

Program Change Request

Date Submitted: 02/23/24 3:52 pm

Viewing: **SC-MS-PHAE : Applied and Engineering Physics, MS**

Last approved: 03/31/23 2:07 pm

Last edit: 03/04/24 3:29 pm

Changes proposed by: jbazaz

Catalog Pages Using this Program

[Applied and Engineering Physics, MS](#)

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

No

Effective Catalog: 2024-2025

Program Level: Graduate

Program Type: Master's

Degree Type: Master of Science

Title:
Applied and Engineering Physics, MS

Banner Title: Applied & Engineering Phys MS

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

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. 03/04/24 8:59 pm
Paul So (paso):
Approved for PHYS GR Committee
- 2. 03/05/24 10:42 am
Ernest Barreto (ebarreto):
Approved for PHYS Chair

History

- 1. Nov 14, 2017 by clmig-jwehrheim
- 2. Jan 16, 2018 by rzachari
- 3. Mar 6, 2018 by Jennifer Bazaz Gettys (jbazaz)
- 4. Mar 6, 2018 by pchampan
- 5. Mar 14, 2018 by rzachari
- 6. Mar 28, 2018 by rzachari

Concentration(s):

7. Mar 29, 2018 by

rzachari

8. Jan 29, 2021 by

Jennifer Bazaz

Gettys (jbazaz)

9. Feb 23, 2021 by

jriemen

10. Mar 31, 2023 by

Jennifer Bazaz

Gettys (jbazaz)

	Associated Concentrations	Registrar's Office Use Only: Concentration Code
1	Standard Physics Concentration	STDP
2	Engineering Physics Concentration	ENGP
3	Applied Physics Concentration	APLP
4	Quantum Information Science and Engineering Concentration	QISE

**Registrar/IRR Use
Only –
Concentration CIP
Code**
College/School: College of Science

**Department /
Academic Unit:** Physics & Astronomy

**Jointly Owned
Program?** No

Justification

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

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

What: Delete "in the last 60 credits" and make the GRE-GEN is optional.

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.

**Total Credits
Required:** Total credits: 30

Registrar's Office Use Only - Program Code:

SC-MS-PHAE

Registrar/IRR Use
Only – Program CIP
Code

40.0801 - Physics, General.

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

Individuals holding a baccalaureate degree in physics or a related field from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent and who have earned a GPA of 3.00 (out of 4.00) ~~in their last 60 credits~~ are invited to apply for admission. Applicants may be required to make up one or two course deficiencies, based on a graduate physics advisor's assessment, and be provisionally admitted into the program.

Application Requirements

[To apply for this program, prospective students should submit the George Mason University Admissions Application and its required supplemental documentation, and three letters of recommendation, preferably from former professors.](#)

~~Three letters of recommendation must be submitted, preferably from former professors.~~ The ~~general~~ GRE [general](#) is [optional](#). ~~recommended and the GRE subject test in physics is not required.~~

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.](#)

Degree Requirements:

Students should refer to the [Admissions & Policies](#) tab for specific policies related to this program. Students should complete the core courses and select one concentration, completing all of the requirements therein.

Plan of Study

Before the beginning of their first semester, students are advised to meet with their academic advisor and develop a preliminary plan of study for the concentration they are interested in pursuing. A final plan of study must be approved by the graduate coordinator at the start of the semester in which the student graduates.

Core Courses

Students should choose their core courses in consultation with an advisor.

Choose one course from each grouping:

Group One: Computational Physics/Astrophysics	3
ASTR 601 Computer Simulation in Astronomy	
PHYS 510 Computational Physics I	
PHYS 534 Introduction to Quantum Computation and Quantum Information	
Group Two: Mechanics	3
PHYS 502 Introduction to Quantum Mechanics and Atomic Physics	
PHYS 620 Continuum Mechanics	
PHYS 684 Quantum Mechanics I	
Group Three: Electricity and Magnetism	3
PHYS 513 Applied Electromagnetic Theory	
PHYS 685 Classical Electrodynamics I	
Group Four: Statistical and Thermal Mechanics	3
PHYS 690 Engineering Thermodynamics	
PHYS 711 Statistical Mechanics	
Group Five: Methods in Physics	3
PHYS 591 Systems for Quantum Scientists	
PHYS 613 Computational Physics II	
PHYS 683 Mathematical Methods in Physics	
Total Credits	15

Standard Physics Concentration (STDP)

This concentration 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.

