At the University of Washington, we believe we are at our most excellent when we cultivate a diverse and equitable academic community. We strive to create welcoming and respectful learning and working environments, with access and opportunity for all.

ANYONE can do Physics!!

- At the University of Washington, we believe we are at our most excellent when we cultivate a diverse and equitable academic community. We strive to create welcoming and respectful learning and working environments, with access and opportunity for all.
So you think you want to take physics ... 

Helpful Hints

Prof. Marjorie Olmstead  
Physics Undergraduate Faculty Advisor  
Associate Chair for Undergraduate Affairs

Teaching and Research:  
olmstd@uw.edu  
PAB B433

Advising:  
ufaphys@uw.edu  
PAT C141
1. Physics makes you more attractive to university recruiters, future employers, and that cute you have your eye on.

2. Without physics there would be NO: grocery laser scanners, space rockets, light bulbs, digital cameras, cars, cell phones, airplanes, solar panels, fiber optics, DVD players, computers, MP3 players, flat-screen TVs.

3. Or explore the mysteries of the universe: lasers to develop new medical techniques.

4. If you study engineering, you can do engineering... you can still do engineering.

5. The laws of physics are 100% recession-proof, and the jobs you can get with physics are pretty darn secure too.

6. Ever wonder why you’re learning all that math? TRY PHYSICS!

7. Physics will get you a better score on any test whose name has three or four capital letters—SAT, ACT, MCAT, LSAT or GRE.

8. Physics explains:
   - Why the sky is blue
   - Why the world goes round
   - Why global warming will have the Alaskans trading in their snow boots for flip-flops.

9. Physics teaches you how to THINK!

10. If you get stuck inside of a black hole, you’ll know how to get out.

---

**Annual Income (k$)**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>90</th>
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<tbody>
<tr>
<td>Petroleum Engn.</td>
<td></td>
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<tr>
<td>Lawyer</td>
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<tr>
<td>Physicist</td>
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<td>Comp Hardware</td>
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<td>Astronomer</td>
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<td>Economist</td>
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<tr>
<td>Mat'l Sci</td>
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<td>Elect Engn.</td>
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<td>Mat'l Engr.</td>
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<td>Database Admin</td>
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<td>Physic Prof</td>
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<td>Mech Engn.</td>
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<td>Biochem/phys</td>
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<td>Programmer</td>
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<td>Medical Sci</td>
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<td>Environ. Sci</td>
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<td>Accountant</td>
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<td>Web Developer</td>
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<td>EE Tech</td>
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<td>Conservation Sci</td>
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<tr>
<td>HS Teacher</td>
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<tr>
<td>Librarian</td>
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<tr>
<td>Computer Support</td>
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<tr>
<td>Paralegal</td>
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<tr>
<td>Chem Tech</td>
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</tbody>
</table>

**Bureau of Labor Statistics May 2016**

**Fraction of Incomes**

10  25  50  75  90
Major and Career Not Same Thing

https://www.census.gov/dataviz/visualizations/stem/stem-html/
What do Career Physicists Do?

Highest Degree

BS Physics
- Life Science: 6%
- CS/Math: 8%
- Physical Sci: 53%
- Engr: 11%
- S&E: 3%
- Teach: 2%
- Technician: 3%
- Other: 14%

Highest Degree

PhD Physics
- Life Science: 6%
- CS/Math: 8%
- Physical Sci: 53%
- Engr: 11%
- S&E: 3%
- Teach: 2%
- Technician: 3%
- Other: 14%

Highest Degree

MS Physics
- Life Science: 7%
- CS/Math: 17%
- Physical Sci: 26%
- Engr: 13%
- S&E: 7%
- Teach: 3%
- Technician: 7%
- Other: 20%

Post-Graduation Physics BS

UW Physics 2016-17 Grads
Pre-graduation Plans
[On Grad Application (N=172)]

Phys/Astro Grad 32%
Other Grad 22%
Unemployed 5%
National Data 2013-14 Grads
One year past graduation
(aip.org/statistics)

Phys Grad School 14%
Other School 14%
Work or School 30%
Work 35%
Teach 1%
Military 6%
## Typical Job Titles 1 yr Post B.S.

