

Program Change Request

Date Submitted: 02/13/24 5:25 pm

Viewing: **SC-PHD-PHYS : Physics, PhD**

Last approved: 03/31/23 1:54 pm

Last edit: 03/07/24 8:55 am

Changes proposed by: paso

Catalog Pages
Using this Program
[Physics, PhD](#)

Are you completing this form on someone else's behalf?

Yes

Requestor:

In Workflow

1. **PHYS GR Committee**
2. **PHYS Chair**
3. **SC Curriculum Committee**
4. SC Assistant Dean
5. Assoc Provost-Graduate
6. Registrar-Programs

Approval Path

1. 02/13/24 5:26 pm
Paul So (paso):
Approved for PHYS GR Committee
2. 02/13/24 5:27 pm
Ernest Barreto (ebarreto):
Approved for PHYS Chair

History

1. Nov 14, 2017 by clmig-jwehrheim
2. Jan 11, 2018 by rzachari
3. Feb 16, 2018 by rzachari
4. Feb 23, 2021 by jriemen
5. Mar 31, 2023 by Jennifer Bazaz Gettys (jbazaz)

Name	Extension	Email
Paul So	4431	paso

Effective Catalog: 2024-2025

Program Level: Graduate

Program Type: Doctoral

Degree Type: Doctor of Philosophy

Title: Physics, PhD

Banner Title: Physics, PhD

Registrar/OAPI Use Only – SCHEV Status Approved

Registrar’s Office Use Only – Program Start Term

Registrar/OAPI Use Only – SCHEV Letter

Registrar/OAPI Use Only – SACSCOC Status

Concentration(s):

	Associated Concentrations	Registrar's Office Use Only: Concentration Code
1	Standard	STND
2	Engineering Physics	ENGP

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

Department / Academic Unit: Physics & Astronomy

Jointly Owned Program? No

Justification

What: Clarify the committee member requirements.

Why: This change would remove the requirement that the external person be a member of the

Graduate Faculty, thus alleviating us of considerable bureaucratic effort and delays while not compromising the integrity of the committee.

What: Referring applicants to central admissions language and removing extraneous wording.

Why: To make the program more adaptable to changes in university policies.

What: Removing "the last 60 credits" GPA requirement.

Why: To the best of our knowledge, no one actually checks this by counting out the credits.

Typically, a student's performance in a specific set of upper-level physics courses is a better gauge in their preparation for their graduate level physics classes.

What: To change the GRE-GEN requirement to optional for admission into the program.

Why: Some studies have shown that the GRE-GEN can be biased against certain traditionally underrepresented groups and is not a good predictor of academic success. A large number of graduate programs nationally have removed the GRE-GEN from their admissions requirements. The department decided to change our GRE-GEN requirement from "required" to "optional".

What: Rearrange the set of required core and specialty sciences courses for the two Concentrations (STND and ENGP) in our PHYS PhD program.

Why: This rearrangement is to emphasize the common core for both concentrations in our PHYS PhD degree program. We also added to our list Specialty Science Courses that our students choose from. A student is now required to select three instead of two Specialty Science Courses.

**Total Credits
Required:**

Total credits: 72

Registrar's Office Use Only - Program Code:

SC-PHD-PHYS

**Registrar/IRR Use
Only – Program CIP
Code**

**Admission
Requirements:**

Admissions

University-wide admissions policies can be found in the [Graduate Admissions Policies](#) section of this catalog. [International students and students having earned international degrees should also refer to Admission of International Students for additional requirements.](#)

~~To apply for this program, please complete the George Mason~~

University Admissions Application Eligibility

Those holding a baccalaureate degree in physics, astronomy, or engineering from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent who earned a GPA of 3.00 (out of 4.00) or higher ~~in their last 60 credits~~ are invited to apply for admission.