Core Course	3
PHYS 705 Classical Mechanics	
Concentration Electives	3
In consultation with an advisor, select 3 credits of graduate-level courses from the following course prefixes: 1	
ASTR	
PHYS	
General Electives	9
In consultation with an advisor, select 9 credits of graduate-level science courses. 2	

Total Credits

15

1

- Courses must be approved by an advisor.
- Courses cannot be directed reading, research, or thesis credits.

2

- Courses must be approved by an advisor.
- 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 completed as an intern.

Engineering Physics Concentration (ENGP)

This concentration 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.

Core Course

3

[PHYS 640](#) Finite Element Analysis of Solids and Fluids

Concentration Electives

3

In consultation with an advisor, select 3 credits of graduate-level courses from the following course prefixes: 1

[PHYS](#)

[MATH](#)

[BENG](#)

[CEIE](#)

[ECE](#)

[ME](#)

General Electives

9

In consultation with an advisor, select 9 credits of graduate-level science and engineering courses. 2

Total Credits

15

1

- Courses must be approved by an advisor.
- These must be regular courses and not directed reading, research, or thesis credits.

2

- Courses must be approved by an advisor.
- 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 Concentration (APLP)

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

Core Course

3

PHYS 533**Modern Instrumentation****Concentration Electives****3**

In consultation with an advisor, select 3 credits of graduate-level courses from the following course prefixes: 1

PHYS**BINF****CHEM****CLIM****MATH****CSI****STAT****General Electives****9**

In consultation with an advisor, select 9 credits of graduate-level science and engineering courses. 2

Total Credits**15****1**

- Courses must be approved by an advisor.
- These must be regular courses and not directed reading, research, or thesis credits.

2

- Courses must be approved by an advisor.
- 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.

Quantum Information Science and Engineering Concentration (QISE)

This concentration prepares students for the quantum information workforce through study of physics and courses across mathematics, computer science, electrical engineering, and mechanical engineering as appropriate for their career plans in this multidisciplinary field.

Core Course**3**

Select a focus area and choose one course therein:

Focus Area: Software

PHYS 736

Computational Quantum Mechanics

MATH 621

Algebra I

MATH 641

Combinatorics and Graph Theory

MATH 674

Stochastic Differential Equations

CS 583

Analysis of Algorithms

CS 587

Introduction to Cryptography

CS 600

Theory of Computation

CS 630

Advanced Algorithms

CS 747

Deep Learning

ECE 508

Internet of Things

ECE 646

Applied Cryptography

ECE 699	Advanced Topics in Electrical and Computer Engineering
ECE 746	Advanced Applied Cryptography
ECE 747	Cryptographic Engineering
Focus Area: Hardware	
PHYS 512	Solid State Physics and Applications
PHYS 533	Modern Instrumentation
PHYS 611	Electro-optics
PHYS 784	Quantum Mechanics II
CHEM 579	Special Topics
CHEM 736	Computational Quantum Mechanics
ECE 685	Nanoelectronics
ME 754	Introduction to Nano-Materials

Research Project 3

Students in the QISE concentration are expected to gain hands-on experience either through an industry internship, externship research experience in a collaborating research laboratory, or research experience in a Mason research laboratory.

[PHYS 798](#) Research Project

General Electives 9

Select 9 credits of graduate-level science and engineering courses approved by an academic advisor. 1

Total Credits 15

1

- Courses must be approved by an advisor.
- Students may take [PHYS 796](#) Directed Reading as a general elective. Up to 6 credits of [PHYS 799](#) Master's Thesis may be taken as general electives by students who would like a thesis option in addition to the research project.

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](#). The student must give an oral defense of the thesis to the committee and the George Mason University community at large. Students are expected to respond to questions on the thesis and related material. The committee determines whether the defense is satisfactory.

**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

[msphae_001.pdf](#)

SCHEV Proposal

Executive Summary

Reviewer Comments

**Additional
Comments**

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

%wi_required.eshtml%

Key: 347