

# PHYSICS (BS)

Degree: Bachelor of Science

Major: Physics

Program Code: 3471

## About This Major . . .

Physics is the study of the universe: what it is made of and how it works, ranging from stars and galaxies to atoms and nuclei and everything in between. Physics forms the foundation of many technical fields including electronics and optics. Physics also features prominently in many of the hottest areas of current research and innovation, such as the multidisciplinary fields of nanotechnology and biophysics.

The physics program serves as a foundation for a wide array of careers. Physics majors from Colorado Mesa University have gone on to graduate programs in physics, astrophysics, chemistry, materials science, and aerospace engineering. They have also gone directly into jobs in engineering, business, and research.

For more information on what you can do with this major, visit Career Services' What to Do with a Major? (<https://www.coloradomesa.edu/career/students/explore/major.html>) resource.

All CMU baccalaureate graduates are expected to demonstrate proficiency in specialized knowledge/applied learning, quantitative fluency, communication fluency, critical thinking, personal and social responsibility, and information literacy. In addition to these campus-wide student learning outcomes, graduates of this major will be able to:

1. Show fluency with the major fields of physics (classical mechanics, electromagnetism, statistical physics, and quantum theory). (Specialized Knowledge)
2. Use mathematical representations to analyze physical scenarios. (Quantitative Fluency)
3. Use laboratory techniques to investigate experimentally physical phenomena. (Applied Learning)
4. Communicate effectively about topics in physics. (Communication Fluency)
5. Execute a project which addresses a significant and complex issue in physics. This project will integrate knowledge and techniques from different areas of physics. (Specialized Knowledge/Applied Learning)

## Requirements

Each section below contains details about the requirements for this program. Select a header to expand the information/requirements for that particular section of the program's requirements.

**To print or save an overview of this program's information, including the program description, learning outcomes, requirements, suggested course sequencing (if applicable), and advising and graduation information, scroll to the bottom of the left-hand navigation menu and select 'Print Options.'** This will give you the options to either 'Send Page to Printer' or 'Download PDF of This Page.' The 'Download PDF of This Page' option prepares a much more concise presentation of all program information. The PDF is also printable and may be preferable due to its brevity.

## Institutional Degree Requirements

The following institutional degree requirements apply to all CMU baccalaureate degrees. Specific programs may have different requirements that must be met in addition to institutional requirements.

- 120 semester hours minimum.
- Students must complete a minimum of 30 of the last 60 hours of credit at CMU, with at least 15 semester hours in major discipline courses numbered 300 or higher.
- 40 upper-division credits (an alternative credit limit applies to the Bachelor of Applied Science degree).
- 2.00 cumulative GPA or higher in all CMU coursework.
- A course may only be used to fulfill one requirement for each degree/certificate.
- No more than six semester hours of independent study courses can be used toward the degree.
- Non-traditional credit, such as advanced placement, credit by examination, credit for prior learning, cooperative education and internships, cannot exceed 30 semester credit hours for a baccalaureate degree. A maximum of 15 of the 30 credits may be for cooperative education, internships, and practica.
- Pre-collegiate courses (usually numbered below 100) cannot be used for graduation.
- Capstone exit assessment/projects (e.g., Major Field Achievement Test) requirements are identified under Program-Specific Degree Requirements.
- The Catalog Year determines which program sheet and degree requirements a student must fulfill in order to graduate. Visit with your advisor or academic department to determine which catalog year and program requirements you should follow.
- See "Requirements for Undergraduate Degrees and Certificates" in the catalog for a complete list of graduation requirements.

## Essential Learning Requirements

(31 semester hours)

See the current catalog for a list of courses that fulfill the requirements below. If a course is an Essential Learning option and a requirement for your major, you must use it to fulfill the major requirement and make a different selection for the Essential Learning requirement.

