

ASTROPHYSICS AND SPACE SYSTEMS (PHD)

CIP: 40.0202

Program Description

Humanity's interest in the stars is older than history itself. While for millennia, humanity could only passively study the cosmos, the dawn of the "space-age" nearly a century ago means that we now actively interact and engage with its celestial surroundings – launching people, satellites, and probes to explore the innermost and outermost Solar System, and building observing facilities to study everything from our closest celestial neighbors to the earliest structures formed after the Big Bang. These explorations have enabled humanity's ability to communicate and monitor conditions literally across the globe, and are the direct result of improvements in the technology, data analysis techniques, and theoretical models used to try and understand the behavior of the tiniest subatomic particles to the largest clusters of galaxies, the motion of particles in the atmospheres of terrestrial planets like the Earth and Mars to the regions around black holes more massive than a million Suns.

The PhD in Astrophysics and Space Systems at NYU Abu Dhabi aims to train the next generation of scientists and researchers who will be at the forefront of technological and scientific exploration of the cosmos. This program is the first of its kind in the UAE, and the NYU global network, and one of the first in the MENA region. Students will be prepared not only for positions in academia (as typical for a PhD in Astrophysics) but also in the growing field of the space industry and space exploration. Students will qualify for various jobs in industry – including consultancy companies, government agencies such as MBRSC and the UAESA, as well as positions at R&D and engineering firms. Moreover, students will have the research experience needed for postdoctoral fellowships at leading institutions around the globe, that might lead to careers in academia or leading roles in international, space-related, institutions (like NASA, UAESA, and other national space agencies). Finally, by requiring all students to develop, execute, and complete a multi-year-long research project before earning their PhD, we will ensure that our graduates have the skills needed to independently oversee/execute complex tasks regardless of their future career. Furthermore, such a project would necessitate students developing the computational and analytical skills required in a wide range of sectors. This is enhanced by the exposure of all students to the engineering, data analysis, and theoretical sides of space sciences, ensuring our graduates have a breadth of knowledge and skills rarely developed at similar programs across the globe. The program has a set of common classes (three core classes and two mandatory labs) and then offers two interconnected tracks: Astrophysics, and Space Systems. Elective classes are track-specific. The program is made up of 70 credits, completed over five years. 40 credits are completed through formal coursework, while 30 credits are awarded for the dissertation.

Admissions

Candidates must have completed at least a bachelor's degree before commencing the PhD program. Candidates need to provide information about any graduate-level courses and degrees have completed. While degrees do not have to be in a particular discipline, a successful application will need to demonstrate the mastery needed to engage effectively with doctoral-level work in this program.

The goal for the selection committee is to choose highly promising students for this program, and admissions decisions are made without knowledge of an applicant's financial need.

Application

In addition to the information below, the online application provides instructions to guide you. All sections of the application and the required supporting documents must be submitted online by the deadline. Incomplete applications will not be reviewed. Do not submit any hard copy materials to NYU Abu Dhabi as part of the application process.

If you have any difficulties with the online application, please email the Graduate Admissions office from the email address associated with your application: nyuad.graduateadmissions@nyu.edu.

After submitting the application, you will not be able to change or add information. You will receive a link to the Application Status Portal where you can track the status of your application.

Required Information

Prepare the following required information when you are ready to start an application:

1. Copies of transcripts from all post-secondary institutions you have attended. If you are admitted to the program, you will need to provide official documents.
2. Official English language proficiency test scores or receive a test waiver
 - a. You are from a designated list of English-speaking countries.
 - b. You have completed at least four years in a university program taught entirely in English.
 - c. Self-reported test scores for proof of English proficiency.
Minimum scores: Academic IELTS = 6.0 / TOEFL iBT = 79 / EmSAT English = 1400. Official results will be needed if you are admitted.
3. Current curriculum vitae
4. Research interest letter: Explain why you want to pursue the PhD in Astrophysics and Space Systems at NYU Abu Dhabi. Describe your research interests and past research experience.
5. Three recommendation letters: You will provide the name, title, and email of three recommenders. They will receive a request from NYUAD to upload a letter of recommendation for your application.

