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The two-year master's program offers advanced study and training in the three disciplines that form the core of the Applied Physics graduate program at Cornell: Optics, Nanotechnology, and biotechnology. It provides valuable graduate training and research/design project experience sought after by industry, government, and R & D organizations. The program also prepares students for PhD programs in physics, applied physics or engineering. Each combines a common core of fundamental mathematics and physics and an interdisciplinary curriculum that addresses the frontiers of their respective technology fields, with a research or design project focused on applying physics to scientific and technological problems. The curriculum is tailored to fit the needs of individual students, and the project offers an opportunity for independent research under the supervision of leading scientists and engineers. These programs are designed to fulfill the needs of the students with basic science background and seeking advanced training in specific application fields.
Special Committee

Each M.S. candidate in the Graduate Field of Applied Physics will need to form a Special Committee. The Special Committee requires a minimum of two faculty members. The Special Committee will oversee your academic progress. For example, your Special Committee can consist of your research advisor and the M.S. program director. You may change your advisors to fit your academic and research interests. You will need to complete a Special Committee Selection and Change form (A1), which is now a fully online process at www.gradschool.cornell.edu/forms. Students may request committee or advisor changes directly from Student Center.

You must find a research advisor, and complete the Special Committee Selection and Change process by the end of the second semester.

Core Curriculum

The program includes a set of common core courses in mathematics and physics, individually tailored lab components and electives, and a thesis project. Student must take a minimum of 12 credit hours per semester, and maintain a C average (2.0) or better to remain in good academic standing.

The math sequence of AEP4210 and AEP4220 provides a rigorous and quantitative math background for a broad range of engineering and physics disciplines. The physics courses cover both electricity and magnetism (EM) and quantum mechanics (QM) at an intermediate level. Depending on the research focus of the degree candidate, a more advanced level of either EM or QM is provided. These core courses are offered in the first year, and form the basis of the M.S. program in Applied Physics.

Hands-on experiences are essential for an advanced degree in engineering and applied sciences. This requirement is fulfilled by laboratory courses in the first year and an individual thesis project supervised by a faculty member in the second year. The lab courses are tailored to match the degree area (see pages 6-11): optics labs (AEP3300 and a portion of AEP5100) for the focus area in optics, labs in biochemistry and molecular biology (BIOMG4400 or biophysics AEP 5710) for the focus area in biotechnology, and labs in solid state physics and nanotechnologies (AEP6620 or MSE5490 and/or a portion of AEP5100) for the focus area in nanotechnology. These lab courses provide training of laboratories skills in the respective areas, and prepare the degree candidates for the year-long thesis project. The individual project is chosen by the degree candidate in consultation with his/her faculty advisor, and requires full-time commitment of the student in the second year of the program. A written thesis and an oral presentation (e.g., group seminar) are required at the end of the project.
In addition to the required common core curriculum, the lab course, and the thesis project, the students are encouraged to take 2 to 3 electives in their respective fields of study. These electives are designed to provide in-depth coverage of specific technical fields, further enhancing the knowledge gained from the individual thesis project.

A seminar course “Special Topics in Applied Physics” will be taught by the faculty members of the Applied Physics graduate field. The purpose of this course is to significantly broaden the knowledge of the student, and increase the interaction between the students and leading researchers in their fields. This seminar course will be offered every fall and spring semesters, and is required for all M.S. students.

In general, students are responsible for their own work/study experience during the summer between the first and second year. There may be some limited opportunities for paid work experience during the summer on campus, but there is no expectation for residency in Ithaca.

Admission requirement

We seek students with a solid background in engineering, physics, chemistry or biology, with strong quantitative skills. To take full advantage of the program incoming students should have the equivalent of an undergraduate major in engineering, physics, chemistry or biology, physics through elementary electricity and magnetism, math through partial differential equations, and elementary chemistry.