Code	Title	Semester Credit Hours
<b>English</b> <sup>1</sup>		
ENGL 111	English Composition I-GTCO1	3
ENGL 112	English Composition II-GTCO2	3
<b>Mathematics</b> <sup>1</sup>		
MATH 151	Calculus I-GT-MA1 <sup>2</sup>	3
<b>History</b>		
Select one History course		3
<b>Humanities</b>		
Select one Humanities course		3
<b>Social and Behavioral Sciences</b>		
Select one Social and Behavioral Sciences course		3
Select one Social and Behavioral Sciences course		3
<b>Fine Arts</b>		

Select one Fine Arts course	3
<b>Natural Sciences</b>	
Select one Natural Sciences course	3
Select one Natural Sciences course with a lab	4
<b>Total Semester Credit Hours</b>	31

<sup>1</sup> Must receive a grade of 'C' or better and must be complete by the time the student has 60 semester hours.

<sup>2</sup> This is a 5 credit course. 3 credits apply to the Essential Learning requirements and 2 credits apply to electives.

## Other Lower Division Requirements

Code	Title	Semester Credit Hours
<b>Wellness Requirement</b>		
KINE 100	Health and Wellness	1
Select one Activity course		1
<b>Essential Learning Capstone</b> <sup>1</sup>		
ESSL 290	Maverick Milestone	3
ESSL 200	Essential Speech	1
<b>Total Semester Credit Hours</b>		6

<sup>1</sup> Essential Learning Capstone must be taken after completion of the Essential Learning English and Mathematics requirements, and when a student has earned between 45 and 75 hours.

## Foundation Courses

(14 semester hours, must earn a grade of "C" or better in all courses)

Code	Title	Semester Credit Hours
Select one of the following options:		4
CSCI 111	CS1: Foundations of Computer Science	
CSCI 110 & 110L	Beginning Programming and Beginning Programming Laboratory	
PHYS 131	Fundamental Mechanics-GTSC1	4
PHYS 131L	Fundamental Mechanics Laboratory-GTSC1	1
PHYS 132	Electromagnetism and Optics-GTSC1	4
PHYS 132L	Electromagnetism and Optics Laboratory-GTSC1	1
<b>Total Semester Credit Hours</b>		14

## Program Specific Degree Requirements

(52-53 semester hours, must pass all courses with a grade of "C" or higher and maintain a 2.00 cumulative GPA or higher in coursework in this area.)

Code	Title	Semester Credit Hours
<b>Core Courses</b>		
PHYS 230	Intermediate Dynamics	3
PHYS 231	Modern Physics	3
PHYS 251	Electronics for Scientists	3

PHYS 252	Intermediate Laboratory	3
PHYS 311	Electromagnetic Theory I	3
PHYS 321	Quantum Theory I	3
PHYS 331	Advanced Laboratory I	3
PHYS 342	Advanced Dynamics	3
PHYS 362	Statistical and Thermal Physics	3
PHYS 482	Senior Research	1
PHYS 482	Senior Research	1
PHYS 494	Physics Seminar	1
PHYS 494	Physics Seminar	1
MATH 152	Calculus II	5
MATH 253	Calculus III	4
MATH 260	Differential Equations	3-4
or MATH 236	Differential Equations and Linear Algebra	
MATH 360	Methods of Applied Mathematics	3
<b>Total Semester Credit Hours</b>		46-47

Code	Title	Semester Credit Hours
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### Restricted Electives

Select two of the following:		6
PHYS 312	Electromagnetic Theory II	
PHYS 372	General Relativity	
PHYS 396	Topics <sup>1</sup>	
PHYS 422	Quantum Theory II	
PHYS 441	Solid State Physics	
PHYS 471	Computational Physics I	
PHYS 472	Computational Physics II	
PHYS 473	Modern Optics	
PHYS 496	Topics <sup>1</sup>	
<b>Total Semester Credit Hours</b>		6

<sup>1</sup> PHYS 396/PHYS 496 may be taken more than once so long as the topic is not repeated.

## General Electives

All college level courses appearing on your final transcript, not listed above that will bring your total semester hours to 120 hours. 16-17 semester hours; 12 hours of upper division may be needed.

Code	Title	Semester Credit Hours
MATH 151	Calculus I-GT-MA1	2
Select additional electives		14-15
<b>Total Semester Credit Hours</b>		16-17

## Suggested Course Plan

While the sequencing below culminates in at total of 121-123 semester credit hours, students must complete a minimum of 120 semester credit hours as required for completion of the degree, including satisfactory completion of all required courses. Plan to complete requirements with varying hour options accordingly.

