**
- Writ 1301/1401 or equivalent

**Writing Intensive (WI):**
- Two: 1xxx or 2xxx level **
- One: 3/4/5xxx level *(in major)*
- One: 3/4/5xxx level *(any dept.)*

Requirements with an (*) will be fulfilled by taking courses at UM-TC required for this major.

<table>
<thead>
<tr>
<th>CORES:</th>
<th>THEMES:</th>
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<tbody>
<tr>
<td>Bio</td>
<td>4 of 5:</td>
</tr>
<tr>
<td>Phy*</td>
<td>Civ</td>
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<tr>
<td>His</td>
<td>DSJ</td>
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<td>SocS</td>
<td>Env</td>
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<td>GP</td>
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<td>AH</td>
<td>TS</td>
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<tr>
<td>Mth*</td>
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</table>

- Not required for students admitted prior to Fall 2017; recommend as a Tech Elective.
Physics

POSSIBLE POSITIONS

- **Data analyst:** Analyzes problems and comes up with creative solutions.
- **Field test engineer:** Performs electro-optical (EO) or infrared (IR) measurements, both on site and at field test sites as part of a small team. Develop/upgrade instrumentation and software for control and analysis, document test procedures and experimental setups, and analyze and document the results of the tests.
- **Lab analyst:** Conducts experiments, runs laboratory tests and analyzes results.
- **Physicist:** Conducts research into the phases of physical phenomena, develops theories/laws on the basis of observation and experiments, and devises methods to apply laws/theories to industry and other fields.
- **Professor/teacher:** Develops and teaches physics curriculum, which includes scientific experiments.
- **Researcher:** Conducts experiments, analyzes findings, operates necessary equipment, develops and tests theories.
- **Thin film deposition engineer:** Conducts product development on thin film deposition using vacuum systems, including operation/maintenance of a vacuum system; designing and constructing part of the system as needed; analysis of the deposited thin film; and designing of experiments, analyzing results, and reporting.

*Some of these positions may require an advanced degree.*

INDUSTRIES

- Aerospace/aeronautical
- Automotive
- Biomedical
- Consulting
- Educational institutions
- Engineering consulting
- Government agencies
- Information technology
- Materials supply
- Nuclear plants
- Observatories
- Optics/electronics
- Petroleum/mining
- Research and development
- Telecommunications

EMPLOYERS

- 3M
- Accenture
- Amazon
- Boom Lab
- Carl Zeiss Industrial Metrology
- Deloitte
- Epic Systems
- General Mills
- Google
- Intel Corporation
- Meditech
- Micron Technology, Inc
- Minco Products
- Orbital ATK
- Proto Labs Inc
- RFA Engineering
- Seagate Technology
- Siemens
- Thomson Reuters
- Vascular Solutions

CSE Career Outcomes

Average Starting Salary: 

Post-graduation Outcomes:

**cohort size too small to report data due to privacy regulations**

More Information

Career Center: cse.umn.edu/career
Salary Information: z.umn.edu/cs_salary
More Information on Undergraduate Majors: cse.umn.edu/majors

Please visit the Career Center to continue exploring this major.

*Salary and Career Outcomes gathered from the 2016-2017 CSE Graduation Survey
Post-graduation outcomes reflect the percentage of students who were employed full-time in their field or were enrolled in a graduate program.*