



LOYOLA UNIVERSITY MARYLAND

— 1852 —

Office of Academic Affairs

February 1, 2025

Sanjay Rai, Ph.D.
Secretary of Higher Education
Maryland Higher Education Commission
217 East Redwood Street, Suite 2100
Baltimore, MD 21202

HEGIS: 042001
CIP: 03.0104

Dear Secretary Rai,

Loyola University Maryland enthusiastically submits a new program proposal for a B.S. in Environmental Science. The program's liberal arts curriculum weaves together natural science, social science, and humanities with a strong emphasis on the study of systems and the relationship of people with the environment.

The proposed program was developed specifically to honor our commitment as members of the first cohort of Laudato Si' universities, a cohort of institutions responding to the call from Pope Francis to recognize the world's environmental and social crisis. Additionally, the proposed program was developed under the University's new strategic plan *Together We Rise* and directly meets the plan's focus area *Care for Our Common Home* and the initiative to become a leader in integral ecology. As such, we proudly present this liberal arts program for your review.

The proposal addresses the 2022 Maryland State Plan for Higher Education's goals and priorities and was approved by Loyola's Academic Senate and Loyola's Board of Trustees. The President approves this proposal, as made evident by his signature on the MHEC Cover Sheet. I approve the proposed program and submit it for your recommendation for implementation. Should the Commission have any questions about the proposals, please contact Mr. David Mack, Academic Program Development Specialist, at 410-617-2317 or dsmack@loyola.edu.

Sincerely,

A handwritten signature in cursive script that reads "Cheryl Moore-Thomas".

Cheryl Moore-Thomas, Ph.D., NCC
Provost and Vice President for Academic Affairs

Cc: Francis Golom, Ph.D., Dean, Loyola College of Arts and Sciences

Mr. Matthew Power, President, Maryland Independent College and University Association
Dr. Angela Sherman, Vice President for Academic Affairs, Maryland Independent College
and University Association



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**Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program**

Institution Submitting Proposal	Loyola University Maryland
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Each action below requires a separate proposal and cover sheet.

- | | |
|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program |
| <input type="radio"/> New Area of Concentration | <input type="radio"/> Substantial Change to an Area of Concentration |
| <input type="radio"/> New Degree Level Approval | <input type="radio"/> Substantial Change to a Certificate Program |
| <input type="radio"/> New Stand-Alone Certificate | <input type="radio"/> Cooperative Degree Program |
| <input type="radio"/> Off Campus Program | <input type="radio"/> Offer Program at Regional Higher Education Center |

Payment <input checked="" type="radio"/> Yes	Payment <input type="radio"/> R*STARS # [REDACTED]	Payment 850.00	Date 2-1-25
Submitted: <input type="radio"/> No	Type: <input checked="" type="radio"/> Check # 65148	Amount:	Submitted:

Department Proposing Program	Natural and Applied Sciences		
Degree Level and Degree Type	Bachelor of Science		
Title of Proposed Program	Environmental Science		
Total Number of Credits	120		
Suggested Codes	HEGIS: 42001.00	CIP: 3.0104	
Program Modality	<input checked="" type="radio"/> On-campus <input type="radio"/> Distance Education (fully online) <input type="radio"/> Both		
Program Resources	<input checked="" type="radio"/> Using Existing Resources <input type="radio"/> Requiring New Resources		
Projected Implementation Date <small>(must be 60 days from proposal submission as per COMAR 13B.02.03.03)</small>	<input checked="" type="radio"/> Fall <input type="radio"/> Spring <input type="radio"/> Summer Year: 2025		
Provide Link to Most Recent Academic Catalog	URL: https://catalogue.loyola.edu/		
Preferred Contact for this Proposal	Name:	David Mack	
	Title:	Program development Specialist	
	Phone:	(410) 617-2317	
	Email:	dsmack@loyola.edu	
President/Chief Executive	Type Name:	Terrence M. Sawyer, J.D.	
	Signature:	 <small>Terrence Sawyer (Jan 31, 2025 08:28 EST)</small>	Date: 01/31/2025
	Date of Approval/Endorsement by Governing Board:	10/15/2024	

Revised 1/2021

Executive Summary

Loyola University Maryland is a member of the first cohort of Laudato Si' universities – a cohort of higher education institutions that are responding to a call from Pope Francis to recognize that the world's environmental and social crises are deeply intertwined and, with that recognition, work toward integral ecology within our institution, our city, and our world. This is directly connected to one of the Universal Apostolic Preferences of the Society of Jesus: Caring for our Common Home by collaborating, with Gospel depth, for the protection and renewal of God's creation.¹ The proposed Bachelor of Science in Environmental Science, is one part of honoring our commitment. This commitment challenges us to act on the 7-goals listed below.²

- Protect our common home for the well-being of all
- Defend all forms of life on Earth
- Acknowledge that the economy relies on the biosphere and our common home
- Adopt sustainable lifestyles
- Rethink and redesign curriculum to foster ecological awareness and transformative action
- Promote ecological spirituality
- Engage in action that builds community resilience and empowerment

The environmental science program will help us honor our commitment to these goals. In addition, the environmental science program will build students' green skills, through high-quality, liberal arts instruction with an environmental science focus.

The demand for skilled workers in the green job industry is increasing. The share of jobs requiring at least one green skill jumped 9.2% per year between 2018 and 2023 and the share of green talent workforce expanded by 5.4% per year over the same period. Fast growing skill areas include, climate action planning, drinking water quality, and hazards communications, and even jobs that are not traditionally considered 'green,' such as healthcare are increasingly requiring green skills.³

The Environmental Science curriculum was designed with a focus on building scientific skillsets, as well as a focus on building community and appreciation for the wonders of the world. For this reason, our curriculum weaves together natural science, social science, and humanities with a strong emphasis on the study of systems and the relationship of people with the environment. To build foundational knowledge, students in the major will complete a three-course foundational sequence designed to introduce students to:

¹ Universal Apostolic Preferences of the Society of Jesus, 2019-2029. <https://www.jesuits.global/uap/>

² *Laudato Si Action Platform*. (n.d.). Retrieved May 7, 2024, from <https://www.laudatosi.org/laudato-si/action-platform/>

³ *Global Green Skills Report 2023. LinkedIn Economic Graph*. <https://economicgraph.linkedin.com/research/global-green-skills-report> (accessed 2024-03-21).

Environmental Science

- The dynamics of Earth's environmental systems (science)
- The interactions of social and political systems with environmental systems (social science)
- The examination of the relationships between humans and nature (humanities)

Environmental Science students will continue to build their skills and knowledge through the completion of an environmental humanities elective; an environment, society, and policy elective; a statistics course; an environmental ethics course; and a course focused on communicating about the environment through writing or other media.

Environmental science careers require foundational knowledge across the basic sciences. To meet this requirement students will complete two introductory sequences in basic science and math, choosing from biology, chemistry, physics, and calculus. In addition, all environmental science students will complete the following two courses.

- ENV 224 Ecological Dynamics in the Mid-Atlantic: From Evolution to Communities
- ENV 320 Environmental Science with Analysis

The first course will allow all environmental science students to learn about ecosystems biodiversity in the Chesapeake Bay region and make field observations. The second course is focused on the physical environmental sciences and will include collection of data in the field, analysis of datasets, and introductory modeling. Environmental studies students will also complete three environmental science electives.

The degree will culminate with a two-course capstone experience. First, students will apply their foundational skills and knowledge in a 3-credit environmental studies experience course (internship or research) where they will also gain valuable experience and network with employers, community partners, or researchers. Next, they will take a 3-credit Integral Ecology capstone course which will bring together environmental studies and environmental science students. The students will work in interdisciplinary teams to complete environmental or sustainability related projects with community partners or university partners. This will allow each student to apply their personal skill set in a collaborative setting, preparing them for the next step in the career path. In this course, students will also engage in reflection on their experience as a student in the program through the process of discernment. This process involves examining their actions, feelings, and senses to determine how they have grown and how they will continue to grow and give back to the world after they graduate.

This proposed program was developed through a collaboration of faculty from across the university who worked together over more than two years to propose this program with input from students and alumni as well. It was a labor of love for our community and our students and is informed by a deep sense of caring for our common home. While there are other liberal arts interdisciplinary environmental science programs in our state that were also developed by amazing faculty, we believe our proposed curriculum takes a unique approach. This approach includes building on our commitment to integral ecology to allow students to not only gain

Environmental Science

knowledge and skills, but also experience built-in opportunities for collaboration with peers, businesses, and community partners and self-reflection to promote personal and professional growth.

A. Centrality to Institutional Mission and Planning Priorities:

1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.

Loyola University Maryland's mission is to inspire students to learn, lead, and serve in a diverse and changing world. As a Jesuit, Catholic university, Loyola is committed to the educational and spiritual traditions of the Society of Jesus and to the ideals of liberal education and the development of the whole person.

The proposed Environmental Science program will capitalize on Loyola's tradition of academic excellence while also building strong skills in critical thinking, written and oral communication, and ethical reasoning. The proposed program will provide students with skills to work in a variety of environmental science related fields and is directly related to the institution's call to action as a *Laudato Si'* designated institution.

In 2021 Loyola University Maryland joined the first cohort of *Laudato Si'* universities, committing to respond to the cry of the earth and the cry of the poor through:

- fostering ecological economics
- adopting sustainable lifestyles
- fostering ecological education
- fostering ecological spirituality
- building community resilience & empowerment

To meet the commitment Loyola has for this designation, the University has many initiatives including the creation and implementation of an all-encompassing Climate Action Plan and Energy Management Policy, sponsoring local, community-focused farmers market to serve Loyola's neighbors, and included as one of the key pillars in the institution's recently approved new strategic plan. The Care for Our Common Home pillar's first initiative is "Become a Leader in Integral Ecology." Development and implementation of the proposed program not only supports the mission and strategic plan of the University, but it is essential to the University's goals and the commitment and priorities designated by Loyola's President, the Board of Trustees, and the institution.

The proposed Environmental Science program (B.S.) at Loyola is an interdisciplinary liberal arts program that will provide students with an education that fosters knowledge of environmental systems through a background in basic and applied science; promotes engagement with environmental issues and assessment of environmental and social systems; and the need for participatory action that responds to the 'cries of the Earth and poor' across society – thus training students to be integral ecologists and to serve others in a diverse and changing world. As integral ecologists students will:

Environmental Science

- Analyze and articulate the interactions between environmental systems and human systems including the connections between the health of society and the health of the environment.
- Examine the relationship past between human beings and the environment and use ethical frameworks to rethink the relationship between humans and the environment.
- Design and advocate for comprehensive solutions that integrate combating poverty and injustice while protecting nature.

Through the 3-course introductory course sequence consisting of a natural science course, a social science course, and a humanities course; students will start to learn to be integral ecologists. Through these courses students will gain introductory knowledge of Earth and environmental science; the intersections between environment, society, and policy; and explore integral ecology through humanistic disciplines to consider how the ‘societal’ and the ‘nature’ comprise our common home. Environmental justice, inclusive of Loyola’s diversity learning aims, will be woven into these three courses. All students will also be required to complete an environmental ethics course and an environmental communication elective from a list of environmental studies related electives in writing, communication, and studio arts.

All environmental science students will take 200-level statistics and a 200-level and a 300-level environmental science course where they will apply skills in statistics. These courses are:

- ENV 224 Ecological Dynamics in the Mid-Atlantic: From Evolution to Communities. This course will provide students with a background in ecology and assessment of ecological systems. Students will gain insights into how species adapt and evolve over time, shaping the biodiversity observed in different environments. Through field and laboratory work, students will expand their knowledge using urban settings, the Chesapeake Bay, and other mid-Atlantic biomes.
- ENV 320 Environmental Science with Analysis. In this course students will learn about environmental indicators and methods of assessment, expanding on their knowledge of environmental systems from the introductory course. During the laboratory, students will analyze environmental data sets, complete environmental assessments such as water and soil quality, and learn techniques for modeling and monitoring environmental systems. Students will apply these analytical skills to the completion of a project for a local organization or the university’s sustainability program.

Students will also gain skills in basic sciences by taking the introductory sequence in two areas of natural and applied sciences choosing from the Biology, Chemistry, Physics, and Calculus course sequences. This will prepare students for upper-level science courses in these areas as well as further study and careers in environmental science. The flexibility in the introductory sequences will allow students to choose areas that are most applicable to their career interests.

Environmental science students will also complete an environmental humanities elective and an environment, society, and policy elective to add breadth to their degree. Students enrolled in the honors program at Loyola receive environmental humanities content through their honors core and will not take an environmental humanities elective as part of their major. This will allow

Environmental Science

them to complete the honors program requirements and the environmental science major, while still maintaining the rigor of both programs.

The skills that students learn through their course work will be applied in environmental science experience courses where students will complete a 3-credit internship or 3-credits of science research. Their experience will culminate during their final semester in their Integral Ecology Capstone where students from across the environmental programs will come together in an interdisciplinary cohort to demonstrate mastery and critical understanding of the dynamic interplay of human and natural systems; envision, evaluate, and potentially enact practical paths toward health, transformation, and repair; and build upon their previous learning and experience to produce a portfolio or project in collaboration with peers and/or community partners that effectively communicates a critical perspective on integral ecology.

2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.

As stated in *Laudato Si'*, 41, 139, "When we speak of the 'environment', what we really mean is a relationship existing between nature and the society which lives in it. Nature cannot be regarded as something separate from ourselves or as a mere setting in which we live. We are part of nature, included in it and thus in constant interaction with it." Through this statement, Pope Francis helps us to understand the importance of integral ecology.

The University has developed this program with the concomitantly proposed environmental studies program as the first programs under the new Strategic Plan that is charged to grow our STEM programs and become a leader in Integral Ecology. Developing programs that enrich the vision of integral ecology, where science, ethics, spirituality, and action are mutually respected and empowered, aligns this new program with the focus areas "Care For our Common Home" and "Grow our Footprint, Influence, and Enrollment" found within Loyola's new strategic plan. These focus areas also align with the Universal Apostolic Preferences which unite the Society of Jesus in our mission onto which Jesuits concentrate and concretize our vital apostolic energies during a ten-year period.

3. Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation. (Additional related information is required in section L.

Implementation of the program will require modest resources in terms of faculty and budget. To assist implementation of the proposed program, the University applied for and received the *Clare Boothe Luce Program for Women in STEM* grant. This grant will provide salary support for 3-years for a new tenure-track environmental science faculty member, helping to offset program implementation costs. This new faculty member is not included in our budget calculations as this faculty member is already included in the University's budget. The budget calculations do include projected faculty needs for courses in both the major and for core courses due to increased student enrollment. For courses in the major, the budget includes salary for

Environmental Science

- Per-course faculty to teach courses in the major as needed (0.5 to 2 courses per year);
- A full-time teaching faculty to teach 1 course per year starting in year two and increase to 4 courses per year in year 5;
- A full-time tenure track faculty member for the major starting in year 3.

These faculty hires are based on projected enrollments and anticipated coverage needs for the program. Nearly all courses in the program are already taught by current faculty and new courses in the proposed curriculum will be taught by current full-time faculty (see included memoranda of understanding).

A support staff position is included in the budget starting in year two with costs split with the concurrently proposed environmental studies program. We have also budgeted for a full-time laboratory manager starting in year 4. Costs for technical equipment and supplies as well as library resources and marketing are included as well as a laboratory renovation in year 3 of the program if needed. The laboratory manager, equipment, and laboratory renovation that we have included in the budget should help to increase the burden on existing support staff and space as the major grows.

As a truly interdisciplinary program that is directly related to the University's mission and strategic plan, the institution has agreed to support the of the program. Additionally, the dean of Loyola College will contribute modest funds for programming to help build community in the major. Review of cross applications indicates a significant interest in the proposed program and in consideration of the strong enrollment in the environmental studies minor, the program's budget projections indicate that overall tuition revenues during the first 5-years will exceed program expenses.

4. Provide a description of the institution's a commitment to:
 - a) ongoing administrative, financial, and technical support of the proposed program

As an interdisciplinary program, the Environmental Science program will be managed by Dr. Elizabeth Dahl (Associate Professor) who will serve as program director. The program director will be overseen by the Associate Dean for the Natural and Applied Sciences who will provide oversight of budget and personnel decisions. The program director will advise students in the major, network with community partners and internship locations, and provide day-to-day administration of the program. Academic advising will be provided by the director and if necessary due to enrollments, other faculty teaching in the major will provide advising.

Technical support for the laboratory courses will be provided by the chemistry & biochemistry and biology departments' technical support staff. Long-term projections include a full-time laboratory manager for environmental science who will take over management of environmental science laboratories.

The current environmental studies steering committee consists of faculty members from across the university. Upon approval, this committee will become the environmental science and studies

Environmental Science

steering committee. This committee will oversee the curriculum of the program and work with the program director to assess learning outcomes.

- b) continuation of the program for a period of time sufficient to allow enrolled students to complete the program.

The program will be given at least five years to establish consistent and sustainable enrollments. After that time, if the program fails to meet anticipated student demand, its continuation will be reassessed. Given the large number of elective courses and the limited increase in new required courses for the major, we do not anticipate issues with students being able to complete their program. If the University chooses to sunset the program in the future, course instruction will continue, and students will be provided the necessary courses to complete their degree program.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan:

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general based on one or more of the following:
 - a) The need for the advancement and evolution of knowledge
 - b) Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education
 - c) The need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs

Across the country and in Maryland there is an increasing need for people prepared for employment in fields such as environmental management, policy, and pollution prevention. Green skills are also needed in fields that are not traditionally considered environmental fields including data science, media, design, and healthcare.⁴

In Maryland, with the 2030 Greenhouse Gas Reduction Act Plan (GGRA), the Maryland Department of the Environment estimates the creation of more than 6000 green jobs and as much as \$5.3 billion in state economic output by 2030.² Across the country, the workforce increases in environmental studies and environmental sciences degree holders are estimated to be 6%.⁵

Across the United States, environmental literacy requirements in K-12 education are also growing⁶ including in Maryland which was the first state to pass an environmental literacy high school graduation requirement.⁷ More students in the United States take the AP environmental

⁴ *Global Green Skills Report*. (2023). LinkedIn Economic Graph. Retrieved March 21, 2024, from <https://economicgraph.linkedin.com/research/global-green-skills-report>

⁵ *Environmental Literacy*. (n.d.). North American Association for Environmental Education. Retrieved February 24, 2023, from <https://cepro.naaee.org/learning/eelearn/eelearn-1-what-ee/lesson-4-environmental-literacy/el-naaee>

⁶ *Environmental Literacy*. (n.d.). North American Association for Environmental Education. Retrieved February 24, 2023, from <https://cepro.naaee.org/learning/eelearn/eelearn-1-what-ee/lesson-4-environmental-literacy/el-naaee>

⁷ MAEOE | Maryland Environmental Literacy. (n.d.). Retrieved November 7, 2023, from <https://maeoe.org/environmental-literacy/defining-environmental-literacy/maryland-environmental-literacy>

Environmental Science

science exam than take AP chemistry or physics.⁸ While environmental literacy in the country and Maryland has increased among young people, a recent study also demonstrated that 84% of 16-25 year olds are worried about climate change.⁹

This new program will build upon the University's core curriculum focused on liberal arts skills. These core skills that enable graduating students to be effective communicators and critical thinkers. The new program builds on this foundation by adding to graduates' skill sets, key green skills necessary to prepare them for the growing workforce need.

In Maryland and across the country, environmental degree programs focus on science and social science. The innovation in our program is that students will have a strong humanities foundation including ethics and communication, be trained to be integral ecologists,¹⁰ and be required to engage in community-based experiential learning. The proposed program has a specific goal of providing graduates with both the green skills and tools necessary to address the environmental crises and application of these skills. This will best position alumni of our program to apply what they have learned at Loyola after graduation and contribute to the green economy shift and initiate changes to society as integral ecologists.

2. Provide evidence that the perceived need is consistent with the [Maryland State Plan for Postsecondary Education](#).

The proposed environmental science program will support many aspects of the 2022 Maryland State Plan for Higher Education. Loyola considers our proposed program to foster innovation primarily in Priorities 5, 6, and 7. Loyola has a focus on building community partnerships through a variety of ways including the York Road Partnership. This focus enables us to build upon relationships with organizations, allowing us to connect students to internships and upon graduation, be prepared for the workforce.

The proposed program aligns with the priorities outlined in the 2022 Maryland State Plan for Postsecondary Education specifically as outlined below.

Priority 5. Maintain the commitment to high-quality postsecondary education in Maryland.

- Plan action items: *Identify innovative fields of study* and *Consider specializing as opposed to expanding academic programs*. While many higher education institutions have environmental science programs, our program's approach is to train students to be integral ecologists. Through the lens of the integral ecology, students who complete the program will be engaged in a curriculum that includes significant course work in science and analysis and encourages students to work towards solutions to our environmental and social crises through analyzing and proposing solutions to environmental problems.

⁸ AP Environmental Science Exam: 2021 Results – All Access | College Board. (2021). Retrieved February 28, 2023, from <https://allaccess.collegeboard.org/ap-environmental-science-exam-2021-results>

⁹ Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & Susteren, L. van. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health*, 5(12), e863–e873. [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3)

¹⁰ *Laudato Si* - Integral Ecology. <https://www.laudatosi.org/dialogue/integral-ecology/> (accessed 2023-11-08).

Environmental Science

- Plan action item: *Evaluate assessment strategies for purpose, including assessing a student for real-world application and capstone projects as representative of experience.* By incorporating an experiential learning requirement (internship or research experience) into our program as a pre-requisite to the capstone integral ecology experience, we will be able to assess how students apply their skills to real-world application of environmental analysis and problem solving. This will provide additional training for the students who will work in multidisciplinary teams in the course.
- Plan action item: *Increase paid real-world experiences (such as internships, externships, work-study opportunities) as a part of new curricula.* The program director and assistant maintain a list of paid and unpaid internships and paid research experiences for students to enable them to complete their environmental science experience course and be paid to do so.

Priority 6: Improve systems that prevent timely completion of an academic program.

- Plan action item: *Improve academic coordination among institutions to address challenges faced by transfer students.* Our program was designed with seamless transfer from community college in mind with the ability of students with associates degrees in environmental studies or science to transfer in courses in environmental science, economics, mathematics, and other sciences. The seamless transfer program at Loyola allows students with an Associate of Arts or Associate of science degree from a Maryland Community College to waive most of the Loyola core requirements. For students with A.A. or A.S. degrees in environmental science, they will be able to waive ENV 114 and ENV 116 as much of that content will be obtained through their community college course work and start their program at Loyola with ENV 210 Introduction to Integral Ecology.

Priority 7: Enhance the ways postsecondary education is a platform for ongoing lifelong learning.

- Plan action item: *Incorporate civic learning and civic engagement into all academic programs.* Building upon the work of Loyola's Center for Community, Service, and Justice, this new program will incorporate civic learning and engagement throughout the curriculum. This will include direct service, community-based projects, and advocacy-based work depending upon the nature of the course and the community needs.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State:

1. Describe potential industry or industries, employment opportunities, and expected level of entry (*ex: mid-level management*) for graduates of the proposed program.

Environmental science graduates are employed in a variety of industries after graduating with their bachelor's degree including careers as environmental scientists and analysis, sustainability professionals, as environmental educators, and in environmental policy. Those who would like to pursue graduate degrees can pursue graduate education and post-graduate career in a variety of

Environmental Science

environmental science related fields such as atmospheric science, Earth science, forestry, and ecology, as well as other fields. According to the World Economic Forum, in the United States, demand for green skills in careers such as design, healthcare, manufacturing, public administration, software and IT services is also growing,¹¹ suggesting that the types of careers available for graduates will continue to diversify.

2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.

In Maryland, with the 2030 Greenhouse Gas Reduction Act Plan (GGRA), the Maryland Department of the Environment estimates the creation of more than 6000 green jobs and as much as \$5.3 billion in state economic output by 2030.¹² Across the country, the workforce increases in environmental studies and environmental sciences degree holders are estimated to be 6%.¹³

The U.S. Bureau of Statistics O*NET lists several occupations related to graduates of Environmental Science programs as *Rapid Growth* occupations. These occupations include environmental compliance inspectors, regulatory affairs specialists, government property inspectors and investigators, environmental restoration planners, environmental science and protection technicians, industrial ecologists, and climate change policy analysts.

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.

The proposed program provides opportunities in the sciences, politics, business and several other categories. The U.S. Bureau of Labor Statistics data indicating projected growth can be found in the tables below.

Occupational Title	SOC Code	Employment, 2023	Projected Employment, 2033	Change 2023-33	
				Percent	Numeric
Environmental scientists and specialists, including health	19-2041	84,600	90,700	7	6,100
Occupational health and safety specialists and technicians	19-5000	153,500	175,500	14	21,900
Atmospheric and space scientists	19-2021	9,900	10,500	6	600

¹¹You need these skills to get that green job. World Economic Forum.

<https://www.weforum.org/agenda/2022/03/green-skills-for-future-jobs/> (accessed 2023-11-07).

¹²Maryland releases bold new plan to achieve climate goals. Maryland Department of the Environment.

<https://news.maryland.gov/mde/2021/02/19/maryland-releases-bold-new-plan-to-achieve-climate-goals/> (accessed 2023-11-07).

¹³ Environmental Studies | Data USA. <https://datausa.io/profile/cip/environmental-studies> (accessed 2023-02-24).

Environmental Science

Occupational Title	SOC Code	Employment, 2023	Projected Employment, 2033	Change 2023-33	
				Percent	Numeric
Natural sciences managers	11-9121	100,100	107,600	8	7,500
Environmental science and protection technicians, including health	19-4042	33,900	36,200	7	2,400
Conservation scientists and foresters	19-1030	41,400	43,300	5	1,900
Geoscientists, except hydrologists and geographers	19-2042	26,000	27,400	5	1,400
Zoologists and wildlife biologists	19-1023	18,800	19,600	4	800
Hydrologists	19-2043	6,500	6,700	3	200
Clinical laboratory technologists and technicians	29-2010	344,200	362,500	5	18,200
Agricultural and food scientists	19-1010	37,200	40,200	8	2,900

4. Provide data showing the current and projected supply of prospective graduates.

School	Program Name	CIP Code	2019	2020	2021	2022	2023
Frostburg State University	Environmental Science	030104	0	0	0	0	0
Johns Hopkins University	Environmental Science	03.0104	3	6	9	6	8
Mount St. Mary's University	Environmental Science	03.0103	1	1	1	1	4
Stevenson University	Environmental Science	03.0104	3	5	13	9	5
Towson University	Environmental Science and Studies	03.0101	43	62	50	50	33

Environmental Science

School	Program Name	CIP Code	2019	2020	2021	2022	2023
University of Maryland - Baltimore County	Environmental Science	03.0104	16	2	0	0	0
University of Maryland - Baltimore County	Environmental Science and Geography	03.0104	39	46	30	28	36
University of Maryland - College Park	Environmental Science & Technology	03.0104	74	65	55	51	38
University of Maryland - College Park	Environmental Science and Policy	26.1301	81	96	77	75	99
University of Maryland - Eastern Shore	Environmental Science	26.1301	6	7	4	6	10
Washington College	Environmental Science	26.1301	12	11	12	10	17

D. Reasonableness of Program Duplication:

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

Environmental Science (CIP code 03.0104) is a common program found at several institutions in the state. There are several programs in the state that have a similar title of Environmental Science but are listed in a different CIP code such as 03.0101 (Natural Resource Conservation), 03.0103 (Environmental Studies), and 26.1301 (Ecology). Loyola's program is designed under CIP code 03.0104. Our proposed environmental science program is not focused on natural resource conservation and is instead focused on physical sciences and interdisciplinary content. While some students in our program may take ecology electives, our major is not an ecology program.