First Year		Semester Credit Hours
Fall Semester		
PHYS 131 & 131L	Fundamental Mechanics-GTSC1 and Fundamental Mechanics Laboratory-GTSC1	5
MATH 151	Calculus I-GT-MA1	5
Essential Learning - Humanities		3
ENGL 111	English Composition I-GTCO1	3
Semester Credit Hours		16
Spring Semester		
PHYS 132 & 132L	Electromagnetism and Optics-GTSC1 and Electromagnetism and Optics Laboratory-GTSC1	5
MATH 152	Calculus II	5
ENGL 112	English Composition II-GTCO2	3
Essential Learning - History		3
Semester Credit Hours		16
Second Year		
Fall Semester		
PHYS 230	Intermediate Dynamics	3
PHYS 251	Electronics for Scientists	3
MATH 253	Calculus III	4
KINA Activity		1
Select one of the following:		4
CSCI 111	CS1: Foundations of Computer Science	
CSCI 110 & 110L	Beginning Programming and Beginning Programming Laboratory	
Semester Credit Hours		15
Spring Semester		
PHYS 231	Modern Physics	3
PHYS 252	Intermediate Laboratory	3
MATH 260 or MATH 236	Differential Equations or Differential Equations and Linear Algebra	3-4
Essential Learning - Social and Behavioral Sciences		3
ESSL 290	Maverick Milestone	3
ESSL 200	Essential Speech	1
Semester Credit Hours		16-17
Third Year		
Fall Semester		
PHYS 311	Electromagnetic Theory I	3
PHYS 342	Advanced Dynamics	3
PHYS 331	Advanced Laboratory I	3
MATH 360	Methods of Applied Mathematics	3
Essential Learning - Social and Behavioral Sciences		3
Semester Credit Hours		15
Spring Semester		
PHYS 321	Quantum Theory I	3
PHYS 362	Statistical and Thermal Physics	3
Essential Learning - Natural Science with Lab		4
Essential Learning - Fine Arts		3
General Elective		3
Semester Credit Hours		16
Fourth Year		
Fall Semester		
Restricted Elective		3
PHYS 482	Senior Research	1
PHYS 494	Physics Seminar	1
General Electives		9
Semester Credit Hours		14
Spring Semester		
Restricted Elective		3
KINE 100	Health and Wellness	1

Essential Learning - Natural Science		3
PHYS 482	Senior Research	1
PHYS 494	Physics Seminar	1
General Electives		4-5
Semester Credit Hours		13-14
Total Semester Credit Hours		121-123

## Advising and Graduation Advising Process and DegreeWorks

Documentation on the pages related to this program is intended for informational purposes to help determine what courses and associated requirements are needed to earn a degree. The suggested course sequencing outlines how students could finish degree requirements. Some courses are critical to complete in specific semesters, while others may be moved around. Meeting with an academic advisor is essential in planning courses and altering the suggested course sequencing. It is ultimately the student's responsibility to understand and fulfill the requirements for her/his intended degree(s).

DegreeWorks is an online degree audit tool available in MAVzone. It is the official record used by the Registrar's Office to evaluate progress towards a degree and determine eligibility for graduation. Students are responsible for reviewing their DegreeWorks audit on a regular basis and should discuss questions or concerns with their advisor or academic department head. Discrepancies in requirements should be reported to the Registrar's Office.

## Graduation Process

Students must complete the following in the first two months of the semester prior to completing their degree requirements:

- Review their DegreeWorks audit and create a plan that outlines how unmet requirements will be met in the final semester.
- Meet with their advisor and modify their plan as needed. The advisor must approve the final plan.
- Submit the "Intent to Graduate" form to the Registrar's Office to officially declare the intended graduation date and commencement ceremony plans.
- Register for all needed courses and complete all requirements for each degree sought.

Submission deadlines and commencement details can be found at <http://www.coloradomesa.edu/registrar/graduation.html>.

If a student's petition for graduation is denied, it will be her/his responsibility to consult the Registrar's Office regarding next steps.