Students lacking some of this background may be conditionally admitted to the program. In this case they will take the background courses needed in their first and/or second semesters and then start the program. Students can also take advantage of the Coop courses during the summer between the first and second year. The duration of the program may be increased by the time required to attain the needed background.

Exceptionally strong students will be allowed to place out of the common core courses. In general, proof of having taken equivalent or higher-level courses will be required for placing out of any of the core courses. Assessment of equivalence will be done individually using an approach similar to that for transfer credits in the undergraduate program. The duration of the degree program can be adjusted accordingly to accommodate the schedule change.
### Focus Area in Optics

**Fall Courses:**
- **AEP 4210** Applied Mathematics
- Choose one:
  - AEP3550/3610 Introduction to E&M and QM
  - AEP5570 Electricity and Magnetism
  - Phys6572 Quantum Mechanics
  - Chem7930 Quantum Mechanics I
- Choose one:
  - AEP3300 Modern Optics Lab*
  - AEP3630 Electronics Lab*
  - Phys6510 Advanced Experimental Physics*
  - Optional Elective
  - **AEP7530** Special Topics in Applied Physics

**Spring Courses:**
- **AEP4220** Applied Mathematics
- Choose one:
  - AEP3560 Intermediate Electrodynamics
  - AEP3620 Intermediate QM
  - Chem7940 Quantum Mechanics II
- Choose one:
  - AEP6510 Advanced Experimental Physics*
  - Optional Elective
  - **AEP7540** Special Topics in Applied Physics

*At least one laboratory course must be taken

**Credits**

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<td><strong>AEP7530</strong> Special Topics in Applied Physics</td>
<td><strong>AEP7540</strong> Special Topics in Applied Physics</td>
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### Optional Electives

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**Student must maintain C average (2.0) or better to remain in good academic standing.**

Changes to your curriculum might cause you not to graduate. Please consult with your Advisor before making any changes to your curriculum.

Advisor ___________________ Date ___________ Student ___________________ Date ___________
Possible Electives for the Focus Area in Optics (not Inclusive):

AEP3560/AEP3620 E&M or Quantum
AEP4400 Quantum and Nonlinear Optics
AEP4500 Solid State Physics
AEP5500 Applied Solid State Physics
AEP5570 Applied Electrodynamics
ECE4300 Lasers and Optoelectronics
ECE4320 MicroElectro Mechanical Systems (MEMS) (also MAE 4320) ECE4330 Microwave Theory, Devices, and Applications
ECE4370 Fiber and Integrated Optics
ECE5310 Quantum Optics for Photonics and Optoelectronics
ECE5330 Semiconductor Optoelectronics
BME6260 Biomedical Optics, Imaging, and Spectroscopy

(Please note: Not all course may be offered every term/year)
Focus Area in Nanotechnology

**Fall Courses:**
- AEP 4210 Applied Mathematics
- Choose one:
  - AEP3550/3610 Introduction to E&M and QM
  - AEP5570 Electricity and Magnetism
  - Chem7930 Quantum Mechanics I
  - Phys6572 Quantum Mechanics
- Choose one:
  - AEP6610 Nanocharacterization
  - Optional Elective
  - AEP7530 Special Topics in Applied Physics

**Spring Courses:**
- AEP4220 Applied Mathematics
- Choose one:
  - AEP3560 Intermediate Electrodynamics
  - AEP3620 Intermediate Quantum Mechanics
  - Chem7940 Quantum Mechanics II
  - Phys6574 Applications of Quantum Mechanics II
- Choose one:
  - AEP6620 Micro/Nano-Fabrication and Processing*
  - MSE5490 Nanofabrication: Making It Small (Lab)*
  - Phys6510 Advanced Experimental Physics*
  - AEP7540 Special Topics in Applied Physics

*At least one laboratory course must be taken

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**Fall Courses:**
- Optional Elective
- Project
- AEP7530 Special Topics in Applied Physics

**Spring Courses:**
- Optional Elective
- Project
- AEP7540 Special Topics in Applied Physics

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Optional Electives

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Student must maintain C average (2.0) or better to remain in good academic standing.

