College of Liberal Arts and Sciences
UNIVERSITY OF COLORADO **DENVER**

PHYSICS – PURE & APPLIED

Bachelor of Science (B.S.) – Catalog Year Fall 2022

PROGRAM OVERVIEW

The department of Physics at the University of Colorado Denver enriches understanding of how the world works by incorporating physics in every aspect of life. Good intuition about how things work has been, since the time of Galileo, a hallmark of physicists.

CU Denver's faculty is committed to providing substantive applied research experiences for our undergraduate students by incorporating aspects of every day life into their classrooms and research. A major in physics is one of the few academic degree programs that prepares its students for an amazing array of careers including computer analyst, engineer, technical writer, industrial marketer, doctor, and lawyer. Our faculty is committed to provide students with opportunities for laboratory experience in a research environment. Students work elbow-to-elbow with their professor mentors on such projects as:

- Applying chaos and complex systems theory to problems ranging from the onset of turbulence in fluid flows to the erratic motions of loads hanging from cranes aboard ships at sea
- Study of quasar jets and other associated dynamical properties, supernovae and nucleosynthesis
- Superconducting Quantum Interference Devices (SQUIDs) specifically the fabrication of microelectronic SQUIDs
- Applying non-linear dynamics and stochastic modeling to biological systems to understand how variations in genotype can lead to unique behavior
- Developing detection techniques in the search for the Dark Matter component of our Universe
- Applying physics to archaeology and historic preservation
- Developing ways to help students learn physics better

Students are strongly encouraged to consult with the Physics advisor, meet physics faculty engaged in research, attend departmental seminars, and explore ways that Physics relates to research undertaken by faculty in other disciplines.

ACADEMIC ADVISING

The College of Liberal Arts and Sciences (CLAS) supports students to graduation using a shared advising system. CLAS students have two academic advisors with whom they should meet regularly to discuss academic and degree progress: a CLAS Academic Advisor and a major/faculty advisor.

For questions related to CU Denver Core Curriculum, CLAS, general graduation requirements, university/college academic policies, or campus resources contact:

CLAS Academic Advising
clas_advising@ucdenver.edu
Find your CLAS Advisor here
North Classroom (NC) 1030
303-315-7100

For questions related to major requirements, major course prerequisites, or evaluation of transfer coursework in your major contact:

Michael "Bodhi" Rogers
michael.b.rogers@ucdenver.edu
Visit the department website here
North Classroom (NC) 3123 B
303-315-7392

GENERAL GRADUATION REQUIREMENTS & POLICIES

All CU Denver CLAS students are required to complete the following minimum general graduation requirements to be eligible to apply for graduation:

1. Complete a minimum of 120 credit hours
2. Achieve a minimum 2.0 CU cumulative grade point average (GPA)
3. Complete a minimum of 45 upper-division (3000- to 4000-level) credit hours
4. Complete all CU Denver Core, CLAS, and major requirements
5. Complete a minimum of 30 CLAS credit hours with letter grades at CU Denver

The following are **maximum** *credit hours that can apply toward the minimum 120 hours required for graduation:*

- 16 credit hours Pass/Fail
- 12 credit hours of Independent Study/Directed Research
- 12 credit hours of internship credit
- 8 credit hours of physical education credit

PROGRAM REQUIREMENTS & POLICIES

Students are responsible for meeting with the major/faculty advisor in the department to confirm major requirements. In addition to completing all CU Denver Core and CLAS requirements, students completing the Physics Pure and Applied B.S. Degree are required to complete the following minimum program requirements:

1. Students must complete a total of 61-63 credit hours, including a minimum of 45 PHYS credit hours and 16 credit hours in ancillary coursework.
2. Students must complete a minimum of 16 upper-division (3000-level and above) credit hours in the major.
3. Students must earn a minimum grade of C- (1.7) in all courses that apply to the major and must achieve a minimum cumulative major GPA of 2.0. All graded attempts in required and elective courses are calculated in the major GPA. Courses taken using pass/fail grading cannot apply to major requirements.
4. Students must complete a minimum of 12 PHYS credit hours with CU Denver faculty.
5. Students must declare their intention to major in Physics by the time they have completed 60 credit hours
6. The introductory labs, PHYS 2351 and PHYS 2361, are required for all physics majors. If the department is unable to offer one or both of these labs then PHYS 2321 may be substituted for PHYS 2351 and PHYS 2341 may be substituted for PHYS 2361, upon prior advisor approval.
7. Students earning a Physics major cannot earn a Physics minor.
8. All physics majors must complete a capstone thesis or capstone project. A thesis is required for all students wishing to graduate with departmental honors.
9. The physics faculty also encourage all physics majors to enroll in PHYS 1450, 3450, and 4450 Professional Development I, II, and III seminar courses.

LYNXCONNECT RESOURCES

Are you interested in learning about internship, study abroad, career, and research opportunities for this major? Visit the CU Denver LynxConnect, located in Tivoli Student Union (TV) Suite 339, and browse the LynxConnect website for more information.

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Degree Requirements	Credits	Notes
* Course prerequisites change regularly. Students are responsible for consulting advisors and the class schedule in the student portal for prerequisite information. *		
CU Denver Core Curriculum Requirements	34 - 40	*CU Denver Core Curriculum Requirements*
CLAS Graduation Requirements	15 - 29	*CLAS Graduation Requirements*
PHYS Major Requirements	63	*16 credit hours must be upper-division*
PHYS Required Courses		
PHYS 2311 General Physics I: Calculus-Based	4	**Prerequisite: C- or higher in MATH 1401*
PHYS 2351 Applied Physics Lab I	1	**Corequisite: PHYS 2311* **PHYS 2321 General Physics Laboratory I may be substituted only with advisor approval*
PHYS 2331 General Physics II: Calculus-Based	4	**Prerequisite: C- or higher in PHYS 2311 and MATH 2411*
PHYS 2361: Applied Physics Lab II	1	**Prerequisite: PHYS 2351* **PHYS 2341 General Physics Laboratory II may be substituted only with advisor approval*
PHYS 2711 Vibrations and Waves	3	**Prerequisite: C- or higher in PHYS 2331 and MATH 2411*
PHYS 2811 Modern Physics I	4	**Prerequisite: C- or higher in PHYS 2331 and MATH 2411*
PHYS 3120 Methods of Mathematical Physics	3	**Prerequisite: C- or higher in MATH 2421 and either MATH 3195 or MATH 3191 and 3200*
PHYS 3711 Advanced Experimental Physics Laboratory	2	**Prerequisite: C- or higher in PHYS 2811*
Required Pure & Applied Courses		
PHYS 3211 Analytical Mechanics	4	**Prerequisite: C- or higher in PHYS 2711, MATH 2421, and either MATH 3195 or MATH 3191 and 3200* **Corequisite: PHYS 3120*
PHYS 3411 Thermal Physics	3	**Prerequisite: C- or higher in PHYS 2331, PHYS 2811, and MATH 2421* **Corequisite: MATH 3195 or MATH 3191 and 3200*
PHYS 3811 Quantum Mechanics	4	**Prerequisite: C- or higher in PHYS 2811 and 3211*
PHYS 4331 Principles of Electricity and Magnetism	4	**Prerequisite: C- or higher in PHYS 2331 and PHYS 3120*
PHYS 4711 Senior Lab I	2	**Prerequisite: C- or higher in PHYS 3721*
PHYS electives at 3000-level or above	6	**See department for approved courses. Check individual courses for prerequisites.*
Complete one of the following options:		
Option 1 • PHYS 3751 Physics Capstone Proposal • PHYS 4751 Physics Capstone Thesis (must take twice and complete two credit hours) Option 2 • PHYS 3751 Physics Capstone Proposal • PHYS 4711 Physics Capstone Project	3	**Check individual courses for prerequisites.*
Required Ancillary Courses		
MATH 1401 Calculus I	4	**Prerequisite: C- or higher in MATH 1109, 1070, or 1110 and MATH 1120; or C- or higher in MATH 1130; or C- or higher in MATH 1401; or entry into the MA01 Student Group OR ALEKS PPL score 76-100.* *Course can fulfill CU Denver Core Mathematics*
MATH 2411 Calculus II	4	**Prerequisite: C- or better in MATH 1401* *Course can fulfill CU Denver Core Mathematics*
MATH 2421 Calculus III	4	**Prerequisite: C- or better in MATH 2411* *Course can fulfill CU Denver Core Mathematics*
MATH 3195 Linear Algebra and Differential Equations **or** both MATH 3191 Applied Linear Algebra and MATH 3200 Elementary Differential Equations	4 - 6	**Prerequisite: C- or higher in MATH 2411 (B- recommended)* **Corequisite: MATH 3191 (for 3200)*
Estimated General Electives	0 - 8	*General Elective credits will vary based on Core & CLAS Requirements. Consult with CLAS Advisor.*