### Engineering
- Systems Engineer
- Electrical Engineer
- Design Engineer
- Mechanical Engineer
- Project Engineer
- Optical Engineer
- Manufacturing Engineer
- Manufacturing Technician
- Laser Engineer
- Associate Engineer
- Technical Services Engineer
- Application Engineer
- Development Engineer
- Engineering Technician
- Field Engineer
- Process Engineer
- Process Technician
- Product Engineer
- Product Manager
- Research Engineer
- Test Engineer
- General Engineer

### Research & Technical
- Research Assistant
- Research Associate
- Research Technician
- Lab Technician
- Lab Assistant
- Accelerator Operator
- Physical Sciences Technician

### Computer Hardware / Software
- Software Engineer
- Programmer
- Web Developer
- IT Consultant
- Systems Analyst
- Technical Support Staff
- Analyst

### Education
- High School Physics Teacher
- High School Science Teacher
- Middle School Science Teacher
- Substitute Science Teacher
Who hires physics bachelors in Washington?

- Some employers in Washington that recently hired new physics bachelor recipients

  - Amazon
  - Astronics AES
  - Bainbridge Parks & Recreation
  - Battelle
  - Best in Class Education Center
  - Blue Box Group
  - Boeing
  - Bombsheller
  - Bruker Elemental
  - Cascade Gasket, Inc.
  - Corvus and Columba LLC
  - David Evans and Associates, Inc.
  - Det Norske Veritas
  - Device Inside, Inc.
  - Eagle Harbor Technologies, Inc.
  - Exotic Metals Forming Company
  - ExtraHop Networks
  - Financial Partners, Inc.
  - Flexasoft
  - Google
  - Gravity Jack, Inc.
  - Intentional Software
  - L&S Engineering
  - Lockheed Martin
  - Logos Bible Software
  - Marchex, Inc.
  - Micro Encoder, Inc.
  - Microsoft
  - NAVSEA
  - NW Medical Physics Ctr
  - Octapharma Plasma, Inc.
  - PNNL
  - Procure Treatment Centers
  - PSC Biotech
  - Puget Sound Naval Shipyard
  - Radiant Zemax, LLC
  - RAFI USA
  - Randstad
  - Red Head Steering Gears
  - Schneider Electric
  - Schweitzer Engineering Labs.
  - Seattle Children's Research Inst.
  - Stardust Materials
  - Tableau Software
  - TecAce Software Limited
  - Telect, Inc.
  - University of Washington
  - Washington State University
  - Woodruff Scientific Computing
  - X2 Biosystems
  - Zulily

https://www.aip.org/statistics/washington

UW is largest undergrad physics in US

UW nearly 2% of total
Welcome to Elite University!

(UW data from SAT web site)

- HS Ranking
  - top 10%: 92%
  - top 25%: 98%
  - top 50%: 100%

- Top 10% of Introductory Physics: 10%

- GPA
  - GPA > 3.75: 67% (HS), 15% (Phys 121)
  - GPA > 3.50: 91% (HS), 28% (Phys 121)
  - GPA > 3.00: 98% (HS), 45% (Phys 121)

Freshmen returning for sophomore year: 94%
Six year graduation rate: 84%
HS GPA doesn’t predict Phys 121 GPA

• Cohort:
  first time taking Physics 121 at UW for students who took Phys 227 A11 to A15
Your First Physics Midterm

- Average grade: usually 60-70%

**WHY?**

- 80% of the points on 80% of the questions = Solid Citizen B
What does it feel like?

Gut “I don’t fit” Reaction:
- You are conditioned to believe that 60% is failing.
- The person next to you got a 95% -- ARGH
- No one you see or talk to has your cultural background
- You wander off and don’t come back

Better “I belong here” Reaction:
- A 60% on a physics midterm is a “solid citizen” result
- The probability that the person sitting next to you will win the Nobel Prize is finite.
- The Prof. will likely remember you
- You persevere, work on your study habits, learn from your mistakes, get some extra help and you thrive.
Confidence in your Education

❖ Life **without** Confidence
  ➢ You doubt yourself
  ➢ You get stopped by small tasks
  ➢ You get walked on
  ➢ You are miserable
  ➢ You quit

