

CornellEngineering
Applied and Engineering Physics



Master of Engineering Handbook

2022-23

OVERVIEW

The one-year masters program offers advanced study and training in engineering physics. It provides valuable graduate training and research and design project experience sought after by industry, government, and research and development organizations. The goal is to prepare students for cutting-edge industrial and research positions. It combines an interdisciplinary curriculum 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.

M.ENG. REQUIREMENTS AND POLICIES IN ENGINEERING PHYSICS

Faculty Advisor

Each M.Eng. candidate will be assigned a field faculty advisor. This person will oversee the academic progress and serve as an intellectual and professional mentor. You may change your advisor to fit your academic and research interests, but he/she must be a member of the Graduate Field Faculty.

Curriculum

Students combine a research or design project with electives selected from a variety of applied physics related graduate fields. Thirty credit hours are required, which includes six to twelve credits for the project. Courses include a core curriculum of applied quantum mechanics, statistical mechanics, and applied mathematics in addition to electives in areas of applied physics, computer science, engineering, or biotechnology. The flexibility of the curriculum allows students, in consultation with their advisor, to select a program of study to meet their individual interests and educational goals.

Academic Program Requirements

The primary objective of the one-year masters level study in engineering physics is to provide an opportunity for advanced study at the professional level; students who earn the M.Eng. (EP) degree are prepared to move into development or research appointments in industrial or governmental institutions.

The degree requirements permit considerable flexibility in the course program, which is planned by the student in consultation with his/her faculty advisor.

The following academic components are required:

M.Eng Project (AEP 7510)

An informal study project, experimental or analytical, which requires individual effort and culminates with a formal report. It is usually completed by the end of the second semester but permission to continue through the summer may be obtained. The study project is chosen in consultation with the M.Eng. Director. Typically, the M.Eng. Project Advisor is your faculty advisor, but an appropriate member of the engineering or science faculty may be appointed from outside the field, subject to the approval of the Director of the Master of Engineering Program.

The following are examples of some recent research and design projects completed by students in the program:

- Chemical synthesis and nonlinear optics in microchannels
- On-chip DNA quantification
- Fabrication of graphene-based devices for the study of atomic membrane interfaces
- Silicon nanocrystals for solar cells
- Engineering a radio-frequency scanning tunneling microscope
- Spatially-resolved photocurrent imaging of PbSe quantum dots
- Characterization and measurement of femtosecond pulses using autocorrelation techniques
- Computational simulation of electrohydrodynamic systems pertaining to micro- and nano-scale fluid flow phenomenon
- Compensation of wake-field-driven energy spread in energy recovery linacs
- 1550nm normal-dispersion femtosecond mode-locking fiber laser
- Technology demonstration of the scanning Double Half Wave Interferometer (DHWI) for use on the Stratospheric Observatory for Infrared Astronomy (SOFIE)
- Vacuum ultraviolet photo ionization studies of fuel-rich ethylene flames
- Wrinkle-based strain-Engineering of WSe₂ quantum emitters

Academic Program Requirements

- Total number of credits = 30 hours minimum / 4000 level or higher
- No grade below C-
- Only 2.0 credits of the 30 hrs minimum may be taken S/U.

Required Coursework

AEP 7530	"Special Topics Seminar in Applied Physics" (fall term only)	1 credit (letter grade)
AEP 7540	"Special Topics Seminar in Applied Physics" (spring term only)	1 credit (letter grade)
AEP 7510	"M.Eng. Project"	6 - 12 credits
Sequence Course 1	Graduate level course sequence (≥ 4000 level) in an area of engineering, applied, or basic science	3 - 4 credits
Sequence Course 2	Graduate level course sequence (≥ 4000 level) in an area of engineering, applied, or basic science	3 - 4 credits
Electives	Advanced (≥ 4000 level) courses in an area of engineering, applied, or basic science	8 - 16 credits

Possible Technical Sequences (Fall / Spring)

This list is not exclusive. Speak with your faculty advisor regarding other options. The goal is to gain a specialization in an applied field. One course must be taken in the fall semester and the other in spring semester.