Any information or materials submitted to NYU Abu Dhabi after the final application deadline are not guaranteed to be reviewed or considered by the Selection Committee.

You will receive an email when there are updates to your application status that can be viewed on the Application Status Portal. Your final official decision will be posted to your status page, and an admission decision from any other source of communication will be not considered official or binding.

NYU Abu Dhabi reserves the right to validate the accuracy of your application information with appropriate sources, including the right to contact relevant individuals and organizations.

Admission Process

1. **Verification:** After submitting your application, the admissions office checks that all supporting documents have been uploaded correctly

and are readable. After this verification, the applications are made available to the Selection Committee for the initial review.

- 2. **Initial review:** The Selection Committee begins reviewing submitted applications after the application deadline. The committee looks at information from all parts of the application to form a complete picture of the applicant's potential fit with the program.
- 3. **Shortlist:** The Selection Committee places applicants who are the best fit for the program on a "shortlist." These applicants are invited to an interview with the selection committee.
- 4. **Interview:** During the interview, the applicant has the opportunity to provide more details about their motivations, education, and experience. This gives the Selection Committee a more complete understanding of the applicant before making the admissions decision.
- 5. **Admissions decision:** Applicants who are offered admission will be notified by email to check the Application Status Portal where the admission letter can be viewed and downloaded. The applicant needs to confirm acceptance of the offer.
- 6. **Offer acceptance:** The applicant confirms acceptance of the admission offer via the Application Status Portal and begins the onboarding process.

Note: You must receive a UAE security clearance, and obtain an appropriate UAE visa if required by your residency status. NYU Abu Dhabi will facilitate these processes for admitted students. If for any reason you cannot obtain the security clearance or visa, your admissions offer may be rescinded.

Contact Us

nyuad.graduateadmissions@nyu.edu

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Program Requirements

Course	Title	Credits
Required Courses		
APHY-GH 6010	Astrophysical Objects	4
APHY-GH 6011	Detectors and Telescopes	4
APHY-GH 6012	Radiative Processes	4
Required Labs		
Select two of the following:		4
APHY-GH 6110 Astroparticle Lab		
APHY-GH 6111 Optical Spectrometry Lab		
APHY-GH 6112 Optics and Photon Detection Lab		
APHY-GH 6113 Radio Astronomy Lab		
APHY-GH 6114 X-Ray Astronomy Lab		
Complete four electives for a minimum of 16 credits from one of the tracks below		16
Research Seminar		8
APHY-GH 7010 Research Rotation I & II		
PhD Dissertation Research		30

APHY-GH 7090 Dissertation Research: Astrophysics and Space Systems	
Total Credits	70

Elective Courses for Astrophysics Track

Course	Title	Credits
APHY-GH 7011	Fluid Mechanics	4
APHY-GH 7030	Astrochemistry	4
APHY-GH 7031	Astroparticle Physics	4
APHY-GH 7032	Compact Objects	4
APHY-GH 7033	Foundations of Spacetime	4
APHY-GH 7034	General Relativity	4
APHY-GH 7035	High Energy Astrophysics	4
APHY-GH 7036	Numerical Methods in Astrophysics	4
APHY-GH 7037	Observational Cosmology	4
APHY-GH 7038	Planetary Formation and Evolution	4
APHY-GH 7039	Quantum Gravity and Cosmology	4
APHY-GH 7040	Theory of Galaxy Formation	4