Some notable environmental science undergraduate programs or concentrations in the state include those offered by Frostburg State, Goucher, Hood, Johns Hopkins, Stevenson, Towson UM Baltimore County, UM College Park, UM Eastern Shore, and Washington College. These programs are similar to ours in that that coursework has a foundation in basic sciences and are inclusive of social science courses. Each of these programs has unique strengths. For example:

Environmental Science

- Frostburg State University's program in Environmental Science is one of the newest programs in the state and is a collaboration between biology and geography, similar to ours, allows students to choose a pathway that will work best for their goals.
- Goucher College offers a concentration in Environmental Science. The concentration focusses on biology, chemistry and environmental studies courses.
- Hood College's Environmental Science program provides a broad program core before offering four concentrations from which students choose to focus their studies.
- Johns Hopkins University offers an interdisciplinary program in Environmental Science that includes a common core with environmental studies which is similar to our program's design.
- Stevenson University's Environmental Science program, like our proposed program, includes courses in environmental ethics and writing and a capstone experience course.
- Towson University offers Environmental Science as a concentration through their Environmental Science and Studies program. Their unique and flexible approach allows students to choose an environmental biology, environmental chemistry, environmental geography, or environmental science track allowing students to choose a focus for their studies.
- UM Baltimore County's program in Environmental Science & Geography has a focus on geography that sets it apart from other programs in the state, resulting in graduates with excellent training in GIS and the intersection of environmental and human systems.
- UM Eastern Shore websites indicate their Environmental Science program has with two concentrations allowing students the option of Environmental Chemistry or Marine Ecology.
- UM College Park's program in Environmental Science and Technology offers four unique concentrations that allows students intensive training in specific areas of environmental science.
- UM College Park's program in Environmental Science and Policy provides a broad background in their program core requirements and then offer 13 concentrations for students to focus their studies.
- Washington College's program in Environmental Science is an interdisciplinary program that prepares students to analyze and investigate potential solutions to environmental problems. Coursework focuses on biology, chemistry and environmental science/studies courses.

While other programs in the state require foundational coursework in science and math, many environmental science programs in the state require all students to take biology and/or chemistry and/or require students to choose a particular specialty. Our program is different in its flexibility by allowing students to choose their basic science pathway and their upper-level electives. The result is that our program will ultimately require environmental science students to complete a minimum of 11 science and math courses and include additional elective courses in environment, society, and policy and environmental humanities. This format will allow students to focus on the science fields and skills most applicable to their interests and desired career pathway and prepare students for continuing education in graduate programs. It will also allow students enrolled in the Environmental Science B.S. to double major or minor in another science if desired.

Environmental Science

Loyola's program is different from other Environmental Science programs in the state in that the students will have 3 connected sequences that enhance the interdisciplinary nature of the program and that will prepare students for advanced course work and careers in environmental science. These sequences are:

1. An interdisciplinary 3-course introductory environmental studies sequence that will provide a foundation in environmental science and studies from the natural science, social science, and humanities disciplines.
2. Completion of two introductory course sequences (2-courses each) in basic science and math (Biology, Chemistry, Physics, and/or Calculus).
3. A two-course sequence in environmental science that includes a course focused on ecology with field observations (200-level) and a course focused on environmental analysis with computation and laboratory work (300-level). Both courses will include field and laboratory work.

Our program is also different from other similar programs in the Maryland in that it starts with courses that frame the study of the environment for students in both environmental science and environmental studies and finishes the student's program with both an environmental science experience course and a capstone course in Integral Ecology with environmental studies students to culminate their experience. This is an important part of our program developed based on student and alumni feedback about what they would like to see in our program and what they think would best prepare graduates for future employment. An additional goal of the capstone course is for students to engage in reflection on their experience as a student in the environmental science program through the process of discernment. The process of discernment involves examining their actions, feelings, and senses to determine how they have grown and how they will continue to grow and give back to the world after they graduate.

Loyola's proposed program will be taught through a social justice lens of a Jesuit Catholic University committed to the educational and spiritual traditions of the Society of Jesus and the development of the whole person. As described in the Executive Summary, the proposed program is a necessary step for the University meeting its commitment to environmental sustainability, as a member of the first cohort *Laudato Si'* universities. The seven *Laudato Si'* goals are linked to the 17 United Nations Sustainable Development Goals, reinforcing the shared and intentional connection with the global development agenda. The University will annually report its progress towards these goals to the Vatican and engage in dialog with other universities around the world engaged in this work.

2. Provide justification for the proposed program.

The proposed environmental science liberal arts program will add to the variety of environmental science programs offered across the state. Many programs in the sciences such as biology, chemistry, and physics have nearly identical curriculums regardless of the University. However, environmental science and related programs at different universities have wide variations in curriculum, allowing higher education institutions to design unique curricula that best fit with their mission and attract different students. Our program design does not duplicate other programs in the state, though it does share some similarities. By focusing on integral ecology in our program we will be able to offer a program that enhances the environmental science program

Environmental Science

offerings across the state while not taking away from the unique strengths and opportunities offered by each institution of higher education.

This new program will attract new students who may not have looked to Maryland previously and potentially keep these students in our state upon graduation. Maryland is uniquely situated for green job growth. The U.S. Bureau of Labor Statistics including O*NET's Careeronestop, indicates environmental scientists and specialists alone project 290 annual job openings in Maryland (see tables C.3 and C.4 above). That is more than the graduate output of all the current similar undergraduate programs in Maryland.

E. Relevance to High-demand Programs at Historically Black Institutions (HBIs)

1. Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBI's.

To determine the relevance of this program to HBIs in Maryland we researched whether environmental studies or environmental science undergraduate programs are offered at the four HBIs in Maryland and found the following.

- Bowie State, Coppin State, and Morgan State do not offer programs in environmental science or environmental studies.
- University of Maryland Eastern Shore offers an Environmental Science major (B.S.) with concentrations in Marine Science or Environmental Chemistry.

The proposed program by Loyola University Maryland would provide minimal impact on the implementation of high-demand programs at UMES as the environmental science programs are common in the state and because the programs are noticeably different in design.

Loyola's proposed environmental science program is significantly different from the programs offered by UMES. Our proposed program does not include any specialization in environmental science and is a general environmental science degree. Loyola does not offer marine science courses and will not compete with UMES in attracting students interested in Marine Science. With regard to the environmental chemistry concentration at UMES, our proposed program does not require chemistry courses of all students, because it is focused on providing more flexibility in student interest across the natural sciences. Our program also requires more lower-level introductory environmental science and studies courses specific to the University's mission as a Jesuit Catholic institution and directly related to our status as a *Laudato Si'* institution.

F. Relevance to the identity of Historically Black Institutions (HBIs)

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs.

The proposed program would have minimal impact on the uniqueness and institutional identities and missions of HBIs. Only one HBI in Maryland offers an environmental science program and

Environmental Science

the proposed program is significantly different from the programs offered at UMES as described above in Section E. Additionally, environmental science programs are common in Maryland and are offered at geographically different locations within the state. The University of Maryland Eastern Shore's programs are significantly different with regard to courses and learning outcomes. The proposed program by Loyola University Maryland was specifically designed to meet the mission of the University as a Jesuit Catholic institution and its commitment as a *Laudato Si'* institution which differs from the UMES mission.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes (as outlined in COMAR 13B.02.03.10):

1. Describe how the proposed program was established, and also describe the faculty who will oversee the program.

The proposed environmental science program grew out of our successful environmental studies minor (established 2015) from discussion with the environmental studies steering committee. In addition, with the work of the university on sustainability initiatives in conjunction with becoming a *Laudato Si'* university, the support structure for a new program in environmental science also is growing.

Nationally there is an increasing need for people with green skills in traditional environmental fields as well as fields such as data science, communication, and healthcare.¹⁴ At an institution such as Loyola with a strong liberal arts foundation, we have an established record for career preparation and outcomes.¹⁵ Building on this strength in career preparation, we aim to prepare students to be part of the innovative transformation of our systems necessary for the societal shift as we work to maintain our environment and social structure within a safe operating space for humanity.

Following a request from academic leadership for information on establishing a new program, the steering committee met to discuss a potential major. In addition, the steering committee reached out to environmental studies alumni who are working in related fields or in graduate school in related fields to discuss with them the strengths and weaknesses of our current minor as well as the key skills that undergraduate students should leave Loyola with upon graduation.

Taking this alumni feedback into account, the steering committee constructed a brief proposal outlining the potential goals of a major program as well as a potential structure. After an Academic Affairs review of this document, the steering committee moved forward on refining the program. To refine the program, additional faculty from across the university were asked to provide their expertise in the development of our program goals and structure. In all, 14 faculty from 13 departments contributed to the development of the proposed program, including faculty from Humanities, Social Sciences, Natural & Applied Sciences, and the Sellinger School.

¹⁴ *Skills for a Greener Future: A Global View*; Strietska-Illina, O., Mahmud, T., Eds.; International Labour Organization, 2019.

¹⁵ Outcomes - Rizzo Career Center - Loyola University Maryland. <https://www.loyola.edu/department/career-center/about/outcomes> (accessed 2023-12-05).

Environmental Science

The program will be overseen by Elizabeth Dahl (PhD, Earth System Science) and the environmental science and studies steering committee. The environmental studies steering committee currently oversees the environmental studies minor. Upon approval of the environmental science major, this committee will become the environmental science and studies steering committee. The committee consists of full-time faculty from across the university and currently includes:

- Mavis Biss (associate professor of philosophy)
- Daniel Castillo (associate professor of theology)
- Elizabeth Dahl (associate professor of chemistry)
- John Dougherty (associate professor of economics)
- Janine Holc (professor of political science)
- Bernadette Roche (associate professor of biology)
- Terre Ryan (associate professor of writing)

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and (modality) of the program.

PLO #1. Environmental Systems. Analyze and describe the dynamics of Earth's environmental systems, evaluate human-environmental system interactions across different temporal and spatial scales, and apply interdisciplinary knowledge from natural and applied sciences.

PLO #2. Environmental, Social, & Political Systems. Critically evaluate the relationships between humans and nature, articulate the roles of cultural, socio-economic, political, and ethical factors in environmental processes, and assess environmental justice implications.

PLO #3. Critical Understanding and Interpretation. Employ moral and ethical frameworks alongside quantitative analysis to construct and critically assess arguments and synthesize diverse sources of information using established qualitative and quantitative methodologies.

PLO #4. Communication. Prepare and deliver clear, well-structured communications that convey the complexities of environmental issues and justice, suitable for academic, policy, and public audiences, as evidenced by presentations, reports, and advocacy materials.

PLO #5. Participatory Action. Design, advocate for, and, when appropriate, implement equitable and just solutions to environmental challenges, demonstrating an understanding of the complex interplay between environmental, social, cultural, and ethical factors, with consideration of their systematic impacts.

The environmental science program will provide pathways for students to learn methodology and skills that they can apply in their careers or post-baccalaureate study. Students will be trained in the collection and analysis of environmental data and receive training in biology, chemistry, and/or physics.

Environmental Science

The core courses of the curriculum will allow students in the major to gain knowledge and skills for multiple career paths including excellent communication skills through a variety of modes, interdisciplinary approaches to analysis, and critical thinking and analytical skills. By incorporating current real-world examples and historical and ethical perspectives, it is our intent to cultivate intellectual curiosity and a commitment to life-long learning of the students in the major.

Students will gain experience applying skills learned in their coursework by completing an experiential course that will include either an internship experience or supervised research experience in environmental science or related field. To complete their study of environmental science, students will complete a capstone course that will include students majoring in environmental science and environmental studies to allow the formation of interdisciplinary cohorts. Students in this course will work together to integrate and apply what they have learned in other courses to assess challenges, develop strategies, and communicate effectively for healing Earth. Through this course students will learn from their peers and engage with communities beyond the classroom.

Additional alignment of courses to program learning outcomes and to the University's Undergraduate Learning Aims can found in Appendix A: Program Outcome Map and Appendix A.1: Program Learning Outcomes Alignment.

3. Explain how the institution will:
 - a) provide for assessment of student achievement of learning outcomes in the program

Assessments in each course are aligned to program outcomes. Learning outcomes are assessed each year in a cycle that follows institutional guidelines and best practices. Assessment of student learning outcomes is standard practice in Loyola's College of Arts and Sciences (LCAS) programs. LCAS has a continuous improvement process, where student learning outcome data is analyzed, curricular revisions are made, and each program generates an annual report submitted to the Assistant Dean and Dean of LCAS.

The data from these assessments are evaluated by faculty, program directors, institutional administrators, and the Committee on the Assessment of Student Learning. These data are used by the program director and faculty teaching in the program to determine if improvements to the curriculum may be needed to help drive curricular change when needed.

- b) document student achievement of learning outcomes in the program

The environmental science faculty steering committee will be responsible for collecting direct evidence of student work, developing assessment rubrics, defining metrics of success, scoring student work against the rubrics, and compiling the data annually for the department, program directors, steering committee and deans. A complete assessment report is submitted to and evaluated by the dean's office annually, and the dean meets with the program director each year to discuss the program's progress. The results of the assessment will be used for continual improvement of the program.

Environmental Science

4. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements

Students are considered to have met their graduation requirements when they have completed all degree requirements. Loyola degree requirements include successful completion of their program including any area of concentration, a minimum of 38 courses (3-,4- or 5-credit courses), diversity-justice course graduation requirements, satisfaction of Loyola's Core Curriculum, all totaling a minimum of 120 credits, while maintaining a minimum cumulative average of 2.00 in all Loyola courses. The residency requirement is satisfactory completion of at least 60 credits at Loyola University Maryland.

The proposed Bachelor of Science in Environmental Science is a 120-credit program - All students complete Loyola's liberal arts core curriculum, the environmental science program core including program electives, and free electives. See Appendix B: Environmental Science Courses and Course Descriptions. Additionally, Appendix C: Program Requirements Worksheet provides a list of course requirements.

