

CLIMATE, ENERGY, AND ENVIRONMENTAL SUSTAINABILITY, MASTER OF SCIENCE

The Climate, Energy, and Environmental Sustainability Master's Program is focused on developing the knowledge, skills, and abilities required to lead efforts that foster an enduring and sustainable future for our planet.

Engineers and scientists play a vital role in addressing and solving the environmental challenges we face on a global scale in a world impacted by a changing climate. It will take leaders with advanced, comprehensive knowledge in engineering, science, and technology to create the necessary changes to achieve sustainability objectives and energy needs while mitigating the impact of the climate and adapting to its impacts. While climate change presents a key existential threat of our time, the application of environmental sustainability and energy tools and conceptual frameworks can significantly reduce associated negative repercussions. Sustainability involves balancing the needs of both human and natural ecosystems, including energy demands so that enduring stewardship is provided robustly and successfully. This can be accomplished by reducing greenhouse gas emissions and providing adaptation opportunities to mitigate the negative impacts of energy-related emissions. The use of solar and wind power is increasing as low-carbon energy technologies fall in cost and gain popularity. This will lead to a greater demand for energy storage to balance the supply and demand of electricity, and other parts of the energy sector.

The program aims to enhance interdisciplinary knowledge in climate, energy usage, and environmental sustainability. The curriculum is designed to benefit from the depth and influence of extensive research, advances in public health, and transformative engineering at Johns Hopkins University. Students will study the impacts of human activities, systems, and processes on the environment. They will also learn how to create solutions that consider these factors. Additionally, they will discover the strategies necessary to maintain the climate and environment, while fulfilling the energy needs of today and the future.

Graduates of the Master's in Climate, Energy, and Environmental Sustainability will be able to:

- Apply the foundations of sustainability and its relationship to energy use, environmental impact, and economic, and social systems.
- Direct the development of solutions to climate problems, energy availability, conversion, and use, and their implications for environmental sustainability.
- Explore the interdisciplinary aspects of environmental sustainability in science, public health, and society.
- Design and implement rigorous and strategic solutions to global environmental, climate, energy, social, and economic challenges.
- Lead or advance public and private sector initiatives in energy, sustainability, and climate change planning and management.

Admission Requirements

Applicants (degree-seeking and special students) must meet the general requirements for admission to graduate study, as outlined in

the Admission Requirements (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/>) section.

In addition, applicants for the Master of Science in Climate, Energy, and Environmental Sustainability degree will have prior educational experience that must include the following prerequisite courses:

- Calculus II.
- Successful completion of college-level courses in physics, chemistry, biology, geology, and statistics is strongly recommended.

Applicants whose prior education does not include the prerequisites listed above may still enroll under provisional status, followed by full admission status once they have completed the missing prerequisites. Missing prerequisites may be completed with Johns Hopkins Engineering or at another regionally accredited institution. Admitted students typically have earned a grade point average of at least 3.0 on a 4.0 scale (B or above) in their undergraduate studies. Transcripts from all college studies must be submitted. When reviewing an application, the candidate's academic and professional background will be considered. Transfer courses are not permitted; however, transfer courses may be reviewed to waive program course prerequisites.

Program Requirements

Ten courses must be completed within five years. The curriculum consists of five courses from the Climate, Energy, and Environmental Sustainability program and five electives. Electives may be selected from any of the four environmental areas of study: Environmental Engineering (<https://e-catalogue.jhu.edu/archive/2022-23/engineering/engineering-professionals/environmental-engineering-science-management-programs/environmental-engineering-master/#requirementstext>), Environmental Engineering and Science (<https://e-catalogue.jhu.edu/archive/2022-23/engineering/engineering-professionals/environmental-engineering-science-management-programs/environmental-engineering-science-master/#requirementstext>), Environmental Planning and Management (<https://e-catalogue.jhu.edu/archive/2022-23/engineering/engineering-professionals/environmental-engineering-science-management-programs/environmental-planning-management-master-science/#requirementstext>), or Climate, Energy, and Environmental Sustainability, subject to prerequisite restrictions. Only one C-range grade (C+, C, or C-) can count toward the master's degree.

Any deviation from the program requirements or digression from the provisions specified in the student's admissions letter will not be approved by the program chair.