Elective Courses for Space Systems Track

Course	Title	Credits
APHY-GH 7011	Fluid Mechanics	4
APHY-GH 7060	Human-Computer Interaction and Tangible Interfaces	4
APHY-GH 7061	Radiation Transport	4
APHY-GH 7062	Space Economy and Sustainability	4
APHY-GH 7063	Space Instrumentation	4
APHY-GH 7064	Space Robotics	4
APHY-GH 7065	Spacecraft Dynamics and Control	4
APHY-GH 7066	Teleoperation	4
APHY-GH 7067	Turbulence	4

Elective Common Courses for Astrophysics and Space Systems Tracks

Course	Title	Credits
APHY-GH 7011	Fluid Mechanics	4

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
APHY-GH 6011	Detectors and Telescopes	4
APHY-GH 6012	Radiative Processes	4
APHY-GH 7010	Research Rotation I & II	4
Credits		12
2nd Semester/Term		
APHY-GH 6010	Astrophysical Objects	4
Track Elective		4
Required Lab		2
Credits		10
3rd Semester/Term		
Track Elective		4
Track Elective		4
APHY-GH 7010	Research Rotation I & II	4
Credits		12
4th Semester/Term		
Track Elective		4

Required Lab		2
Qualification Exam		
Credits		6
5th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems	4-9
Thesis Proposal		
Credits		4-9
6th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems	4-9
Credits		4-9
7th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems	4-9
Credits		4-9
8th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems	4-9
Credits		4-9
9th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems	4-9
Credits		4-9
10th Semester/Term		
APHY-GH 7090	Dissertation Research: Astrophysics and Space Systems (PhD Dissertation Research should total at least 30 credits over 3 years)	10
PhD thesis defense		
Credits		10
Total Credits		70-95

Learning Outcomes

Upon successful completion of the program (**PLO** - Program Learning Outcomes), students will learn:

1. **PLO 1:** Demonstrate mastery of the highly specialized field of graduate-level knowledge of the physics at the heart of emission, characterization, and detection processes of multi-messenger signals coming from space, with the capacity for critical analysis, evaluation and synthesis of new and complex ideas.
2. **PLO 2:** Evaluate, adapt and apply technology, including observational technique and instrumentation, mathematical modeling, and computational simulation, to solve modern space-related problems.
3. **PLO 3:** Demonstrate highly developed expert communication and information technology skills to present, explain and/or critique fundamental astronomical and space science concepts and/or new research to specialist academic, peer specialists/experts and/or professional audiences. / Oral and written communication skills necessary produce a paper that is of standard for publication and or delivery at a professional conference.
4. **PLO 4:** Lead and support professional multi-disciplinary and culturally diverse teams.

Astrophysics Track Program Learning Outcomes

1. **PLO 5a.** (Astrophysics Track): Use creative expert skills to propose and execute research programs in theoretical, observational and/or numerical astrophysics. Conduct independent research with the aim to formulate and develop new knowledge connected to our understanding of the Cosmos and its constituents. Prepare

papers for publication in leading peer-reviewed journals in the field of Astronomy and Astrophysics.

2. **PLO 6a.** (Astrophysics Track): Analyze and critically address the literature in the field of Astronomy and Astrophysics and contribute to its advancement. Create new knowledge through research and scholarship, and submit it to the analysis of international experts, to contribute to the development of the field.

Space Systems Track Program Learning Outcomes

1. **PLO 5b.** (Space Systems Track): Use highly developed cognitive abilities and intellectual independence to design and deliver new space-ready technology. Create new research tools and instruments geared towards space exploration and the understanding of our Universe. Prepare papers for publication in peer-reviewed literature pertinent to the chosen research field.
2. **PLO 6b.** (Space Systems Track): Critique and scrutinize technological results in the field of Space Science and Space instruments. Create new, original, techniques and technology, as judged by independent experts applying international standards, to sustain the advancement of Space exploration.

Policies

NYU Abu Dhabi Policies

All NYU Abu Dhabi Graduate policies can be found on the school's academic policy page (<https://bulletins.nyu.edu/graduate/abu-dhabi/academic-policies/>).

NYU Policies

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).