5. Discuss how general education requirements will be met, if applicable.

Loyola undergraduate students are required to satisfy the requirements of the Loyola Core Curriculum. The Loyola Core Curriculum comprises the foundations of a liberal arts education in the Jesuit tradition. Courses span areas in the humanities, social sciences, and natural sciences/mathematics. They include disciplines such as fine arts, writing, English, history, theology, philosophy, and ethics. This includes multiple diversity courses that focus on topics related to racial and social justice and other diversity related topics.

6. Identify any specialized accreditation or graduate certification requirements for this program and its students.

No specialized accreditation is required for the program.

7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.

The proposal does not include contracting with another institution or non-collegiate organization.

8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.

All program requirements, including pre-requisites, curriculum, administration, financial aid, and any other relevant information will be maintained on the program's website and in the undergraduate catalogue. The program director will be responsible for ensuring that the webpage remains current and that students are informed of any changes. Individual course requirements will be clearly delineated on syllabi and in catalogue descriptions prior to registration. The

Environmental Science

program director will also be available to discuss program/course requirements and university services during office hours or by appointment.

Loyola provides support services that include an Office of Technology Services, Counseling Center, Disability Support Services, Financial Aid Office, the Loyola-Notre Dame Library, a National Fellowships Office, The Study, the Writing Center, and many other support services to assist students for success. As mentioned above, Loyola's website provides the appropriate program costs and student support resources, including required consumer information disclosures.

9. Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.

Loyola University Maryland has a dedicated Office of Marketing and Communications. Loyola endorses and adheres to ethical principles and codes of conduct published by various national organizations. These include the Public Relations Society of America (PRSA) Code of Ethics, the National Association for College Admission Counseling (NACAC) Statement of Principles of Good Practice, the National Association of Student Financial Aid Administrators (NASFAA) Statement of Ethical Principles and Code of Conduct for Institutional Financial Aid Professionals, American Association of Collegiate Registrars and Admissions Officers (AACRAO) Professional Practices and Ethical Standards, the NAFSA: Association of International Educators Statement of Ethical Principles, and the Association for Institutional Research (AIR) Code of Ethics, which are followed by the Office of Marketing and Communications, the Admission Office, the Office of Financial Aid, the Records and Admissions Offices, the Office of International Programs, and the Office of Institutional Research, respectively. Furthermore, the institution provides clear and accurate program information on the University's website.

Loyola's Enrollment Management team will be sent all the relevant information for the program and works closely with academic departments and the Academic Advising and Support Center to ensure that advertised information is clear and accurate. The academic program's website will be a major resource for students. At Loyola, all websites are maintained by individual departments and programs. This helps to ensure that content is accurate and relevant for anyone who visits a department website.

H. Adequacy of Articulation (as outlined in COMAR 13B.02.03.19)

1. If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements. More information for Articulation Agreements may be found here.

No formal articulation agreements for this program have been developed with partner institutions. However, Loyola offers a seamless transfer program to students who complete an associate degree at a Maryland community college. Most students who complete their associate of arts or science degree at any Maryland community college will be considered as having

Environmental Science

fulfilled all Loyola core requirements (with the exception of two courses that would fulfill the theology and philosophy requirements) that serve as the foundation of our Jesuit liberal arts curriculum. Additionally, if students have taken at least two semesters of a college-level foreign language (e.g., Spanish 101 and 102), they will have completed Loyola's language requirement.

I. Adequacy of Faculty Resources (as outlined in COMAR 13B.02.03.11).

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of **faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach in the proposed program.**

The program's faculty are distinguished and meet or exceed the requirements set in COMAR as well as Loyola University Maryland faculty requirements. Any new faculty will be reviewed utilizing university policy and meet or exceed COMAR requirements.

See Appendix D: Faculty Chart, for a list of the faculty who will teach in the proposed program.

2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:
 - a) Pedagogy that meets the needs of the students

Loyola currently offers two formal university-wide teaching enhancement workshops each year for all faculty, as well as numerous less formal pedagogical opportunities throughout the year. Several workshop sessions are dedicated to pedagogical training for faculty and instructors, including discussions of best practices for promoting student learning. In 2018, Loyola established Teaching Fellows who act as learning communities to research, incorporate, and disseminate best practices. Cohorts of teaching fellows have been formed for high-impact teaching practices, equity and inclusion, and digital teaching and learning.

- b) The learning management system

Loyola uses the Moodle learning management system and has a fully staffed technology center. Support includes a help line for faculty, several Moodle specialists, and Moodle training workshops to help faculty use Moodle effectively. The institution also provides an Office of Digital Teaching & Learning that provides additional support and training, including support and training for face-to-face courses that supplement learning with digitally enhanced support.

- c) Evidenced-based best practices for distance education, if distance education is offered.

The program is not a distance education program. However, the Office of Digital Teaching and Learning instructional designers are available to develop on-line classes. Loyola as a whole

Environmental Science

follows quality assurance standards for online education programs including adhering to C-RAC guidelines.

J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12).

1. Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program.

The Loyola-Notre Dame Library (LNDL) staff reviewed the proposed program and affirmed the library has adequate resources to support the proposed program, providing a large collection of resources for students. The staff provided a list of existing and recommended resources for the Environmental Science bachelor's program to help students gain greater understanding within their chosen concentration. The expenses for the recommended resources have been incorporated in the program expenditures budget table in Appendix F.

Existing costs will be supported by Loyola College of Arts and Sciences and the Office of Academic Affairs. The president's signature on the Commission's Proposal Cover Sheet indicates his support for the library resource to meet the program's needs.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13)

1. Provide an assurance that physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences.

Loyola currently possesses the appropriate instructional resources and faculty offices to support the initiation of the proposed program. The University maintains several programs that include lab space and plans for renovations for new lab space in the near future. The new proposed courses require minimal resources, and no change in need for existing facilities, equipment, or staff. The program can be implemented with the current resources in place at our institution. While the University has the faculty resources to implement the program, to allow for diversity of scientific expertise, we will hire one full-time tenure track environmental science faculty supported by the recently awarded Clare Boothe Luce grant. This faculty member will teach courses in environmental science and either chemistry, physics, or mathematics and establish an environmental science research program. We have also budgeted for the potential hire of an additional tenure-track faculty in environmental science in year 3 of the program should enrollment numbers indicate the need for additional faculty resources. The president's signature on the proposal coversheet indicates his support for the proposal and the adequacy of infrastructure, and instructional needs for the program.

Environmental Science

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:
 - a) An institutional electronic mailing system, and
 - b) A learning management system that provides the necessary technological support for distance education

The proposed program is not a distance education program. Regardless of program delivery mode, students are provided with an electronic mailing system and other technologies listed above in section I, upon matriculation. The institution has several computer labs and utilizes Moodle as the learning management system. The Office of Technology Services provides technical support for all student email accounts and for those using the learning management system.

L. Adequacy of Financial Resources with Documentation (as outlined in COMAR 13B.02.03.14)

1. Complete **Table 1: Resources and Narrative Rationale**. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each resource category. If resources have been or will be reallocated to support the proposed program, briefly discuss the sources of those funds.

See the Resources Table in Appendix E: Program Resources

Loyola University Maryland will provide the resources required to support the proposed program. Revenue from the program is expected to exceed expenses within the first year of the program's start with modest increases in revenue projected. The revenue projections are overall positive for the first 5 years of the program, with a slight deficit for the hiring of a new tenure track science faculty in year 3. This is due to the need for startup funding and laboratory renovations, however as the University is currently initiating a multi-million-dollar renovation of existing science facilities, the expenses for renovations may be significantly lower than our current estimates.

2. Complete **Table 2: Program Expenditures and Narrative Rationale**. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each expenditure category.

See the Expenditure Table in Appendix F: Program Expenditures

Expenditures are limited for implementation of the program. Per course faculty are included in the calculation to cover specialized courses within the program. Additionally, a lab manager and administrative support are calculated into the projected expenses as well as library resources. Minimal technical equipment will be required as this program builds off the already existing undergraduate program resources. Costs are therefore limited as many of the courses within the proposed program will be taught by existing University faculty. Program expenditures do not outpace projected revenue with the exception of year three where renovations to labs are

Environmental Science

expected. The division and institution as a whole will assist with the expected deficit in the program for Year 3.

M. Adequacy of Provisions for Evaluation of Program (as outlined in COMAR 13B.02.03.15).

1. Discuss procedures for evaluating courses, faculty and student learning outcomes.

Loyola University Maryland utilizes several mechanisms for evaluating courses, including student course evaluation, faculty peer evaluations, and faculty annual updates. The latter require faculty to perform self-evaluation of courses and teaching effectiveness, and to provide evidence of achieving student learner outcomes. In turn, all these assessment vehicles are evaluated by the department chair and dean. In the case of Loyola's proposed Environmental Science program, a review will be performed annually by the director of environmental science and the Associate Dean for the Natural and Applied Sciences.

2. Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.

The results of the assessment will be used for continual improvement of the program. Reports will be completed regularly and will include measures of student achievement of the program learning outcomes. The reports, an assessment cycle, and the curricular map will be recorded in a centralized software system used university wide. Institutional evaluation will occur in accordance with the University's and Middle State's accreditation timelines. The cost-effectiveness of the program will be reviewed annually by the Dean.

Each program at Loyola is required to submit an annual report, which includes progress towards previous year's goals and a complete assessment report. The reports are evaluated by the Dean's office annually, and the Dean meets with the program director each year to discuss the program's progress. Programs also engage in academic program review on a seven-year cycle at Loyola, and assessment of the Environmental Science program will be overseen by the associate dean of natural and applied sciences every 7 years.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR 13B.02.03.05).

1. Discuss how the proposed program addresses minority student access & success, and the institution's cultural diversity goals and initiatives.

Loyola University Maryland has a strategic focus on enhancing equity and inclusion for the university community. The university is committed, through its mission and core values, to creating a community that embraces and celebrates the inherent value and dignity of each person. The strategic plan goal to enhance equity and inclusion guides faculty and administrators' work toward promoting inclusive academic excellence. Specifically, teaching practices identified by

Environmental Science

AAC&U as highly impactful for the success of all students are being incorporated more fully in academic and cocurricular programs across the university. The provost has invested in related professional development by funding cohorts of faculty fellows to explore, employ, disseminate, and support high-impact teaching strategies. Faculty Fellows for High-Impact Practices (HIPs) are represented in all three schools, including the Loyola College of Arts and Sciences. Following a similar model, a cohort for Equity & Inclusion Fellows and a cohort for Digital Teaching and Learning has been established.

Furthermore, a variety of studies have indicated that internships are key to improving a college student's return on investment and minimizing underemployment. This is especially true for students of color.¹⁶

The Global Green Skills Report 2023 and the Skills for a Greener Future report from the International Labour Organization provides new data on green skills and jobs to help transition the global workforce to a green economy future.^{17, 18} By requiring internships or other authentic experiences, this proposed major will provide students from diverse backgrounds with the tools, mentors, and skills to discern their path and to embark upon a successful career.

O. Relationship to Low Productivity Programs Identified by the Commission:

1. If the proposed program is directly related to an identified low productivity program, discuss how the fiscal resources (including faculty, administration, library resources and general operating expenses) may be redistributed to this program.

This program is not a low productivity program.

P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.

Loyola University Maryland is approved to offer distance education and abides by C-RAC Guidelines, but this program is not a distance education program.

2. Provide assurance and any appropriate evidence that the institution complies with the C-RAC guidelines, particularly as it relates to the proposed program.

Loyola University Maryland is approved to offer distance education and abides by C-RAC Guidelines, but this program is not a distance education program.

¹⁶Racial Disproportionalities Exist in Terms of Intern Representation. Default. <https://www.naceweb.org/diversity-equity-and-inclusion/individuals-with-disabilities/ready-willing-but-still-underemployed/bf4d6e46-4f48-41b4-b72c-9f924bec31f9> (accessed 2024-03-07).

¹⁷ Global Green Skills Report 2023. LinkedIn Economic Graph. <https://economicgraph.linkedin.com/research/global-green-skills-report> (accessed 2024-03-21).

¹⁸ Skills for a Greener Future: A Global View; Strietska-Illina, O., Mahmud, T., Eds.; International Labour Organization, 2019.