Courses

Code	Title	Credits
Required Course (Students with an undergraduate degree in Environmental Engineering are exempt from this requirement)		
EN.575.604	Principles of Environmental Engineering ¹	3
Climate, Energy, and Environmental Sustainability Courses (Select 4 Credits or 5 depending on EN.5775.604 requirement)		
EN.575.623	Industrial Processes and Pollution Prevention	3
EN.575.658	Natural Disaster Risk Modeling	3
EN.575.711	Climate Change and Global Environmental Sustainability	3
EN.575.721	Air Quality Control Technologies	3
EN.575.722	Principles of Air Quality Management	3

EN.575.723	Environmental Sustainability and Next Generation Buildings	3	EN.575.713	Field Methods in Habitat Analysis and Wetland Delineation	3
EN.575.732	Energy Technologies for Solving Environmental Challenges	3	EN.575.714	Water Resources Management	3
EN.575.733	Energy and the Environment	3	EN.575.715	Environmental Contaminant Dispersion and Transport	3
EN.575.734	Smart Growth Strategies for Sustainable Cities	3	EN.575.716	Principles of Estuarine Environment: The Chesapeake Bay Science and Management	3
EN.575.736	Designing for Sustainability: Applying a Decision Framework	3	EN.575.717	Hydrology	3
EN.575.738	Transportation, Innovation, and Climate Change	3	EN.575.720	Air Resources Management and Modeling	3
EN.575.743	Atmospheric Chemistry	3	EN.575.724	Air Quality and Climate Modeling	3
EN.575.750	Environmental Policy Needs in Developing Countries	3	EN.575.727	Environmental Monitoring and Sampling	3
EN.575.771	Data Analytics in Environmental Health and Engineering	3	EN.575.728	Sediment Transport and River Mechanics	3
EN.575.801	Independent Project	3	EN.575.730	Geomorphic and Ecologic Foundations of Stream Restoration	3
			EN.575.731	Water Resources Planning	3
			EN.575.735	Energy Policy and Planning Modeling	3
			EN.575.737	Environmental Security with Applied Decision Analysis Tools	3
			EN.575.741	Membrane Filtration Systems and Applications in Water and Wastewater Treatment	3
			EN.575.742	Hazardous Waste Engineering and Management	3
			EN.575.744	Environmental Chemistry	3
			EN.575.745	Physical and Chemical Processes for Water and Wastewater Treatment	3
			EN.575.746	Water and Wastewater Treatment Plant Design	3
			EN.575.747	Environmental Project Management	3
			EN.575.748	Water Quality Engineering with Green Infrastructure	3
			EN.575.749	Water Quality of Rivers, Lakes, and Estuaries	3
			EN.575.751	Environmental Justice, Climate, and Health Equity	3
			EN.575.752	Environmental Decision-Making: Climate, Energy, Indigenous Populations, and Accessibility	3
			EN.575.753	Communication of Environmental Information and Stakeholder Engagement	3
			EN.575.759	Environmental Policy Analysis	3
			EN.575.761	Measurement and Pseudo-measurement in the Environmental Arena	3
			EN.575.762	Resilience of Complex Systems	3
			EN.575.763	Nanotechnology and the Environment: Applications and Implications	3

¹ All students in the Environmental Engineering, Science, and Management Programs who do not possess an undergraduate degree in Environmental Engineering must take EN.575.604 Principles of Environmental Engineering as one of their required courses.

Electives

Select up to five courses from the Climate, Energy, and Environmental Sustainability course list above or from the following elective courses:

Code	Title	Credits
Select up to five of the following elective courses:		
EN.575.601	Fluid Mechanics	3
EN.575.605	Principles of Water and Wastewater Treatment	3
EN.575.606	Water Supply and Wastewater Collection	3
EN.575.607	Radioactive Waste Management	3
EN.575.608	Optimization Methods for Public Decision Making	3
EN.575.611	Economic Foundations for Public Decision Making	3
EN.575.615	Ecology	3
EN.575.619	Principles of Toxicology, Risk Assessment & Management	3
EN.575.620	Solid Waste Engineering & Management	3
EN.575.626	Hydrogeology	3
EN.575.628	Business Law For Engineers	3
EN.575.629	Modeling Contaminant Migration through Multimedia Systems	3
EN.575.635	Environmental Law for Engineers & Scientists	3
EN.575.637	Environmental Impact Assessment	3
EN.575.640	Geospatial Intelligence: the art and science for better understanding our world	3
EN.575.643	Chemistry of Aqueous Systems	3
EN.575.645	Environmental Microbiology	3
EN.575.703	Environmental Biotechnology	3
EN.575.704	Applied Statistical Analysis and Design of Experiments for Environmental Applications	3
EN.575.706	Biological Processes for Water & Wastewater Treatment	3
EN.575.707	Environmental Compliance Management	3
EN.575.708	Open Channel Hydraulics	3
EN.575.710	Financing Environmental Projects	3