Total Minimum Credit Hours:	120	*45 credit hours must be upper-division*

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SAMPLE ACADEMIC PLAN OF STUDY

The following academic plan is a *sample* pathway to completing degree requirements for this major. Students should tailor this plan based on previously completed college coursework (e.g., AP, IB, CLEP, dual/concurrent enrollment, and transfer credit), course availability, and individual preferences related to course load, schedules, or add-on programs such as minors or double-majors.

Year One

Fall	CRS
ENGL 1020 – Core Composition I	3
MATH 1401 [PE C]	4
CU Denver Core Behavioral Science	3
CU Denver Core Humanities / First-Year Seminar	3
CU Denver Core Social Science	3
Total Credit Hours	**16**

Spring	CRS
ENGL 2030 – Core Composition II	3
MATH 2411 [PE C]	4
PHYS 2311 [PE C] and PHYS 2351 [PE]	5
CU Denver Core Arts	3
Total Credit Hours	**15**

Year Two

Fall	CRS
MATH 2421 [PE C]	4
PHYS 2331 [PE C] and PHYS 2361 [PE]	5
CLAS Communicative Skills	3
CLAS Humanities	3
Total Credit Hours	**15**

Spring	CRS
PHYS 2711 [PE]	3
PHYS 2811 [PE]	4
MATH 3195 [PE]	4
CLAS Behavioral Science	3
Total Credit Hours	**14**

† Availability of upper-division PHYS courses varies significantly by semester. Meet with the PHYS advisor to discuss course sequencing and availability. †

Year Three

Fall	CRS
PHYS 3211† [PE]	4
PHYS 3120† [PE]	3
PHYS 3711† [PE]	2
CLAS Second Language Semester I	5
Upper-Division General Elective	3
Total Credit Hours	**17**

Spring	CRS
PHYS 3411† [PE]	3
PHYS 3751† [PE]	1
PHYS Upper-Division Elective†	3
CU Denver Core International Perspectives	3
CLAS Second Language Semester II	5
Total Credit Hours	**15**

Year Four

Fall	CRS
PHYS 4331† [PE]	4
PHYS 4751 or PHYS 4711† [PE]	0-2
General Elective	3
CLAS Social Science	3
Upper-Division General Elective	3
Total Credit Hours	**13-15**

Spring	CRS
PHYS 3811† [PE]	4
PHYS 4751 or PHYS 4711† [PE]	0-2
PHYS Upper-Division Elective†	3
Upper-Division General Elective	3
CU Denver Core Cultural Diversity	3
Total Credit Hours	**13-15**

[M] *Major Course Available* [C] *CU Denver Core Course* [PE] *Prerequisite Enforced* [PR] *Prerequisite Recommended*