Environmental Science

Appendix A: Environmental Science Program Outcomes Map

Environmental Science BS Learning Outcomes Alignment Map

Instructions: Use the key below

Environmental Studies (BA) Learning Outcomes	Alignment to Loyola Undergraduate Learning Aims	Operational Details	Courses
PLO #1. Environmental Systems. Analyze and describe the dynamics of Earth's environmental systems, evaluate human-environmental system interactions across different temporal and spatial scales, and apply interdisciplinary knowledge from natural and applied sciences.	Intellectual Excellence 1; Intellectual Excellence 2; Intellectual Excellence 3; Intellectual Excellence 4	We interpret this as courses in environmental science and natural and applied sciences	(I) Care for Our Common Home: Earth System; (R) Environmental Science; (R) Natural History Course; (R) Environmental Science Elective(s); (R) Natural & Applied Sciences intro sequence; (M) Integral Ecology Capstone
PLO #2. Environmental, Social, & Political Systems. Critically evaluate the relationships between humans and nature, articulate the roles of cultural, socio-economic, political, and ethical factors in environmental processes, and assess environmental justice implications.	Intellectual Excellence 1; Intellectual Excellence 2; Intellectual Excellence 3; Intellectual Excellence 4; Promotion of Justice 1; Promotion of Justice 2; Promotion of Justice 3; Diversity 3; Diversity 4	We interpret this as courses in social sciences and humanities.	(I) Care for Our Common Home: Society & Policy; (R) Introduction to Integral Ecology; (R) Environmental Society & Policy Elective(s); (R) Environmental Philosophy elective(s); (M) Environmental Ethics elective(s); (M) Integral Ecology Capstone
PLO #3. Critical Understanding and Interpretation. Employ moral and ethical frameworks alongside quantitative analysis to construct and critically assess arguments, and synthesize diverse sources of information using established qualitative and quantitative methodologies.	Critical Understanding 1; Critical Understanding 2; Critical Understanding 3; Critical Understanding 4; Critical Understanding 5; Critical Understanding 6; Critical Understanding 7, Intellectual Excellence 3; Intellectual Excellence 4	We interpret this as courses in philosophy, theology, and some environmental science courses.	(I) Care for Our Common Home: Earth System; (I) Care for Our Common Home: Society & Policy; (I) Introduction to Integral Ecology; (R) Environmental Society & Policy Elective(s); (R) Environmental Philosophy elective(s); (M) Eloquencia Perfecta elective; (M) Environmental Ethics elective(s); (M) Integral Ecology Capstone
PLO #4. Communication. Prepare and deliver clear, well-structured communications that convey the complexities of environmental issues and justice, suitable for academic, policy, and public audiences, as evidenced by presentations, reports, and advocacy	Eloquencia Perfecta 1; Eloquencia Perfecta 2; Diversity 4; Promotion of Justice 2; Promotion of Justice 3	We consider this outcome as being incorporated across our curriculum as well as focused work in writing and communication courses.	(I) Care for Our Common Home: Earth System; (I) Care for Our Common Home: Society & Policy; (R) Introduction to Integral Ecology; (M) Eloquencia Perfecta elective; (M) Integral Ecology Capstone
PLO #5. Participatory Action. Design, advocate for, and, when appropriate, implement equitable and just solutions to environmental challenges, demonstrating an understanding of the complex interplay between environmental, social, cultural, and ethical factors, with consideration of their systematic impacts.	Intellectual Excellence 2; Intellectual Excellence 3; Critical Understanding 2; Critical Understanding 3; Critical Understanding 4; Promotion of Justice 1; Promotion of Justice 2; Promotion of Justice 3; Diversity 1; Diversity 2; Diversity 3; Diversity 4;	We consider this outcome as incorporated at the introductory and reinforcement level in many courses followed by focused work in the experiential and capstone courses.	(I) Foundation Courses & elective; (R) Environmental Studies Experience; (M) Integral Ecology Capstone

Key - Loyola University Maryland Undergraduate Learning Aims	
Undergraduate Learning Aim "Code"	Undergraduate Learning Aim Description
Intellectual Excellence 1	Appreciation of and passion for intellectual endeavor and the life of the mind
Intellectual Excellence 2	Appreciation of and grounding in the liberal arts and sciences
Intellectual Excellence 3	Excellence in a discipline, including understanding of the relationship between one's discipline and other disciplines; understanding the interconnectedness of all knowledge
Intellectual Excellence 4	Habits of intellectual curiosity, honesty, humility, and persistence
Critical Understanding 1	The ability to evaluate a claim based on documentation, plausibility, and logical coherence
Critical Understanding 2	The ability to analyze and solve problems using appropriate tools
Critical Understanding 3	The ability to make sound judgments in complex and changing environments
Critical Understanding 4	Freedom from narrow, solipsistic, or parochial thinking
Critical Understanding 5	The ability to use mathematical concepts and procedures competently, and to evaluate claims made in numeric terms
Critical Understanding 6	The ability to find and assess data about a given topic using general repositories of information, both printed and electronic
Critical Understanding 7	The ability to use information technology in research and problem solving, with an appreciation of its advantages and limitations
Eloquencia Perfecta 1	The ability to use speech and writing effectively, logically, gracefully, persuasively, and responsibly
Eloquencia Perfecta 2	Critical understanding of and competence in a broad range of communications media
Eloquencia Perfecta 3	Competence in a language other than one's own
Aesthetics 1	An appreciation of beauty, both natural and man-made
Aesthetics 2	A cultivated response to the arts, and the ability to express oneself about aesthetic experience
Leadership 1	An understanding of one's strengths and capabilities as a leader and the responsibility one has to use leadership strengths for the common good
Leadership 2	A willingness to act as an agent for positive change, informed by a sense of responsibility to the larger community
Faith & Mission 1	An understanding of the mission of the Catholic university as an institution dedicated to exploring the intersection of faith and reason, and experience and competence in exploring that intersection
Faith & Mission 2	An understanding of the mission of the Society of Jesus and of the religious sisters of Mercy, especially of what it means to teach, learn, lead, and serve "for the greater glory of God"

Environmental Science

Faith & Mission 3	A habit of thoughtful, prayerful, and responsible discernment of the voice of God in daily life; a mature faith
Faith & Mission 4	Habits of reflection in solitude and in community
Faith & Mission 5	A commitment to put faith into action
Promotion of Justice 1	An appreciation of the great moral issues of our time: the sanctity of human life, poverty, racism, genocide, war and peace, religious tolerance and intolerance, the defense of human rights, and the environmental impact of human activity
Promotion of Justice 2	Commitment to promote justice for all, based on a respect for the dignity and sanctity of human life
Promotion of Justice 3	Commitment to and solidarity with persons who are materially poor or otherwise disadvantaged
Diversity 1	Recognition of the inherent value and dignity of each person, and therefore an awareness of, sensitivity toward, and respect for the differences of race, gender, ethnicity, national origin, culture, sexual orientation, religion, age, and disabilities
Diversity 2	Awareness of the structural sources, consequences, and responsibilities of privilege
Diversity 3	Awareness of the global context of citizenship and an informed sensitivity to the experiences of peoples outside of the United States
Diversity 4	Awareness of the multiplicity of perspectives that bear on the human experience, and the importance of historical, global, and cultural context in determining the way we see the world
Wellness 1	Attentiveness to development of the whole person—mind, body, and spirit
Wellness 2	Ability to balance and integrate care for self and care for others
Wellness 3	Understanding the importance of productive and responsible use of leisure time
Wellness 4	Freedom from addictive behaviors

Environmental Science

Appendix A.1 - Environmental Science Table: Course to Program Learning Outcomes Alignment

Learning Outcomes	ENV 116	ENV 114	ENV 210	Ethics	EP	Env Hum	EnvSP	EnvSc	Nat App	Env 496	ENV 410
PLO #1.		I						R	I & R	M	M
PLO #2.	I		R	M		R					M
PLO #3.	I	I	R	M	M						M
PLO #4.	I	I	R		M		M				M
PLO #5.	I	I	I	R	R	R	R	R		R	M

KEY: I = Introduced, R = Reinforced, M = Mastery

Course Key

ENV 116 Care for our Common Home: Society & Policy

ENV 114 Care for our Common Home: Earth System

ENV 210 Introduction to Integral Ecology

Environmental Ethics course

Comm – Environmental Communication Course

EnvHum - Environmental Humanities Electives

EnvSP - Environmental, Society & Policy Electives

EnvSc - Environmental Science Electives

Environmental Ethics course

ENV 496 - Environmental Studies Experience

ENV 401 Integral Ecology Capstone

NatApp - Natural & Applied Science intro sequence

Environmental Science

Appendix B: Environmental Science Courses and Descriptions

Environmental Science Courses

Course Number	Course Title	Credits	Course Description
BL 150	Foundations of Biology I	3	An examination of the molecular and cellular basis of life, specifically how cell structure determines cell function, thereby enabling cells to adapt to their environment. Topics include chemical bonding, macromolecules, genome structure, cell structure and replication, metabolism and cellular energetics, cellular homeostasis, and cell communication.
BL 151	Foundations of Biology I Lab	1	An introduction to laboratory work at the cellular and molecular level, in which students demonstrate the ability to use the scientific method, design of experiments, perform laboratory techniques such as pipetting and microscopy, express and interpret data in graphs and tables, perform scientific calculations and statistics, and work in diverse teams.
BL 152	Foundations of Biology II	3	An introduction to organismal structure and function, including how and why cells are organized into tissues, organs, and organ systems, transmission and expression of genetic information, the role of positive and negative feedback in maintaining homeostasis, and how organisms use different strategies to solve problems such as reproduction, repair and regeneration, response to the environment, transport of materials, and control via cellular communication. <i>Prerequisites BL 150, BL 151</i>
BL 153	Foundations of Biology II Lab	1	A continued introduction to laboratory work at the organismal level, in which students demonstrate proper dissection techniques, express and interpret data in graphs and tables, perform scientific calculations and statistics, design, conduct, and adapt experiments and protocols, and work in diverse teams. <i>Prerequisites BL 150, BL 151</i>
BL 154	Foundations of Biology III	3	An introduction to ecology, evolution, and population biology including the relationships among organisms, responses to stress, the mechanisms of genetic change and maintenance of diversity, mechanisms of evolution and speciation, biogeography, energy flow through ecosystems and resource allocation, food webs and ecosystem services, and biogeochemical cycles. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 155	Foundations of Biology III Lab	1	An intermediate lab course in which students conduct a long-term research project that requires: responsible use of living materials, revision and adaptation, expression and interpretation of data in

Environmental Science

Course Number	Course Title	Credits	Course Description
			<p>graphs and tables, the completion of scientific calculations and statistics, and communication of results. Students also engage in computational analysis, modeling, and simulation of complex processes, discuss current topics in biology using evidence-based arguments, and explore sub-fields and career options in biology.</p> <p><i>Preequisites BL 150, BL 151, BL 152, BL 153</i></p>
BL 276/SC 276	Human Health and the Environment	3	<p>What does Lyme disease have to do with climate change? Why did children lose millions of IQ points to leaded gasoline and paint? Why do so many children in Baltimore have asthma? Answers may be found in this exploration of the bidirectional relationship between our health and the health of our homes, communities, food, air, waterways and climate. Study of toxicology, risk assessment, prevention, environmental justice, history, and policy will provide framework for understanding effects of environmental exposures. Examples of how major exposures such as air toxins are managed in Baltimore and Maryland lend context and relevance to class discussions. Finally, examples of environmental impacts on children, the most vulnerable population group will emphasize a major course theme: a multidisciplinary approach is necessary to guarantee the health of future generations and the planet. <i>Prerequisite: BL 111 or BL 154 or BL 201 or CH 114; or one SC 100-level course; or written permission of the environmental and sustainability studies minor director.</i></p>
BL 290	Insect Biology	3	<p>Provides an introduction to the spectacular diversity of insects and their behavior, ecology, morphology, and physiology. The course emphasizes major innovations in insect evolution as well as emerging research on current threats to insect diversity such as climate change. The impact of insects on humans, including disease, pollination services, and more are also examined. Course content is split between lectures and labs, with labs focused on developing insect identification skills. <i>Prerequisites BL 150, BL 151, BL 152, BL 153, BL 154, BL 155</i></p>
BL 311	Research Methods: Plant Science	3	<p>A laboratory only course where students gain hands-on understanding of the importance of plants to humans by exploring interactions within agricultural, urban, and natural ecosystems. The course emphasizes skills that integrate practical knowledge of plant science techniques and more universally applicable scientific skills. Laboratory topics include plant identification, plant propagation (including tissue culture), agricultural and urban ecology, and plant secondary compound production (including interactions with bacteria, fungi, animals, and humans). Students conduct research on plant interactions with abiotic factors, with a strong emphasis on experimental design, scientific writing, and data analysis.</p> <p><i>Prerequisites BL 150, BL 151, BL 152, BL 153</i></p>

Environmental Science

Course Number	Course Title	Credits	Course Description
BL 346	Plant-Animal Interactions	3	Interactions between plants and animals may strongly influence their evolution and ecology. These interactions are arguably the most important forces structuring ecological communities. Students explore the predominant interactions between plants and animals (e.g., pollination, herbivory, seed dispersal) using evolutionary and ecological approaches. The ecological conditions that favor certain types of interactions and the (co)evolution of interactions are emphasized. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 349	Biology of Mammals	3	Examines the diversity found within the class Mammalia to gain an understanding of the evolution, physiology, and ecology of these animals. An examination of the conservation problems of this group is included. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 350	Biology of Mammals with Lab	3	The diversity found within the class Mammalia is examined to gain an understanding of the evolution, physiology, and ecology of these animals. An examination of the conservation problems of this group is included. Students examine the distinctive characteristics of mammals, both in the lab and through field study of natural populations. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 364	Insect Biology with Lab	5	Provides an introduction to the spectacular diversity of insects and their behavior, ecology, morphology, and physiology. The course emphasizes major innovations in insect evolution as well as emerging research on current threats to insect diversity such as climate change. The impact of insects on humans, including disease, pollination services, and more are also examined. The lab focuses on insect collection, preservation, and identification skills. Students learn to distinguish a broad array of insects and have the opportunity to create their own insect collections through field trips and in-class work. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 380	Aquatic Ecology	5	Provides an introduction to aquatic ecosystems, with an emphasis on those found in the mid-Atlantic. There is a particular focus on the interactions between aquatic organisms and their environments, as well as the impacts of humans on these ecosystems. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 390	Conservation Biology	3	A comprehensive survey of the theoretical background and current practices in conservation biology. Students examine local and global threats to biological diversity; the measure and value of biological diversity; conservation strategies including the design and management of protected areas, captive breeding, reintroduction programs, and associated legislation; and ethical and moral responsibilities of our society as it interacts with nature and other nations. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 436	Evolution	3	An examination of the evidence for Darwin's theory of evolution by natural selection. Students study the details of the process of evolution from several perspectives including population genetics, evolutionary ecology, and macroevolution. topics include genome