Application Requirements

~~To apply for this program, prospective students should submit~~ please complete the George Mason University Admissions Application and its required supplemental documentation, and three letters of recommendation, preferably from former professors. ~~Application:~~

~~The GRE-GEN is required; however, this requirement is waived if the student has received a master's degree from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent.~~ The GRE-GEN is optional and the GRE subject test in physics is is not required.

~~Three letters of recommendation must be submitted, preferably from former professors.~~ A degree-seeking graduate applicant with a baccalaureate degree who has not met all admission requirements may be offered provisional admission if sufficient evidence is presented to suggest that the applicant has the ability to pursue graduate work.

~~For more details concerning admission requirements to George Mason University please refer to Graduate Admission Policies.~~

Program-Specific
Policies:

Policies

For policies governing all graduate programs, see [AP.6 Graduate Policies](#).

Transferring Previous Graduate Credit into this Program

Previously earned and relevant graduate credits may be eligible for transfer into this program; details can be found in the Credit by Exam or Transfer section of this catalog.

~~Reduction of Credits For students entering the doctoral program with a master's degree in a related field from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent, the number of required credits may be reduced up to 30 credits, subject to approval of the program faculty and the college's associated dean. See AP.6.5.2 Reduction of Credits for more information.~~

Degree Requirements:

Students should refer to the [Admissions & Policies](#) tab for specific policies related to this program.

~~Students must first choose one concentration, then continue with the additional sections: Standard Concentration (STND) Engineering Physics Concentration (ENGP) General Science Electives~~ In consultation with a faculty advisor,

Qualifying Examination All students must complete successfully pass the Core Courses, the requirements four individual sections required for one concentration, General Science Electives, pass each concentration of a qualifying exams, and complete a dissertation. ~~examination:~~

~~1 These electives must be approved by the student's advisor or the graduate coordinator.~~

Core Courses

Select one course from each grouping:

Group One: Mechanics I 3

PHYS 694Applied Mechanics of Solids

PHYS 695Applied Fluid Mechanics

PHYS 705Classical Mechanics

Group Two: Mechanics II 3

PHYS 620Continuum Mechanics

PHYS 684Quantum Mechanics I

Group Three: Electricity and Magnetism 3

PHYS 513Applied Electromagnetic Theory

PHYS 685Classical Electrodynamics I

Group Four: Statistical and Thermal Physics 3

PHYS 690Engineering Thermodynamics

PHYS 711Statistical Mechanics

Total Credits 12

Standard Physics Concentration Concentration (STND)

Core Courses 12

~~PHYS 684~~ Quantum Mechanics I

~~PHYS 685~~ Classical Electrodynamics I

~~PHYS 705~~ Classical Mechanics

~~PHYS 711~~ Statistical Mechanics

Specialty Science Courses 1 6

Select two of the following courses:

Specialty Science Courses

Select 9-10 credits of the following courses: 9-10

ASTR 601 Computer Simulation in Astronomy

ASTR 602 Methods of Observational Astronomy

~~ASTR 680~~ Physics of Interstellar Media

~~ASTR 730~~ Stellar Astrophysics

PHYS 510 Computational Physics I

PHYS 512 Solid State Physics and Applications

PHYS 683 Mathematical Methods in Physics

~~PHYS 784~~ Quantum Mechanics II

~~PHYS 785~~ Classical Electrodynamics II

Seminar 3

~~PHYS 703~~ Seminar in Physics (must be taken three times)

Total Credits 12-13

Engineering Physics Concentration ~~Physics Concentration~~ (ENGP)

~~1~~These electives must be approved by the student's advisor or the graduate coordinator.