❖ Life **with** Confidence
  ➢ You believe in yourself
  ➢ You overcome barriers and accomplish tasks
  ➢ You are respected
  ➢ You are happy
  ➢ You persevere and succeed
Confidence vs Time at UW

Figure 2. Academic Self-Confidence Measures for Women who Remained in Science and Engineering vs. Women who Switched to Another Major

Self-assessment of level of confidence in Science and Math

Stayed in STEM
Switched Majors

S. Brainard et al, UW Center for Workforce Development
Physics 12x Structure

- No physics makes sense until you have seen it 3 times
- Each of you learns in a different way
- Opportunities
  - PART OF YOUR GRADE
    - Tests (2/3 of total)
    - Tutorial
    - Tutorial Pretests
    - Tutorial Homework
    - Laboratory Pre-lab
    - Laboratory Reports
    - Lecture Homework
    - Class-Response Questions
    - Pre-lecture Questions
  - HIGHLY RECOMMENDED
    - Lecture
    - Textbook
    - Study Center
    - Professor’s Office Hours
    - Chat Room
    - Study with Peers
    - Supplemental Homework

Use what works for you!!

NOTE: Keeping track of all this is one of your biggest tasks in Physics 12x
12x Grading

- **Exams:** 66%
  - Best 3 of MT1, MT2, final/2, final/2
  - 2/3 from lecture, 1/6 lab, 1/6 tutorial
  - 55% multiple choice MT; 100% on final

- **Lab (pre-Lab, in-class):** 10%

- **Tutorial**
  - (HW, Pretest, Attend) 8%

- **Lecture HW** 8%

- **Pre-lecture** 4%

- **In-class response** 4%

For more detail, see
https://phys.washington.edu/12x-series-grading-allocation
Should I take calculus first?

Concurrent Math Class

First UW Phys 121 vs Concurrent Math Class  N = 594
What about HS Physics?

- First 6-7 weeks of 121 covered well in HS
  - Last 3 weeks are not!
- If you did have good HS Physics:
  - Leave time in your schedule for later in the quarter when new material is introduced
  - Use the time to explore in greater depth
- If you DIDN’T have good HS Physics:
  - Don’t panic. You will catch up soon.
  - Develop good study habits early.


Come to Class!!!

- Strongest correlation I could find:

- GPA = 0.5 + 0.1 * Classes Clicked In

122B A11
Fit to 18-27 classes
Resources

- Your Classmates
- Your Teaching Assistants
- Your Professors
- Physics Advisor (Margot)
- Physics Study Center
- Physics 104 – Group study for Phys 121
- C. L. U. E. (Mary Gates Hall)
- WISE, Engineering Academic Center
- OMA/D Instructional Center
- Disability Resources for Students
Why Stay in STEM?

- It’s fascinating!
- Lots of career options
- Intellectually engaging
- Meet and work with interesting people
- Solve interesting problems
- Gain the potential to change the world
Why do people leave SME?

- **Female top 6:**
  - Non-SME major offers better education
  - Turned off of science
  - Rejection of SME career and lifestyle
  - Poor teaching by SME faculty
  - Inadequate advising
  - Curriculum overload / fast pace

- **Male Top 6:**
  - Turned off of science
  - Curriculum overload / fast pace
  - Poor teaching by SME faculty
  - SME Career rewards not worth the effort
  - Non-SME major offers better education
  - Discouraged/lost confidence due to low grades in early years
Physics Major and Minor

- Physics Minor – 30-36 credits:
  - 15 credits already engineering requirements
  - Add thermodynamics, quantum mechanics I or new class
  - Plus choose from:
    - Teaching preparation 407-8-9
    - Three advanced labs
    - Mathematical physics + E&M or QM

- Physics Major
  - Comprehensive
  - Applied
  - Teaching
  - Biophysics
I have changed majors or chosen a major late
Health or other personal problems slowed my progress
I have been delayed by inability to enroll in physics classes that I need
There are too few credits given per required core physics course
I am pursuing two or more majors/degrees
I took fewer courses each quarter so that I could get better grades
I have been delayed by inability to enroll in non-physics classes that I need
There were not enough physics classes offered at the institution I attended before UW
I have been unable to take full course loads due to financial needs
I took some time off for travel or other non-work opportunities
# Physics Core Courses