Environmental Science

Course Number	Course Title	Credits	Course Description
			evolution, adaptation, speciation, and extinction. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 445	Conservation and the Tree of Life	3	The field of conservation biology is changing rapidly, with evolutionary principles of growing importance in the preservation of biodiversity. Students explore the greatest threats to biodiversity and examine the biology of threatened and endangered species. The Tree of Life is examined along with the processes that have shaped the last 4.5 billion years of life on Earth. Learn how evolutionary relationships and phylogenetic diversity are used to inform conservation decisions when there is limited time and resources, allowing biologists to maximize the preservation and protection of Earth's biodiversity. Students evaluate, present, and discuss primary literature. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
BL 471	Seminar: Special Topics in Ecology, Evolution, and Diversity	3	An examination of current topics in ecology, evolution, and diversity with an emphasis on primary literature. Students lead group discussions and/or make oral presentations. <i>Prerequisites BL 150, BL 151, BL 152, BL 153</i>
CM 385	Special Topics	3	An upper-level course in communication study. <i>Topic announced when course is offered.</i>
CH 101	General Chemistry I	3	Basic atomic structure, periodic table, chemical equations, gases, liquids, solids, electrolysis, properties of elements and compounds, rates and mechanisms of reactions.
CH 102	General Chemistry II	3	A continuation of CH101. <i>Prerequisite CH 101</i>
CH 105	General Chemistry I Lab	1	An introduction to the laboratory study of the physical and chemical properties of matter; the principles and applications of gravimetric, volumetric chemical, and qualitative analysis.
CH 106	General Chemistry II Lab	1	A continuation of CH105. <i>Prerequisite CH 105</i>
CH 201	Quantitative Analysis	4	An investigation into techniques used to determine chemical composition. Includes application of statistical analysis to chemical systems and emphasizes chemical equilibrium. Provides a foundation for advanced level courses in physical chemistry, instrumental analysis, and laboratory techniques. <i>Prerequisite: At least a C or better in CH 102.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
CH 311	Physical Chemistry I	3	A detailed examination and analysis of kinetics and the laws of classical thermodynamics with applications to the properties of gases, liquids, and solids, as well as to solutions, phase, and chemical equilibria. <i>Prerequisite: CH 102 (C or better); MA 251 or MA 252. Concurrent Requisite: CH 315.</i>
CH 315	Physical Chemistry Lab I	1	Principles of experimental physical chemistry and introduction of techniques and instruments used in modern chemical research. Emphasis is placed on interpreting results, critical thinking, and writing formal reports. <i>Concurrent Requisite: CH 311.</i>
CH 410	Instrumental Methods	3	Principles and applications of analytical instrumentation. An introduction to spectroscopic, chromatographic, and electrochemical techniques. <i>Prerequisite: CH 201, CH 311, CH 315. At least a C or better in CH 311. Concurrent Requisite: CH 411.</i>
CH 411	Instrumental Methods Lab	1	Covers principles and applications of some spectroscopic and chromatographic techniques. Applications of chemometrics. <i>Concurrent Requisite: CH 410.</i>
EC 360	Environmental Economics	3	Examines contemporary issues of environmental quality, natural resource allocation, and conservation from the economic perspective. Students develop an understanding of the history of the environmental movement and learn to analyze environmental issues using economic tools. Topics include benefit-cost analysis, property rights, incentive-based pollution control policies, and a review of government regulatory performance. Students delve deeper into a specific area by conducting original research and writing a paper on a topic they develop in conjunction with the professor. <i>Prerequisite EC 102, EC 103</i>
EG 301	Statics	3	Engineering mechanics treatment of rigid bodies at rest or moving at constant velocity. Covers force vectors, equilibrium of a particle, force system resultants, equilibrium of a rigid body, simple structural analysis, internal forces, friction, center of gravity and centroid, and moments of inertia. <i>Prerequisite: MA 251, PH 201.</i>
EG 380	Thermodynamics	3	Examines the relationships among heat, work, and various other forms of energy in engineering applications. Covers thermodynamic systems, property evaluation, phase changes, equations of state, the first and second laws of thermodynamics, the Carnot cycle, entropy, and power and refrigeration cycles. <i>Prerequisite: MA 251, PH 201.</i>
EG 421	Fluid Mechanics	3	Examines fluids at rest and in motion in engineering applications. Covers fluid statics; kinematics and dynamics of inviscid and viscous fluid flows; integral continuity, momentum, and energy analyses; boundary layers; turbulence; scale modeling and similitude; conduit flows; simple turbomachinery; and lift and drag. <i>Prerequisite: EG 301, MA 252.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
EN 101	The Art of Reading	3	Cultivates reading, writing, thinking, and oral communication skills by investigating the kinds of attention that literary texts, in multiple genres, ask of readers. The course is writing intensive. Topics reflect the range of faculty expertise and interests and are selected to invite student curiosity.
ENV 114	Care for Our Common Home: Earth System	3	In this course, students from all disciplines explore how humans have changed the planet resulting in a new geologic age known as the Anthropocene. Using systems theory, students will learn about the Earth system including the cycling of energy and matter through these systems. Topics covered will include ecology and biodiversity, the climate system, and planetary boundaries. Students will explore the relationship between these systems and human activity and the resilience of ecologic and social systems. Additional topics covered in this course will include major environmental issues of the time such as climate change, biodiversity loss, pollution, and water availability. During this course, students will complete project in which they explore environmental justice with an environmental issue. The form of this project and the potential topics will be determined by the instructor.
ENV 116	Care for our Common Home: Society & Policy	3	In this course, students from all disciplines explore how human society interacts with the natural world. Students will survey current environmental policies. Concepts of environmental history, racism, and justice will be introduced. Students will gain a background in environmental economic theory, including markets, externalities, non-renewable resources, and the commons. They will also learn critiques of this approach, discussing ecological economics and envisioning alternate economic conceptions of a flourishing society. Finally, students will learn basic environmental accounting as well as critiques of current systems.
ENV 210	Introduction to Integral Ecology	3	Integral ecology is a term used to describe how humans may justly care for Earth, our common home. In this course students will explore the concept of integral ecology through a variety of humanistic disciplines (e.g. literature, philosophy, theology, history, arts). Through these disciplines, students will consider the interrelated ways the “societal” and the “natural” comprise our common home. Topics covered will include conceptions of nature, aesthetics, justice, and the consequences of the history of Western colonialism. <i>Prerequisites ENV 114, ENV 116</i>
ENV 320	Environmental Science with Analysis	4	Expands upon the study of natural systems, human impacts, and the sustainability of the Earth system using the processes and properties of matter and energy to understand the biogeochemical cycles of the Earth system. Topics covered include the climate system; the quality of water, air, and soil; and how humans are altering the Earth system. Using a hands-on learning in a laboratory and outdoor setting, students collect and analyze environmental samples and are

Environmental Science

Course Number	Course Title	Credits	Course Description
			introduced to methods of statistical, graphical, and modeling analyses in environmental science. <i>Prerequisite: ENV 114 or BL 154; MA 109 or MA 151 or MA 251 or ST 110 or ST 210 or ST 265.</i>
ENV 224	Ecological Dynamics of the MidAtlantic	4	This course spans the realms of ecology, evolution, population biology, and community ecology, providing students with a comprehensive framework for understanding of the mechanisms shaping Earth's biodiversity. The course will be constructed to study the fundamental principles of ecology, exploring the interactions between organisms and their environments. Students will gain insights into how species adapt and evolve over time, shaping the biodiversity observed in different environments. The lab will explore these topics using urban, Chesapeake Bay, and other mid-Atlantic biomes. Students will also explore the factors that shape the size and distribution of populations through the introduction of models and real-world examples. <i>Prerequisite: ENV 114 or BL 111 or BL 154</i>
ENV 410	Integral Ecology Capstone	3	In this course, environmental studies and sciences students will draw upon multiple disciplines to engage in discussion about their experiences and learning. Students will integrate and apply what they have learned in other courses to assess challenges, develop strategies, and communicate effectively for healing Earth. Students will learn from their peers and engage with communities beyond the classroom. <i>Pre or co-requisite ENV 496 and Environmental Studies or Environmental Science major</i>
ENV 496	Environmental Studies Experience	3	A capstone experience in the environmental and sustainability studies minor, in which a student arranges an internship, independent study, or research experience with a faculty sponsor to engage in an in-depth exploration of a topic associated with environmental or sustainability issues.
HS 100	Encountering the Past	3	Why does history matter? This course explores why the study of the past is essential for understanding our present. Through the lens of a single historical topic that varies by instructor, students are introduced to what it means to think like a historian and weave compelling stories. Along the way, students learn to ask critical questions, to evaluate evidence, to make persuasive arguments, and to write clearly and cogently. The course introduces students to how and why histories are produced, but more than that, it sets out to provide new ways of thinking about the human experience and about our place in the world today.

Environmental Science

Course Number	Course Title	Credits	Course Description
HS 211	American Environmental History	3	Explores the changing relationship between people and the natural world from the colonial period to the present in the region that became the United States. The physical environment shaped the development of American culture even as different groups of Americans transformed that environment. Topics include Native American ideas about the natural world, European transformations of the environment, the rise of capitalism and its environmental consequences, water the West, the development of an environmental movement, and current debates about the natural world and our place in it. <i>Prerequisite: HS 100.</i>
HS 222	Global Environmental History	3	Designed to provide a nuanced understanding of environmental history from a global perspective. Environmental historians explore the symbiotic relationship between humans and the natural world as one of many factors that have shaped the course of human events. Through a combination of lectures, discussions, and analysis of primary and secondary sources, this course explores the ways in which humans have shaped their environments and have, in turn, been shaped by their environments for several millennia. Temporally, the course covers the time period between the moment that humans learned to control fire to contemporary debates surrounding the human role in global climate change. Topics covered include water management, diseases, climate change, sustainability, and transitions between different energy regimes, among other topics. <i>Prerequisite: HS 100.</i>
HS 314	Disasters in American History	3	Examines American history through the lens of disasters. Disasters offer a unique perspective from which to examine social, political, and economic structures and institutions. Explores disasters at various points in U.S. history in an effort to understand how these calamities have affected events; how the impact and understanding of disasters have changed over time; and ultimately, to provide a window onto the changing nature of American society over the past 200 years. <i>Prerequisite: HS 100.</i>
HS 490	Seminar: Environmental History in Latin America	3	Explores how humans and the environment have interacted over time in the Americas from pre-Columbian populations to the recent past. The study of historical change in human-nature interactions reveals both how people have affected the environment and how nature has shaped human actions. Because of the wide range of research methods and topics it embraces, the burgeoning field of Environmental History is both compelling and challenging. This course examines diverse views of nature, ecological effects of shifting agricultural and consumption patterns, the impact of technological advances, political ecology, conservation, and environmental movements. In part, this course seeks to define what constitutes "Environmental History" and to determine if there is a coherent set of problems and issues that this emergent field addresses. <i>Prerequisite: HS 100.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
LW 411	Environmental Law and Policy	3	Surveys the statutes, regulations, and common law principles and policies that address a wide range of environmental problems. Also compares different approaches to resolving environmental problems, e.g., traditional regulations, pollution prevention, and ecological restoration.
MA 251	Calculus I	4	A rigorous approach to Calculus for all majors. Topics include limits, definition, interpretation, and applications of the derivative; differentiation rules; antiderivatives; definition of definite and indefinite integrals; and the Fundamental Theorem of Calculus. <i>Prerequisite: MA 109 or a score of 56 or better on Part II of the Math Placement Test or a score of 76 or higher on ALEKS or one year of high school calculus.</i>
MA 252	Calculus II	4	A continuation of MA 251. Techniques and applications of integration; improper integrals; parametric equations and polar coordinates; sequences and series. <i>Prerequisite: At least a C- or better in MA 251.</i>
MG 222	Introduction to Sustainable Business	3	Introduces sustainable business principles and methods, as well as examples of how they are used in real-world situations. Students learn how to integrate sustainable business into organizational management by investigating various business functions such as marketing, supply chain management, finance, accounting, political strategy, IT management, and human resource management. In addition, the course explores the role of ethical decision-making in sustainable business practices and the importance of corporate social responsibility. Students also delve into the concepts and theories of stakeholder engagement and materiality and how it can be effectively implemented in sustainable business strategies. Throughout the course, students have the opportunity to analyze case studies of successful sustainable businesses and apply the principles learned to their own future careers in business and management.
MG 333	Global Strategy for Sustainability	3	Examines how corporations deliver value to people, planet, and profit while creating and sustaining competitive advantage. Students critically assess the relationship between environmental, social, and governance (ESG) practices and the company's financial performance, contingent on time-horizon (short-term vs. long-term), industry, region, and cultural context. Additionally, students learn and apply managing tools, industry standards, and metrics to plan and evaluate sustainability strategies. <i>Prerequisite: MG 222, IB 282 or BH 282.</i>
MG 433	Environmental, Social, and Governance Reporting	3	Provides an understanding of the key concepts and processes related to the management, measurement, and reporting of environmental, social, and governance (ESG) issues that local and global companies face. The course helps students develop their knowledge around: identifying and prioritizing material ESG issues; approaches to addressing ESG risks and opportunities; criteria for measuring ESG performance; and reporting frameworks and standards for corporate sustainability. <i>Prerequisite: MG 201 or BH 201; IB 282 or BH 282.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
PH 125	Practical Meteorology	3	Teaches students the science behind what causes weather. Course content highlights cloud types, storm systems, weather instruments, and foundations of forecasting. Throughout the course, students analyze the most up-to-date computer models, radar, satellite, and forecast discussions. This course prepares students to create their own weather forecasts by understanding meteorological terminology, interpreting graphs, and forecasting models. By the end of the semester, students put their skills to the test by effectively communicating their personalized forecasts with the class.
PH 150	Energy & Environment	3	An examination of energy sources for the future: nuclear power, breeder reactors, gasoline substitutes, the future of coal, solar and geothermal sources are studied in view of the laws of thermodynamics. Studies the impact of energy use on resource conservation, water resources, air quality, waste disposal, land use.
PH 201	General Physics I	4	Designed for majors in the physical sciences. Topics include vectors, kinematics, Newton's laws and dynamics, conservation laws, rigid body equilibrium, rotational mechanics, oscillatory motion, fluid mechanics and motion in a gravitational field, and wave motion. Fundamental concepts of vector analysis and calculus are developed. <i>Concurrent Requisite: MA 251, PH 291 or written permission of the department chair.</i>
PH 202	General Physics II	4	A continuation of PH201 which includes classical electromagnetic theory and geometrical optics. <i>Prerequisite: PH 201. Concurrent Requisite: MA 252; PH 292</i>
PH 291	General Physics Lab I	1	An introduction to experimental physics stressing principles of measurement, treatment and presentation of data and error analysis with experiments taken primarily from mechanics. <i>Concurrent Requisite: PH 201.</i>
PH 292	General Physics Lab II	1	A continuation of PH291 with experiments taken from sound, wave motion, electrostatics, DC and AC circuits, and geometrical optics. Basic electronic instrumentation introduced. <i>Concurrent Requisite: PH 202.</i>
PH 307	Mathematical Methods in Physics	3	Development of the mathematical methods needed to describe waves and vector fields. Topics include power series, complex numbers, linear algebra, Fourier series, and vector calculus. Physical examples cover harmonic oscillations, coupled oscillations, and traveling waves. <i>Prerequisite: MA 252.</i>
PH 317	Thermal Physics	3	An examination of classical thermodynamic concepts including temperature, heat, entropy, free energy, and thermodynamic cycles. Also introduces the concepts of probability and statistical physics with an emphasis on the kinetic theory of gases. <i>Prerequisite: PH 201.</i>
PH 480	Advanced Topics in Physics	3	An advanced course in one or more areas of special interest. Possible topics include solid state physics, nuclear and particle physics, general relativity, astrophysics, thermal physics, statistical mechanics, advanced mechanics, optics, or computational physics.