Core Courses 12

Specialty Science Courses

PHYS 510 Computational Physics I 3

PHYS 613 Computational Physics II 3

~~PHYS 620 Continuum Mechanics~~

~~PHYS 690 Engineering Thermodynamics~~

~~Specialty Science Courses 1~~ 6

PHYS 640 Finite Element Analysis of Solids and Fluids 3

~~PHYS 694 Applied Mechanics of Solids~~

~~PHYS 695 Applied Fluid Mechanics~~

~~PHYS 684 Quantum Mechanics I~~

~~PHYS 685 Classical Electrodynamics I~~

Seminar 3

Select 3 credits of seminar from the following courses:

PHYS 703 Seminar in Physics (at least one credit required)

~~And any other graduate-level PHYS/CEIE/MECH/MATH/CSI seminar~~

Any other graduate-level PHYS or CEIE or MECH or MATH or CSI-prefixed seminar courses

Total Credits 12

General Science Electives

~~Students in both the Standard Concentration and Engineering Physics Concentration must complete 27 credits of 27 approved general electives and preliminary research credits: 2~~

Students in either concentration must complete approved general electives and/or preliminary research credits: 23-

1 24

ASTR 796 Directed Reading and Research

ASTR 798 Research Project

PHYS 796 Directed Reading and Research

PHYS 798 Research Project

~~Any graduate-level course chosen from PHYS/ASTR courses 3~~

Any graduate-level PHYS or ASTR-prefixed courses 2

Total Credits 23-
24

1
PHYS 796 Directed Reading and Research/ASTR 796 Directed Reading and Research may be repeated as needed.

2

General elective courses may be chosen from PHYS/ASTR courses, and/or other related disciplines as approved by the student's advisor or dissertation committee.

3

General elective courses may be chosen from PHYS/ASTR courses, and/or other related disciplines as approved by the student's advisor or dissertation committee.

Qualifying Examination

Every If a student receives a grade of “unsatisfactory” in a given section of the exam, he/she is allowed to retake that section in the next cycle, but a student must satisfactorily pass a four-section qualifying examination all sections of the exam by the end of the third year from the start of date of enrollment in the PhD program enrollment. program.

The sections depend upon the chosen concentration:

For the Standard Physics Concentration, the four sections topics on the qualifying exam are on material covered in PHYS 684 Quantum Mechanics I, PHYS 685 Classical Electrodynamics I, PHYS 705 Classical Mechanics, the four core courses (PHYS 684 Quantum Mechanics I, PHYS 685 Classical Electrodynamics I, PHYS 705 Classical Mechanics, and PHYS 711 Statistical Mechanics. PHYS 711 Statistical Mechanics).

For ~~For~~ the Engineering Physics Concentration, students may choose sections the four topics on material the qualifying exam are covered in the following courses: four core courses (PHYS 690 Engineering Thermodynamics or PHYS 711 Statistical Mechanics, PHYS 620 Continuum Mechanics or PHYS 705 Classical Mechanics, PHYS 510 Computational Physics I and PHYS 613 Computational Physics II) and in one of the specialty science courses (PHYS 694 Applied Mechanics of Solids or PHYS 695 Applied Fluid Mechanics). PHYS 690 Engineering Thermodynamics or PHYS 711 Statistical Mechanics, PHYS 620 Continuum Mechanics or PHYS 705 Classical Mechanics, PHYS 694 Applied Mechanics of Solids or PHYS 695 Applied Fluid Mechanics, and both PHYS 510 Computational Physics I and PHYS 613 Computational Physics II.

All four sections of the qualifying exam are ~~will be~~ offered twice a year, typically in the week before the ~~start of the~~ fall and spring semesters. A student may ~~can~~ choose to take one ~~a particular section~~ or more exam ~~a combination of~~ sections at any one sitting. Each section is graded pass/fail, and students may retake individual sections as needed within the three-year time limit.

Grades of “pass” or “unsatisfactory” will be given individually for each of the four sections of the exam. If a student receives a grade of “unsatisfactory” in a given section of the exam, he/she is allowed to retake that section in the next cycle, but a student must satisfactorily pass all sections of the exam by the end of the third year from the date of enrollment in the PhD program. Students may waive entering the requirement to take program with equivalent courses taken at another institution can satisfy a particular core or specialty science course if they pass requirement by taking the corresponding associated qualifying exam section. without taking the course.