Changes to your curriculum might cause you not to graduate. Please consult with your Advisor before making any changes to your curriculum.

Advisor ___________________ Date ___________________ Student ___________________ Date ___________________
Possible Electives for the Focus Area in Nanotechnology (not inclusive):

AEP3560/AEP3620 EM or QM
AEP3630        Electronics Lab
AEP4500        Solid State Physics
AEP5500        Applied Solid State Physics
AEP5100        Advanced Experimental Lab
AEP5570        Applied Electrodynamics
AEP6620        Nanofabrication and Processing
AEP 6630       Nanobiotechnology (also BLOG 6630, MSE 5630)
MAE4320        MicroElectro Mechanical Systems (MEMS) (also ECE
4320) MAE5240  Physics of Micro- and Nanoscale Fluid Mechanics
ECE5360        Nanofabrication of Semiconductor Devices (also MSE
5410) ECE5370  Nanoscale Devices, Circuits, and Physics
PHYS6572       Quantum Mechanics I

(Please note: Not all course may be offered every term/year)
Focus Area in Biotechnology:  Biophysics Track

**Fall Courses:**
- AEP 4210  Applied Mathematics
  Choose one:
  - AEP3550/3610 Introduction to E&M and QM
  - AEP5570  Electricity and Magnetism
  - Phys6572  Quantum Mechanics
  Choose one:
  - AEP3630  Electronic Circuits
  - AEP4700  Biophysical Methods
  - Phys6510  Advanced Experimental Physics*
  - AEP7530  Special Topics in Applied Physics

**Spring Courses:**
- AEP4220  Applied Mathematics
  Choose one:
  - AEP3560  Intermediate Electrodynamics
  - AEP3620  Intermediate QM
  - Phys6574  Applications of Quantum Mechanics II
  Choose one:
  - AEP3630  Electronic Circuits*
  - AEP5520  Physics of Life
  - AEP5710  Biophysical Methods Advanced Laboratory (if offered)*
  - AEP6510  Advanced Experimental Physics*
  - AEP6510  Advanced Experimental Physics*  
  - AEP7540  Special Topics in Applied Physics

*At least one laboratory course must be taken

**Fall Courses:**
- Optional Elective
- Project
- AEP7530  Special Topics in Applied Physics

**Spring Courses:**
- Optional Elective
- Project
- AEP7540  Special Topics in Applied Physics

**Optional Electives**

Student must maintain C average (2.0) or better to remain in good academic standing.

Changes to your curriculum might cause you not to graduate. Please consult with your Advisor before making any changes to your curriculum.

Advisor __________________________ Date ___________ Student __________________________ Date ___________
Focus Area in Biotechnology: Biochemistry Track

**Fall Courses:**
- AEP 4210  Applied Mathematics
Choose one:
- AEP3550/3610 Introduction to E&M and QM
- AEP5570  Electricity and Magnetism
- Phys6572  Quantum Mechanics
- BioMG3300  Principles in Biochemistry
- AEP7530  Special Topics in Applied Physics

**Spring Courses:**
- AEP4220  Applied Mathematics
Choose one:
- AEP3560  Intermediate Electrodynamics
- AEP3620  Intermediate QM
- Phys6574  Applications of Quantum Mechanics II
- BioMG4400  Laboratory in Biochemistry and Molecular Biology*
- AEP7530  Special Topics in Applied Physics

*At least one laboratory course must be taken

**Fall Courses:**
- Optional Elective
- Project
- AEP7530  Special Topics in Applied Physics

**Spring Courses:**
- Optional Elective
- Project
- AEP7530  Special Topics in Applied Physics

Optional Electives

Student must maintain C average (2.0) or better to remain in good academic standing.

Changes to your curriculum might cause you not to graduate. Please consult with your Advisor before making any changes to your curriculum.

Advisor ___________________ Date ______________ Student ___________________ Date ______________
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