Environmental Science

Course Number	Course Title	Credits	Course Description
PL 201	Foundations of Philosophy	3	A one semester introduction to philosophy. Three focal points are covered: the emergence and development of rational theories on the nature of reality (metaphysics); questions concerning the grounds for distinguishing between knowledge and opinion (epistemology); and the nature and status of values (ethical, aesthetic, religious, etc.). Special attention is paid to the origins of philosophy and its historical beginnings in the ancient world.
PL 232	Philosophical Perspectives: Gender and Nature	3	Examines the history of Western concepts of nature and science with particular attention to how ideas about hierarchy, gender, and violence have affected our relationship to the natural world. <i>Prerequisite: PL 201.</i>
PL 235	Philosophical Perspectives: Philosophy and Science	3	A philosophical examination of science. Explores topics such as confirmation of the scientific method, the possibility of scientific progress, and the value of scientific inquiry. <i>Prerequisite: PL 201.</i>
PL 236	Philosophical Perspectives: Environmental Philosophy	3	Explores the place of human beings within the much larger natural world and the fundamental conceptions of nature. Is nature savage, a resource for our use, or a mindless machine? Special topics may include animal consciousness, sustainability, indigenous cultures, global climate change and other ecological crises, and the effects of contemporary technologies. <i>Prerequisite: PL 201.</i>
PL 314	Environmental Ethics	3	An investigation of the relationship between human beings and the natural world, with attention to the ethical dimensions of our lifestyle and environmental policies. Students explore their obligations to the nonhuman world and to future generations. <i>Prerequisite: PL 201.</i>
PL 393	Technology and the Crisis of Nature	3	Is the human use of technology rooted in a kind of thinking or way of being? Through a reading primary of Martin Heidegger's work, students look at the dark side of technology and the devastating effects of human technical manipulation of the natural world. <i>Prerequisite: PL 201.</i>
PS 358	Global Environmental Politics	3	Why is global cooperation on climate change so difficult? What assumptions, interests, and strategies are the main obstacles to successful environmental international relations? This course analyzes environmentalism and climate change in three modules: theory, policy, and activism. Students are expected to be active participants, invest time in substantial readings, and develop an independent project with an activism component. The experience of indigenous and native peoples is at the center of this course.
PT 377	Landscape and Nature Photography	3	An intensive workshop in photographing the landscape and elements from it as an expression of personal statement. <i>Prerequisite: PT 270 or PT 300 or PT 301.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
SA 315	Landscape	3	Explores drawing and painting the landscape. Deals with naturalistic ideas, light being a primary concern. Students improve drawing and painting skills and media as they work in the classroom and at locations around the Loyola community. Slide lectures and a museum visit supplement outdoor sessions. <i>Prerequisite: SA 224 or written permission of the instructor.</i>
SA 399	Special Topics	3	An examination of a specific topic in studio art. Topic may be related to issues of medium, technique, genre, cultural, historical, or other factors.
SC 373	Sociology of Human Rights	3	Human rights are approached from a comparative historical and interdisciplinary perspective. Students learn about foundational notions of human rights as they are interpreted in accordance with various belief systems and secular humanist philosophy; the UN-based human rights regime; and contemporary challenges to the realization of human rights in the global era. Taught from a sociological perspective, this course takes a critical approach to the study and analysis of the human rights system, with special focus on contradictions, failures, and collective mobilization. <i>Prerequisite: SC 100 or SC 102 or SC 202 or SC 203.</i>
SC 374	Sociology of Development	3	The topics of political and economic development are approached from a comparative historical perspective. Students learn about the history of modern development practices; the postulates and assumptions of various theories of development; and the various criticism/critiques of development in regard to European colonialism, Cold War geopolitics, and contemporary global integration and backlashes. <i>Prerequisite: SC 100 or SC 102 or SC 202 or SC 203.</i>
SC 440	Global Sociology	3	A reading and writing intensive seminar that engages with global social theory and the writings of sociologically informed thinkers who critically analyze the processes of global connectivity, global movement, and global social change from a macro, longue durée perspective. Global social formations include the capitalist economic system that is anchored by private property relations the world over, a political system organized by and for territorially bound nation-states and in the name of a legally sanctioned citizenry, and a cultural system enamored by processes of service-driven consumerism. With a special focus on social order, social power, and social change, this course emphasizes the study of social inequality/stratification, systemic crisis, and structural adaptation. <i>Prerequisite: SC 100 or SC 102 or SC 202 or SC 203.</i>
ST 210	Introduction to Statistics	3	A non-calculus-based course covering descriptive statistics; regression model fitting; probability; normal, binomial, and sampling distributions; estimation; and hypothesis testing. <i>Prerequisite: MA 109 or a score of 48 or better on Part II of the Math Placement Test or a score of 65 or higher on ALEKS or one year of high school calculus.</i>

Environmental Science

Course Number	Course Title	Credits	Course Description
ST 265	Biostatistics	3	A non-calculus-based course covering descriptive statistics, regression model fitting, probability, distributions, estimation, and hypothesis testing. Applications are geared toward research and data analysis in biology and medicine. <i>Prerequisite: MA 109 or a score of 48 or better on Part II of the Math Placement Test or a score of 65 or higher on ALEKS or one year of high school calculus.</i>
ST 310	Statistical Computing	3	Reviews a number of statistics topics as a vehicle for introducing students to statistical computing and programming using SAS and R for graphical and statistical analysis of data. Statistics topics include graphical and numerical descriptive statistics, probability distributions, one and two sample tests and confidence intervals, simple linear regression, and chi-square tests. SAS topics include data management, manipulation, cleaning, macros, and matrix computations. Topics in R include data frames, functions, objects, flow control, input and output, matrix computations, and the use of R packages. Lastly, this course also includes an introduction to the resampling and bootstrap approaches to statistical inference. <i>Prerequisite: ST 210 or ST 265 or EC 220, or written permission of the department chair.</i>
ST 465	Experimental Research Methods	3	Concepts and techniques for experimental research including simple, logistic, and multiple regression; analysis of variance; analysis of categorical data. <i>Prerequisite: EC 220 or EG 381 or PY 292 or ST 210 or ST 265 or ST 381.</i>
TH 201	Theology Matters	3	An introduction to the Jewish and Christian scriptures, the history of Christianity, and the way these texts and traditions challenge, and are challenged by, the contemporary world.
TH 232	Food, Hunger, and the Bible	3	Investigates issues related to food and hunger in the Hebrew Bible and New Testament texts, the ways in which these biblical concepts inform a Christian theology and spirituality of food, and how these biblical concepts relate to modern ethical and social justice issues including: poverty, hunger, and food access; food production; ethical labor practices in agricultural and food industries; sustainability; ethical treatment of animals; community and hospitality, etc. Students investigate biblical principles and apply them to current issues-both local and global. <i>Prerequisite: TH 201.</i>
TH 312	Christian Environmental Ethics	3	How are human beings to value non-human creation? Possible answers are considered to this question by drawing on both Christian theological/ethical sources and contemporary environmental science. The focus is especially on: 1) how to construct an environmental ethic in light of the constant flux of nature; 2) the relationship between ecological justice and social justice; and 3) the relationship between the global economy and the biosphere. <i>Prerequisite: TH 201.</i>
TH 395	Justice, Peace, and the Integrity of Creation: A	3	Explores the ways in which justice, peace, and the integrity of creation are interrelated, and examines the challenges that this

Environmental Science

Course Number	Course Title	Credits	Course Description
	Christian Theological Inquiry		poses for ethical action. Students examine the political ecology of the contemporary global context; explore sources of Christian revelation that can help to judge this context; and begin to consider how they might more fully commit their lives to social and environmental justice. <i>Prerequisite: TH 201.</i>
WR 100	Effective Writing	3	Introduces students to the discipline of writing in the university through the critical and creative study of the contemporary essay within a rhetorical framework. Students learn to conceive an original idea, develop implications of thought, use language effectively, and conduct inquiry (including basic library research). Students develop a full writing process-planning, drafting, revising based on critical feedback from peers and instructor, and editing. Provides a foundation for both faculty and students to build upon as students move across the curriculum. <i>Required of all students.</i>
WR 301	Writing About Science	3	Students practice techniques of writing nonfiction for the general public and engage in rhetorical analysis of the representation of science in popular discourse. Students read contemporary popular nonfiction that draws upon science and learn how writers use the art of prose to contribute to scientific literacy. <i>Prerequisite: WR 100.</i>
WR 354	Writing About the Environment	3	Explores various representations of the American environment from European contact to the present in this discussion based, reading intensive course. The following questions are explored: What is nature? What is culture? Why do we partition the world as we do? What cultural myths inform American perceptions of our environment? To what extent-and to what effects-do Old World values influence contemporary perceptions of landscape and, consequently, public policy? In what ways do they influence our communities? How do our lifestyles impact the environment? What is just? What is sustainable? With a special focus on justice, the ways in which the representations of how nature continues to influence the complex relationship between Americans and their physical environment is explored. <i>Prerequisite: WR 100.</i>

Environmental Science



LOYOLA
UNIVERSITY MARYLAND

Appendix C: Program Requirements Worksheet

<i>Environmental Science (BS)</i>		
<i>Liberal Arts Core</i>	<i>Credits</i>	<i>Semester Completed</i>
1. WR 100 Effective Writing	3	
2. History 100 Encountering the Past	3	
3. History 200 Level OR English 200 Level	3	
4. EN 101 The Art of Reading	3	
5. World Language Intermediate II Level (104 level)*	3	
6. Social Science Core (ENV 116 Care for Our Common Home: Society & Policy)	3	
7. Social Science Elective	3	
8. Fine Arts (AH109, AH110, AH111, DR250, DR251, DR252, MU201, MU202, MU203, MU204, PT270, SA224 or SA227)	3	
9. Math Core (ST 210 or ST 265)	3	
10. Science Core (ENV 114 Care for Our Common Home: Global Environment)	3	
11. Math/Science Core (BL 150/151 or CH 101/105 or PH 201/202)	4	
12. PL 201 Foundations of Philosophy	3	
13. TH 201 Theology Matters	3	
14. PL 202 – 299 OR TH 202 – 299	3	
15. Environmental Ethics PL 314 (<i>If student took TH 202 – 299 for #14</i>) TH 312 (<i>If student took PL 202 – 299 for #14</i>)	3	
Diversity and Justice Courses (3)**		

*Students who place higher than the 104 level on Loyola’s world language placement exam may be exempt from the world language core requirement, pending confirmation from Loyola’s Modern Language department after a **proctored on-site** placement exam. Those students will need to complete 1 additional free elective in lieu of the world language core.

The Diversity and Justice course requirement may simultaneously fulfill a Core, Major, Minor or Elective requirement. The Diversity and Justice course may be taught in any discipline and will focus on domestic diversity, global diversity, or justice awareness. **The Diversity and Justice course must be taken at Loyola.

<i>Environmental Science</i>	<i>Environmental Science Credits</i>	<i>Semester Completed</i>
16. ENV 210 Introduction to Integral Ecology	3	
17. Communicating about the Environment Elective (WR 301 or WR 354 or CM 385 or SA 399)	3	
18. ENV 224 Ecological Dynamics in the Mid-Atlantic	4	
19. ENV 320 Environmental Science with Analysis	4	
20. BL 152/153 or CH 102/106 or PH 291/292	4-5	
21. BL 150/151 or CH 101/105 or PH 201/291 or MA 251	4-5	
22. BL 152/153 or CH 102/106 or PH 202/292 or MA 252	4-5	
23. Environment, Society, & Policy Elective	3	
24. Environmental Humanities Elective	3	
25. Environmental Science Elective	3 or 4	
26. Environmental Science Elective	3 or 4	
27. Environmental Science Elective	3 or 4	
28. ENV 496 Environmental Studies Experience	3	
29. ENV 410 Integral Ecology Capstone	3	
<i>Electives</i>		<i>Semester Completed</i>
30. Free Elective	3	
31. Free Elective	3	
32. Free Elective	3	
33. Free Elective	3	
34. Free Elective	3	
35. Free Elective	3	
36. Free Elective	3	
37. Free Elective	3	
38. Free Elective	3	

Major has no limit on double counting for core or another major or minor outside of Environmental Studies or Environmental Science i.e., students may not double major or major and minor in environmental studies and environmental science.

CM 385 and SA 399 must be approved by director based on topic to fulfill this requirement.
 Students completing the biology introductory sequence should also take BL 154/155 as one of their 3 environmental science electives.
 At least 4 electives must be at the 300 or 400 level.