<table>
<thead>
<tr>
<th>Core Classes (55/6 cr)</th>
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</thead>
<tbody>
<tr>
<td>Phys: 121, 122, 123 224, 225 294</td>
<td>Mechanics, Elect. &amp; Mag., Waves, Thermo, Modern I Intro to Research</td>
</tr>
<tr>
<td>227 321, 322 334</td>
<td>Math Phys Electromagnetism II&amp;III Electronics Laboratory</td>
</tr>
</tbody>
</table>
# Physics Option Requirements

<table>
<thead>
<tr>
<th></th>
<th>Comprehensive (+38-41 cr)</th>
<th>Applied (+34-39 cr)</th>
<th>Teaching (+38-41 cr)</th>
<th>Biological (+51-552 cr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Math</strong></td>
<td>Phys 228 (Math Phys) + 1 MM</td>
<td>AMATH 301 (MatLab) +2 of {Phys 228 +MM}</td>
<td>Phys 228 + 1 MM</td>
<td>Phys 228</td>
</tr>
<tr>
<td><strong>32x</strong></td>
<td>226, 324 (Part; QM2) Three junior level E&amp;M, QM, Astro, Mechanics, Statistical</td>
<td>One from 226, 323, 324, 328, 329 (Part., E&amp;M3, QM2, Statistical, Classical)</td>
<td>226, 324 (Part; QM2) One from E&amp;M, QM, Mechanics</td>
<td>324 (QM2) 328 (Statistical) One from 226, 323, 329</td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td>Two advanced labs</td>
<td>231 (intermediate lab) Two advanced labs</td>
<td>One advanced lab</td>
<td>(in bio/chem)</td>
</tr>
<tr>
<td><strong>Res/Sem</strong></td>
<td>3 cr Research or Sem</td>
<td>3 cr Research or Sem</td>
<td>3 cr teaching/PER</td>
<td>3 cr in bio-related research</td>
</tr>
<tr>
<td><strong>UD Elect</strong></td>
<td>2 additional Phys/Cognate Class</td>
<td>3 additional 32x, Phys/Cognate (may include 1 lab; 1 intro sci)</td>
<td>407-8-9 (physics for future teachers)</td>
<td>429 (Biophysics)</td>
</tr>
<tr>
<td><strong>Other Sci</strong></td>
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<td></td>
<td>3 chem classes 2 bio 2 additional bio/chem</td>
</tr>
</tbody>
</table>
TOP 10 REASONS WHY YOU SHOULD TAKE PHYSICS

www.compadre.org/careers

#10
Someone call a physicist! If you get stuck inside of a black hole, you'll know how to get out.

#9
Physics teaches you how to THINK!

#8
Physics explains:
- Why the sky is blue
- Why the world goes round
- Why global warming will have the Alaskans trading in their snow boots for flip-flops.

#7
SAT LSAT
Physics will get you a better score on any test whose name has three or four capital letters—SAT, ACT, MCAT, LSAT or GRE.

#6
The laws of physics are 100% recession-proof, and the jobs you can get with physics are pretty damn secure too.

#5
Ever wonder why you're learning all that math? TRY PHYSICS!

#4
If you study engineering, you can do engineering. If you study physics, you can STILL do engineering...

#3
Explore the mysteries of the universe using lasers to develop new medical techniques.

#2
Without physics there would be NO: grocery laser scanners, space rockets, light bulbs, digital cameras, cars, cell phones, airplanes, solar panels, fiber optics, DVD players, computers, MP3 players, flat-screen TVs. Get the picture?

#1
NUMBER 1 REASON
Physics makes you more attractive to university recruiters, future employers, and that cutie you have your eye on.

F = ma
E = mc²
What have Physicists Brought Society?

- Battery-powered Car
- MRI of Brain Cancer
- 'Butterfly Wings on Every Eyelid' - L'Oreal

Images include:
- iPod
- Contact Lens
- World Wide Web
- Elementary Particles
- Leptons, Quarks, Force Carriers