1. Solid State Physics (AEP 4500) /
Applied Solid State Physics (AEP 5500)
2. Nanocharacterization (AEP 6610) / Nanofabrication (MSE 5490)
3. Nanocharacterization (AEP 6610) /
Applied Solid State Physics (AEP 5500)
4. Nanocharacterization (AEP 6610) /
Electronic Properties of Materials (MSE 6050)
5. Thin Film Materials Science (MSE 5430) /
Nanofabrication (MSE 5490)
6. MicroElectro Mechanical Systems (ECE 4320) /
Nanofabrication (MSE 5490)
7. MicroElectro Mechanical Systems (ECE 4320) /
Applied Solid State Physics (AEP 5500)
8. Lasers and Optoelectronics (ECE 4300) /
Fiber and Integrated Optics (ECE 4370)
9. Lasers and Optoelectronics (ECE 4300) /
Quantum & Nonlinear Optics (AEP 4400)
10. Quantum Optics (ECE 5310) /
Fiber and Integrated Optics (ECE 4370)
11. Biophysical Methods (AEP 4700)
12. Biophysical Methods (AEP 4700) /
Biomedical Optics, Imaging, and Spectroscopy (BME 6260)

Computational Engineering Physics (AEP 4380) is a good spring class to accompany many of these fall options.

APPLIED PHYSICS GRADUATE FIELD FACULTY

Brock, Joel D.	Applied Physics	jdb20@cornell.edu
Cohen, Itai	Physics	ic64@cornell.edu
Disa, Ankit	Applied Physics	asd47@cornell.edu
DiSalvo, Francis J.	Chemistry and Chemical Biology	fjd3@cornell.edu
Erickson, David C.	Mechanical and Aerospace Engineering	de54@cornell.edu
Fatemi, Valla	Applied Physics	valla.fatemi@cornell.edu
Fennie, Craig J.	Applied Physics	fennie@cornell.edu
Fuchs, Gregory D.	Applied Physics	gdf9@cornell.edu
Giannelis, Emmanuel P.	Materials Science and Engineering	epg2@cornell.edu
Gruner, Sol	Physics	smg26@cornell.edu
Hammer, David A.	Electrical and Computer Engineering	dah5@cornell.edu
Hines, Melissa A.	Chemistry and Chemical Biology	mah11@cornell.edu
Jena, Debdeep	Electrical and Computer Engineering, Materials Science and Engineering	dj326@cornell.edu
Kourkoutis, Lena F.	Applied Physics	lf56@cornell.edu
Kusse, Bruce R.	Applied Physics	brk2@cornell.edu
Lal, Amit	Electrical and Computer Engineering	al274@cornell.edu
Lambert, Guillaume	Applied Physics	lambert@cornell.edu
Mak, Kin Fai	Physics / Applied Physics	km627@cornell.edu
McEuen, Paul	Physics	plm23@cornell.edu
McMahon, Peter	Applied Physics	pmcmahon@cornell.edu
Moses, Jeffrey	Applied Physics	jam262@cornell.edu
Muller, David A.	Applied Physics	dm24@cornell.edu

APPLIED PHYSICS GRADUATE FIELD FACULTY

Pollack, Lois	Applied Physics	lp26@cornell.edu
Pollock, Clifford R.	Electrical and Computer Engineering	crp10@cornell.edu
Ralph, Daniel C.	Physics	dcr14@cornell.edu
Robinson, Richard D.	Materials Science and Engineering	rdr82@cornell.edu
Schaffer, Chris	Biomedical Engineering	cs385@cornell.edu
Schlom, Darrell	Materials Science and Engineering	ds636@cornell.edu
Seyler, Charles E.	Electrical and Computer Engineering	ces7@cornell.edu
Shan, Jie	Applied Physics	js3469@cornell.edu
Shvets, Gennady	Applied Physics	gs656@cornell.edu
Thompson, Michael O.	Materials Science and Engineering	mot1@cornell.edu
Tiwari, Sandip	Electrical and Engineering	st222@cornell.edu
Van Dover, Robert B.	Materials Science and Engineering	rbv2@cornell.edu
Wang, Michelle	Physics	mdw17@cornell.edu
Wang, Zheng Jane	Mechanical and Aerospace Engineering	zw24@cornell.edu
Wise, Frank W.	Applied Physics	fww1@cornell.edu
Xu, Chris	Applied Physics	cx10@cornell.edu
Zipfel, Warren R.	Biomedical Engineering	wrz2@cornell.edu