

Program Change Request

Date Submitted: 02/10/23 12:15 pm

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

Last approved: 02/23/21 4:31 pm

Last edit: 02/10/23 12:15 pm

Changes proposed by: jbazaz

Catalog Pages Using this Program [Applied and Engineering Physics, MS](#)

No Longer Anticipated closure date (i.e., calendar Rationale for

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 Associate Dean
5. Assoc Provost-Graduate
6. Registrar-Programs

Approval Path

1. 02/10/23 12:47 pm Ernest Barreto (ebarreto): Approved for PHYS GR Committee
2. 02/10/23 12:51 pm Paul So (paso): 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
7. Mar 29, 2018 by rzachari
8. Jan 29, 2021 by Jennifer Bazaz Gettys (jbazaz)

9. Feb 23, 2021 by
jriemen

Name	Extension	Email
Ernest Barreto	4431	ebarreto

Effective Catalog: 2023-2024

Program Level: Graduate

Program Type: Master's

Degree Type: Master of Science

Title: Applied and Engineering Physics, MS

Approval Criteria

1. What was the process used within your academic
2. Who was involved in approving the badge?
3. What evidence was used to identify need/demand
4. Please attest to the following statements regarding...
 - a. Have you ensured there are no other existing badges
 - b. Has CPE confirmed the proposed badge does not
 - c. Has the instructor(s) for this badge experience been
 - d. Is there a contact hour minimum?
 - e. Is an assessment required?
 - f. Does this badge provide a benefit for current or
5. Is this badge co-sponsored with another organization, association, or unit? (If you would like an
 - a. What is the organization, program, or department

Earning Criteria

Course:

Badge:

Participant:

Department:

Portfolio:

Presentation:

Assessment:

Credential:

Education

Other:

Priority:

Professional

Schedule/Registration:

Volunteer:

Skills Tag

Skills Tag

Badge Attributes

Please select one from each category:

Achievement Type:

Mastery Level:

Time Commitment:

Cost:

Industry Standards:

Recommendations:

Issuance information and Pricing

Pricing: See <https://cpe.amu.edu/digitalbadgespricing/> for more information.

Estimated Number of Badges Expected to be Issued:

Notes:

- All badge requests will be routed to CPE for review and approval. Please allow 7 business days for processing. A draft badge template and design will be provided
- A Mason Digital Credentials Advisory Group may be developed to review badge development on an annual basis to determine which badges are underutilized and may need to be archived. Earners for any archived badges will always retain
- To view examples of all active badges at Mason, please see:

Banner Title: Applied & Engineering Phys MS

Is this a retitling of an existing program?

Existing Program

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 Physics Concentration	STDP
2	Engineering Physics Concentration	ENGP
3	Applied Physics Concentration	APLP
4	Quantum Information Science and Engineering Concentration	QISE

INTO Major(s):

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

Department / Academic Unit: Physics & Astronomy

Jointly Owned Program? No

Participating Colleges

Participating Departments

Justification What: We are changing the wording regarding GRE and GRE subject test in physics in our application requirements.

Why: Our faculty voted to explicitly not require the GRE subject test in physics of applicants to our graduate programs.

Catalog Published Information

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.

To apply for this program, please complete the [George Mason University Admissions Application](#).

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.

Three letters of recommendation must be submitted, preferably from former professors.

The general GRE **is recommended** and the GRE subject test in physics **is not required**. ~~are recommended for applicants who received their baccalaureate degrees within the past five years.~~

Program-Specific Policies:

Policies

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

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

[ASTR 601](#)

Computer Simulation in Astronomy

3

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

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

**Honors
Information:**

**Accelerated
Description/Dual
Degree
Description:**

**INTO-Mason
Requirements:**

**College
Requirements &
Policies:**

Department /
Academic Unit
Requirements &
Policies:

Program Outcomes

Additional Program Information

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

**Courses offered via
distance (if
applicable):**

Indicate whether
students are able

**What is the
primary delivery
format for the
program?** Face-to-Face Only

Does any portion of this program occur off-campus?

No

Off-campus details:

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

No

Please explain:

**Related
Departments**

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

No

Please explain:

Are you adding or removing a licensure component?

No

Please explain:

Additional SCHEV & SACSCOC Information

Is the content of the new program closely related to that of an existing approved program at the same instructional level (i.e., baccalaureate, master's, doctoral)?

Which existing approved program(s)?

Is this new program considered to be "advancing the degree level of a currently approved program" (i.e. existing content is at lower degree level, new content is at the higher degree level)?

Which existing approved program(s)?

Is this new program considered to be "lowering the degree level of a currently approved program" (i.e. existing content is at higher degree level, new content is at the lower degree level)?

Which existing approved program(s)?

Is this a re-opening of a program that was closed to admission within the last five years?

Date of Program Closure

What are the methods of delivery for the program?

Does this program include a course/credit-based competency-based education delivery option?

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

Which existing approved program(s)?

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 credit in calculations for undergraduate programs.)

0%-24% 50%-100%

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

No

What is the new method of delivery?

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

Description of institutional impact:

Will any additional faculty be required?

No

Description of institutional impact:

Will any additional financial resources be needed?

No

Description of institutional impact:

Additional library/learning resources needed?

No

Description of institutional impact:

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Green Leaf Program Designation

Is this a Green Leaf program? No

Green Leaf Designation

Sustainability-focused academic programs require at least one green leaf course. Either that course is itself sustainability-focused or else the program requires a set of sustainability-related courses with aggregated substance equivalent to a sustainability-focused course

Relationship to Existing Courses

Relationship to Existing Programs

List sustainability-focused courses currently required in the degree program:

Sustainability-related academic programs either require at least one sustainability-related course or else offer any green leaf course as an option or elective.*

List sustainability-related courses currently required in the degree program:

Does this program cover material which crosses into another department?

No

**Impacted
Departments**

**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%](#)

**Attached
Document**

[%attach_document.eshtml%](#)

Key: 347