APPLIED AND ENGINEERING PHYSICS, MS

Banner Code: SC-MS-PHAE

Graduate Advisor

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Fairfax Campus

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This degree contains elements of traditional physics programs and the application of physics to a diversity of critical societal problems. The program is divided into three areas of emphasis; see Requirements for details.

Many courses are offered during late afternoon or evening hours to allow students with full-time employment to easily attend. Students employed at area high-technology organizations may take up to 6 credits (out of 30) for work done on the job under the guidance of a faculty member. This employment-related research may be conducted under an optional 3-credit research project or an optional 6-credit master's thesis. Master's students who are not employed full time may apply for financial aid or a limited number of research assistantships.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies (http://catalog.gmu.edu/admissions/graduate-policies/) section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now/).

Individuals holding a baccalaureate degree in physics or a related field from a regionally accredited institution and who have earned a GPA of 3.00 (out of 4.00) in their last 60 credits are invited to apply for admission. If the baccalaureate degree is in a field other than physics, applicants should have taken several courses beyond the introductory physics courses, such as junior-level classical mechanics, electricity and magnetism, or electronics. Applicants may be required to make up one or two deficiencies, based on a graduate physics advisor's assessment, and be provisionally admitted into the program. Three letters of recommendation must be submitted, preferably from former professors. The general GRE and the GRE subject test in physics are recommended for applicants who received their baccalaureate degrees within the past five years.

Policies

For policies governing all graduate programs, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

Requirements

Degree Requirements

Total credits: 30

Students should refer to the Admissions & Policies tab for specific policies related to this program. Select one emphasis and complete all the requirements therein.

Plan of Study

Before the end of their first semester, each student must submit to the graduate coordinator's office a plan of study that has been approved by their academic advisor. The selected courses must be cohesive and lead to comprehensive knowledge in one area; it cannot be a set of disjointed courses. Any deviations from this plan must be approved by the student's academic advisor. A final, signed version of the plan must be submitted to the graduate coordinator at the start of the semester in which the student plans to graduate.

Select one emphasis and complete all the requirements therein.

Standard Emphasis

This emphasis is intended for students who may wish to pursue further graduate study in physics or astrophysics or pursue graduate study following the Standard Physics concentration of the Physics PhD.

Code	Title	Credits
Core Courses		12
PHYS 684	Quantum Mechanics I	
PHYS 685	Classical Electrodynamics I	
PHYS 705	Classical Mechanics	
PHYS 711	Statistical Mechanics	
Emphasis Electives [1]		
Select 9 credits of graduate-level courses from the following:		9
ASTR (http://catalog.gmu.edu/courses/astr/)		
PHYS (http://catalog.gmu.edu/courses/phys/)		
General Electives [2]		9
Select 9 credits of graduate-level science courses approved by an academic advisor.		
Total Credits		30

1. These must be regular courses and not directed reading, research, or thesis credits.
2. Students may take PHYS 796 Directed Reading and Research and up to 6 credits of PHYS 798 Research Project as general electives. PHYS 798 Research Project is conducted under the supervision of a faculty research advisor and may be based on work done as an intern. Up to 6 credits of PHYS 799 Master's Thesis may be taken as general electives by students pursuing the thesis option and may also be based on work done as an intern.

Engineering Physics Emphasis

This emphasis is intended for students who may wish to pursue employment in an engineering-related field or pursue graduate study following the Engineering Physics concentration of the Physics PhD.

Code	Title	Credits
Core Courses		12
Choose one course from each group:		
Group One		
PHYS 510	Computational Physics I	
Group Two		
PHYS 502	Introduction to Quantum Mechanics and Atomic Physics	
PHYS 684	Quantum Mechanics I	
PHYS 690	Engineering Thermodynamics	
Group Three		
PHYS 513	Applied Electromagnetic Theory	
PHYS 620	Continuum Mechanics	
PHYS 685	Classical Electrodynamics I	
Group Four		
PHYS 533	Modern Instrumentation	
PHYS 613	Computational Physics II	
Emphasis Electives [1]		9
Select 9 credits of graduate-level courses from the following:		
BENG (http://catalog.gmu.edu/courses/beng/)		
CEIE (http://catalog.gmu.edu/courses/ceie/)		
ECE (http://catalog.gmu.edu/courses/ece/)		
MATH (http://catalog.gmu.edu/courses/math/)		
ME (http://catalog.gmu.edu/courses/me/)		
PHYS (http://catalog.gmu.edu/courses/phys/)		
General Electives [2]		9
Select 9 credits of graduate-level science and engineering courses approved by an academic advisor.		
Total Credits		30

1. These must be regular courses and not directed reading, research, or thesis credits.
2. Students may take PHYS 796 Directed Reading and Research and up to 6 credits of PHYS 798 Research Project as general electives. PHYS 798 Research Project is conducted under the supervision of a faculty research advisor and may be based on work done as an intern. Up to 6 credits of PHYS 799 Master's Thesis may be taken as general electives by students pursuing the thesis option and may also be based on work done as an intern.

Applied Physics Emphasis

This emphasis is intended for students who may wish to pursue employment in an applied physics or engineering related field.