~~At the beginning of each academic year, the program director will appoint members to the qualifying examination committee. This committee is responsible for creating, administering, and grading the qualifying exams offered that year. Additional information and previous qualifying exams can be found on the departmental webpage.~~

Dissertation Committee and Program of Study

Upon successful completion of the qualifying examinations, a dissertation committee should be formed by the student as soon as possible. The chair of this committee must be a graduate faculty member from the Department of Physics and Astronomy. The committee must include at least two additional members from the graduate faculty. ~~faculty, one of whom must be from outside the Department of Physics and Astronomy.~~ One committee member must be from outside the Department of Physics and Astronomy. The composition of the committee must be approved by the program director. The dissertation committee is responsible for directing the student in their chosen field of research. The student should work closely with their committee to select specialty courses and electives that form a cohesive program of study. The student's program of study must be approved by the dean before advancement to candidacy.

Advancement to Candidacy

Before a student may be advanced to doctoral candidacy, he/she needs to complete all required coursework, pass the qualifying examination, have the program of study and dissertation proposal approved by the dean, and be recommended by the dissertation committee. Advancement to doctoral candidacy implies that the student has demonstrated adequate breadth and depth of knowledge in the field of study and is capable of conducting research on the boundaries of knowledge.

Dissertation Research

Note: No more than 24 combined credits from PHYS 998 Doctoral Dissertation Proposal/ASTR 998 Doctoral Dissertation Proposal and PHYS 999 Doctoral Dissertation/ASTR 999 Doctoral Dissertation may be applied toward satisfying the doctoral degree requirements, with no more than 21 credits of PHYS 998 Doctoral Dissertation Proposal/ASTR 998 Doctoral Dissertation Proposal.

Select 24 credits from the following: 24

ASTR 998 Doctoral Dissertation Proposal

ASTR 999 Doctoral Dissertation

PHYS 998 Doctoral Dissertation Proposal

PHYS 999 Doctoral Dissertation

Total Credits 24

Doctoral Dissertation

After advancing to doctoral candidacy, the student works with their dissertation committee to develop their preliminary research into a doctoral dissertation. The dissertation research should represent a significant contribution to its scientific field and should be deemed publishable in a refereed scientific journal. The dissertation must be defended in a public forum before the dissertation committee and other interested faculty.

**Retroactive
Requirements
Updates:**

Plan of Study:

Program Outcomes

Additional Program Information

This information is required by the Office of Accreditation and Program Integrity.

Courses offered via distance (if applicable):

What is the primary delivery format for the program?

Face-to-Face Only

Does any portion of this program occur off-campus?

No

Are you working with a vendor / other collaborators to offer your program?

No

Related Departments

Could this program prepare students for any type of professional licensure, in Virginia or elsewhere?

No

Are you adding or removing a licensure component?

No

Additional SCHEV & SACSCOC Information

Is this change a simple retitling of an existing program, with no other changes, to any existing program content, curriculum requirements, etc?

No

Does this change represent a repackaging of content in an existing approved degree/certificate program at the same instructional level (i.e., baccalaureate, master's, or doctoral)?

No

Percentage of total credits containing new course content. ("New course content" is defined by SACSCOC as content that is not currently included in an existing approved degree/certificate program at the same instructional level. Do not exclude gen ed credits in calculations for undergraduate programs.)

0%-24%

Does this change include the addition of a distance education or face-to-face method of delivery for this program?

No

Does this change include the addition of a course/credit-based competency-based education delivery option?

No

Will any additional equipment/facilities be needed?

No

Will any additional faculty be required?

No

Will any additional financial resources be needed?

No

Additional library/learning resources needed?

No

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Green Leaf Program Designation

Is this a Green Leaf program? No

Does this program cover material which crosses into another department?

No

Additional Attachments

[physics.phd.pdf](#)

SCHEV Proposal

Executive Summary

Reviewer Comments

**Additional
Comments**

Is this course required of all students in this degree program?

%wi_required.eshtml%

Key: 348