Code	Title	Credits
Core Courses		12
Select one course from each group:		
Group One		
PHYS 510	Computational Physics I	
Group Two		
PHYS 533	Modern Instrumentation	
Group Three		
PHYS 502	Introduction to Quantum Mechanics and Atomic Physics	
PHYS 684	Quantum Mechanics I	
Group Four		
PHYS 513	Applied Electromagnetic Theory	
PHYS 685	Classical Electrodynamics I	
Emphasis Electives		9
Select 9 credits of graduate-level courses from the following:		
BINF (http://catalog.gmu.edu/courses/binf/)		
CHEM (http://catalog.gmu.edu/courses/chem/)		
CLIM (http://catalog.gmu.edu/courses/clim/)		
CSI (http://catalog.gmu.edu/courses/csi/)		
MATH (http://catalog.gmu.edu/courses/math/)		
STAT (http://catalog.gmu.edu/courses/stat/)		
PHYS (http://catalog.gmu.edu/courses/phys/)		
General Electives [2]		9
Select 9 credits of graduate-level science and engineering courses approved by an academic advisor.		
Total Credits		30

1. These must be regular courses and not directed reading, research, or thesis credits.
2. Students may take PHYS 796 Directed Reading and Research and up to 6 credits of PHYS 798 Research Project as general electives. PHYS 798 Research Project is conducted under the supervision of a faculty research advisor and may be based on work done as an intern. Up to 6 credits of PHYS 799 Master's Thesis may be taken as general electives by students pursuing the thesis option and may also be based on work done as an intern.

Thesis Option

In preparation for this option, the student must form a committee comprising a chair and two other faculty members.

The student completes a thesis under the direction of the committee chair. The thesis work is typically completed while students are registered for 6 credits of PHYS 799 Master's Thesis. A thesis proposal and thesis are submitted in accordance with AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/). The student must give an oral defense of the thesis to the committee and the George Mason community at large. Students are expected to respond to questions on the thesis and related material. The committee determines whether the defense is satisfactory.

Accelerated Master's

Physics, BS/Applied and Engineering Physics, Accelerated MS

Overview

This program allows academically strong undergraduates with a demonstrable commitment to research to obtain the Physics, BS (http://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/) and Applied and Engineering Physics, MS degrees by successfully completing 144 credits. Upon completion, students are well-prepared for

entry into a professional school or a PhD program in physics or a related discipline.

Admitted students take selected graduate courses during their senior year and are able to use up to 6 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program and complete an additional 24 credits to receive the master's degree.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (http://catalog.gmu.edu/admissions/graduate-policies/) section of this catalog.

Successful applicants will have completed at least 90 credits toward their undergraduate degree and 45 credits in physics major coursework. The physics major GPA must be at least 3.50. One or more recommendation letters from one or more research supervisors are also required. Interested applicants should submit a letter to the undergraduate physics coordinator requesting admission along with the aforementioned recommendation letter(s). Contact the physics undergraduate or graduate coordinator for further details.

Accelerated Option Requirements

At the beginning of the student's final undergraduate semester, students must submit a bachelor's/accelerated master's transition form (http://registrar.gmu.edu/forms/) to the College of Science's Office of Academic and Student Affairs (https://cos.gmu.edu/about/contact-us/). Students must begin their master's program in the semester immediately following conferral of the bachelor's degree.

Students must maintain an overall GPA of 3.00 or higher in graduate coursework.

Reserve Graduate Credit

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master's program. Reserve graduate credits do not apply to the undergraduate degree.

Mechanical Engineering, BS/Applied and Engineering Physics, Accelerated MS

Overview

This program allows academically strong undergraduates with a demonstrable commitment to research to obtain the Mechanical Engineering, BS (https://catalog.gmu.edu/colleges-schools/engineering/mechanical/mechanical-engineering-bs/) and Applied and Engineering Physics, MS degrees by successfully completing 145 credits. Upon completion, students are well-prepared for entering into the professional workforce, or a PhD program in physics or a related engineering discipline.

Admitted students take selected graduate courses during their senior year and are able to use up to 6 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program and complete an additional 24 credits to receive the master's degree.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (http://catalog.gmu.edu/admissions/graduate-policies/) section of this catalog.

Successful applicants majoring in Mechanical Engineering will have completed at least 90 credits toward their undergraduate degree with an overall GPA of at least 3.00, and the following courses with a GPA of 3.00 or better:

Code	Title	Credits
CS 112	Introduction to Computer Programming	4
ME 212	Solid Mechanics	3
ME 231	Dynamics	3
ME 313	Material Science	3
ME 322	Fluid Mechanics	3
ME 323	Heat Transfer	3
ME 351	Analytical Methods in Engineering	3

One or more recommendation letters from one or more research supervisors are also required. Interested applicants majoring in Mechanical Engineering, BS (https://catalog.gmu.edu/colleges-schools/engineering/mechanical/mechanical-engineering-bs/) should submit a letter to the undergraduate Mechanical Engineering coordinator and the Physics Graduate Coordinator, respectively, requesting admission along with the aforementioned recommendation letter(s). Contact the Mechanical Engineering undergraduate and the Physics graduate coordinator for further details.

Accelerated Option Requirements

At the beginning of the student's final undergraduate semester, students must submit a bachelor's/accelerated master's transition form (http://registrar.gmu.edu/forms/) to the College of Science's Office of Academic and Student Affairs (https://cos.gmu.edu/about/contact-us/). Students must begin their master's program in the semester immediately following conferral of the bachelor's degree.

Students must maintain an overall GPA of 3.00 or higher in graduate coursework.

Reserve Graduate Credit

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master's program. Reserve graduate credits do not apply to the undergraduate degree.