Environmental Science

Environmental Science Program Electives

Environmental Humanities Electives		
Choose 4 Courses from the following¹		
HS 211	American Environmental History	3
HS 222	Global Environmental History	3
HS 314	Disasters in American History	3
HS 490	Seminar: Environmental History in Latin America	3
PL 232	Philosophical Perspectives: Gender and Nature	3
PL 235	Philosophical Perspectives: Philosophy and Science	3
PL 236	Philosophical Perspectives: Environmental Philosophy	3
PL 314	Environmental Ethics	3
PL 393	Technology and the Crisis of Nature	3
PT 377	Landscape and Nature Photography	3
SA 315	Landscape	3
TH 312	Christian Environmental Ethics	3
TH 232	Food, Hunger, and the Bible	3
TH 395	Justice, Peace, and the Integrity of Creation: A Christian Theological Inquiry	3
WR 301	Writing about Science	3
WR 354	Writing about the Environment	3
Environment, Society, and Policy Electives		
Choose 1 Course from the following*		
EC 360	Environmental Economics	3
LW 411	Environmental Law and Policy	3
MG 222	Introduction to Sustainable Business	3
MG 333	Global Strategy for Sustainability	3
MG 433	Environmental, Social, and Governance Reporting	3
PS 358	Global Environmental Politics	3
SC 373	Sociology of Human Rights	3
SC 374	Sociology of Development	3
SC 440	Global Sociology	3
Environmental Science Electives		
Choose 1 Course from the following*		
BL 154/155	Foundations of Biology III	4
BL 276	Human Health and the Environment	3
BL 290	Insect Biology	3
BL 311	Research Methods: Plant Science	3
BL 346	Plant-Animal Interactions	3
BL 349	Biology of Mammals	3
BL 350	Biology of Mammals with Lab	3
BL 364	Insect Biology with Lab	5
BL 380	Aquatic Ecology	5
BL 390	Conservation Biology	3
BL 436	Evolution	3
BL 445	Conservation and the Tree of Life	3
BL 471	Seminar: Special Topics in Ecology, Evolution, and Diversity	3
CH 201	Quantitative Analysis	4
CH 311/315	Physical Chemistry I with Lab	4

Environmental Science

CH 410/411	Instrumental Methods with Lab	4
EG 301	Statics	3
EG 380	Thermodynamics	3
EG 421	Fluid Mechanics	3
PH 125	Practical Meteorology	3
PH 150	Energy & Environment	3
PH 307	Mathematical Methods in Physics	3
PH 317	Thermal Physics	3
PH 480	Advanced Topics in Physics	3
ST 310	Statistical Computing	3
ST 465	Experimental Research Methods	3

¹ At least 4 electives must be at the 300 or 400 level.

Environmental Science

Appendix D: Faculty Chart

Faculty Chart – Environmental Science

Last Name	First Name	Highest Degree	Highest Degree Field	Title/Rank	Status	Classes Taught
Couch	Brock	Ph. D	Mathematics and Science Education	Assistant Teaching Professor	Fulltime	BL 380, ENV 224, BL 155, BL 471
Derrickson	Elissa	Ph. D	Biology	Associate Professor	Fulltime	BL 152, BL 350
Ets	Hillevi	Ph. D	Pharmacology and Physiology	Assistant Teaching Professor	Fulltime	BL 151, BL 153
Garfinkel	Chloe	Ph. D	Ecology & Evolutionary Biology	Assistant Teaching Professor	Fulltime	BL 152, BL 290, ENV 224, BL 155, BL 471
Hassan	Kolaleh	Ph. D	Biology	Assistant Teaching Professor	Fulltime	BL 150, BL 151, BL 153
Kazi	Armina	Ph.D.	Physiology	Associate Professor	Fulltime	BL 151
Kendig	Derek	Ph.D.	Pharmacology and Physiology	Associate Professor	Fulltime	BL 153
Lau	Marie	M.S.	Biology	Assistant Teaching Professor	Fulltime	BL 150, BL 154
Per course instructor		Variable	Biology	Affiliate Instructor	Parttime	BL 276, BL 349, BL 350, BL 364, BL 390, BL 445
Roche	Bernadette	Ph.D.	Biology	Associate Professor	Fulltime	BL 436, BL 155, BL 346, BL 471
Scheifele	Lisa	Ph.D.	Cell/Cellular	Associate Professor	Fulltime	BL 150
Schoeffield	Andrew	Ph.D.	Microbiology	Associate Professor	Fulltime	BL 150
Tangrea	Michael	Ph.D.	Molecular and Cellular Biology	Professor	Fulltime	BL 150
Veatch-Blohm	Maren	Ph.D.	Plant Physiology	Professor	Fulltime	BL 154, BL 311, ENV 224
Albrecht	Birgit	Ph.D.	Physical & Theoretical Chemistry	Associate Professor	Fulltime	CH 102/106
Barr	Brian	Ph.D.	Biochemistry	Associate Professor	Fulltime	CH105
Dahl	Elizabeth	Ph.D.	Earth System Science	Associate Professor	Fulltime	ENV 114, ENV 220, CH 201, ENV 496, ENV 410
Hastings	Courtney	Ph.D.	Organic Chemistry	Associate Professor	Fulltime	CH 101

Environmental Science

Hendrix	John	M.S.	Organic Chemistry	Assistant Teaching Professor	Fulltime	CH 102/106
Lunsford	Kyle	Ph.D.	Analytical Chemistry	Assistant Teaching Professor	Fulltime	CH 102/106, CH 410, CH 411
McDougal	Nicola	Ph.D.	Organic Chemistry	Assistant Teaching Professor	Fulltime	CH101
Schmidt	Heather	Ph.D.	Physical Chemistry	Chemistry Lab Manager	Fulltime	CH105, CH 311, CH 315
Walsh	Joe	Ph.D.	Classics	Professor	Fulltime	HS 258
Biswas	Masudul	Ph.D.	Communication	Professor	Fulltime	CM 385
Kobell	Rona	M.A.	English, Environmental Sustainability	Affiliate Instructor	Parttime	CM385
Pascual-Ferra	Paola	Ph.D.	Communication	Associate Professor	Fulltime	CM 385
Dougherty	John	Ph.D.	Agricultural Development and Environmental Economics	Assistant Professor	Fulltime	EC360, ENV 116
Bailey	Robert	Ph. D	Mechanical Engineering	Professor	Fulltime	EG421, EG380
Kim	Hoyeon	Ph. D	Mechanical Engineering	Teaching Assistant Professor	Parttime	EG301
Carey	David	Ph. D	History	Professor	Fulltime	HS342, HS490, HS 222
Mulcahy	Matthew	Ph. D.	History	Professor	Fulltime	HS211, HS314
Part time affiliate instructor		J.D.	Law	Affiliate Instructor	Parttime	LW 411
Kang	Jinyoung	Ph. D	Management	Assistant Professor	Fulltime	MG333, MG 222, MG 433
Bertram	Alexander	M.S.	Statistics	Affiliate Instructor	Parttime	ST210
Calise	Anthony	M.S.	Statistics	Affiliate Instructor	Parttime	ST210
Chidyagwai	Prince	Ph. D	Mathematics	Associate Professor	Fulltime	MA251, MA252
Clark	Timothy	Ph.D.	Algebraic Combinatorics	Associate Professor	Fulltime	MA251, MA252
Deshpande	Neeta	M.S.	Statistics Teaching	Teaching Professor	Fulltime	ST210, ST465
Drummey	Kevin	Ph.D.	Bayesian Statistics, Mathematics Education	Assistant Teaching Professor	Fulltime	ST210
Duckworth	Ethan	Ph. D	Mathematics	Chair, Associate Professor	Fulltime	MA251, MA252
Galbraith	Michael	Ph.D.	Mathematics	Affiliate Instructor	Parttime	MA252, MA251
Georgieff	Glenn	M.S.	Mathematics	Affiliate Instructor	Parttime	MA251, MA252

Environmental Science

Knapp	Michael	Ph.D.	Number Theory	Professor	Fulltime	MA251, MA252
Lee	Bu Hyoung	Ph.D.	Statistics: Time Series Analysis	Assistant Professor	Fulltime	ST210, ST310
Oberbroeckling	Lisa	Ph.D.	Mathematics	Associate Professor	Fulltime	MA251, MA 114
Tao	Jiyuan	Ph.D.	Applied Analysis Optimization	Professor	Fulltime	MA252
Xuan	Anson	M.S.	Mathematics	Assistant Teaching Professor	Fulltime	MA251, MA252
Biss	Mavis	Ph. D	Philosophy	Associate Professor	Fulltime	PL314
Gordon	David	Ph. D	Philosophy	Assistant Teaching Professor	Fulltime	PL236
Gursozlu	Selin	Ph. D	Philosophy	Associate Professor	Fulltime	PL232
Lotfi	Sarvnaz	Ph. D	Science, Technology & Society	Affiliate Instructor	Fulltime	PL235
Page	Meghan	Ph. D	Philosophy	Associate Professor	Fulltime	PL235, PL314
Sentesy Wagner	Mark	Ph. D	Philosophy	Teaching Professor	Fulltime	PL236
Snow	Dale	Ph. D	Philosophy	Associate Professor	Fulltime	PL232, PL 377
Hanley	Catriona	Ph.D.	Philosophy	Associate Professor	Fulltime	PL 393
Erdas	Andrea	Ph. D	Physics	Chair, Professor	Fulltime	PH317, PH480
Heyer	Inge	Ph. D	Physics	Teaching Professor	Fulltime	PH291
Jones	Randall	Ph. D	Physics	Associate Professor	Fulltime	PH201
Kapilevich	Gary	Ph. D	Physics	Assistant Teaching Professor	Fulltime	PH307
Lowe	Mary	Ph. D	Physics	Professor	Fulltime	PH201
Robey	Molly	M.S.	Applied Meteorology/Communication	Assistant Teaching Professor	Fulltime	PH125, ENV114
Yong	Grace	Ph. D	Physics	Assistant Teaching Professor	Fulltime	PH291
Holc	Janine	Ph.D	Political Science	Professor	Fulltime	PS 358
Hendrick	Joshua	Ph. D	Sociology	Associate Professor	Fulltime	SC440, SC373, SC374
Castillo	Daniel	Ph. D	Theology	Associate Professor	Fulltime	TH312, ENV 210, ENV 410, TH 395
Eklund	Rebekah	Th.D.	Theology	Professor	Fulltime	TH232
Friebele	William	MFA	Studio Art	Associate Professor	Fulltime	SA399

Environmental Science

Part time affiliate instructor		Variable	Variable	Affiliate Instructor	Parttime	PT 377, SA 315, PH 150
Curtis	Tiffany	Ph.D.	English	Assistant Teaching Professor	Fulltime	WR354
Ryan	Teresa	Ph. D	Literature	Associate Professor	Fulltime	WR301, WR354, ENV 210
Satterfield	Jane	MFA	Writing	Professor	Fulltime	WR354

Environmental Science

Appendix E: Program Resources

Maryland Higher Education Commission Academic Program Proposal Resources Guidelines

Maryland Higher Education Commission

TABLE 1: PROGRAM RESOURCES

Resource Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c + g below)	\$87,960	\$202,626	\$366,384	\$585,300	\$765,952
a. Number of F/T Students	4	9	16	25	32
b. Annual Tuition/Fee Rate	\$21,990	\$22,514	\$22,899	\$23,412	\$23,936
c. Total F/T Revenue (a x b)	\$87,960	\$202,626	\$366,384	\$585,300	\$765,952
d. Number of P/T Students	0	0	0	0	0
e. Credit Hour Rate	0	0	0	0	0
f. Annual Credit Hour Rate	0	0	0	0	0
g. Total P/T Revenue (d x e x f)	0	0	0	0	0
3. Grants, Contracts & Other External Sources	0	0	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	\$87,960	\$202,626	\$366,384	\$585,300	\$765,952

Environmental Science

2. Tuition and fee revenue based on projected students at annual tuition and fee for full-time students. No part-time students are calculated.
- 2.a. In-coming class sizes estimated as 4, 6, 8, 10, and 12 for Years 1-5. Retention rates of ~88% for year 1 to year 2, and ~91% for year 2 to year 3, using Loyola averages.
- 2.b. From Enrollment Management (Budget Comm presentation 03.13.2024)
- 2.c. FTE x tuition and fee

Loyola University Maryland will provide the resources required to support the proposed program. Revenue from the program is expected to exceed expenses within the first year of the program's start with modest increases in revenue projected for years two through five. Year three is expected to have a shortfall because of planned renovation costs involved with the program.

Appendix F: Program Expenditures - Environmental Science

Maryland Higher Education Commission

TABLE 2: PROGRAM EXPENDITURES:					
Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	\$4,844	\$69,169	\$217,071	\$270,972	\$321,972
a. Number of FTE	0.125	1.000	2.375	3.000	3.500
b. Total Salary	\$4,500	\$54,635	\$168,997	\$210,639	\$249,660
c. Total Benefits	\$344	\$14,534	\$48,074	\$60,333	\$72,312
2. Admin. Staff (b + c below)	0	0	0	1	1
a. Number of FTE	0	0	0	1	1
b. Total Salary	\$0	\$0	\$0	\$60,750	\$62,573
c. Total Benefits	0	0	0	0	0
3. Support Staff (b + c below)	\$0	\$13,849	\$14,264	\$29,465	\$30,349
a. Number of FTE		0.25	0.25	0.5	0.5
b. Total Salary	0	10,625	10,944	22,544	23,220
c. Total Benefits	0	\$3,224	\$3,320	\$6,921	\$7,129
4. Technical Support and Equipment	\$10,000	\$12,500	\$15,000	\$20,000	\$20,000
5. Library	\$6,663	\$6,929	\$7,206	\$7,495	\$7,794
6. New or Renovated Space	0	0	\$200,000	0	0
7. Other Expenses	\$1,400	\$3,150	\$5,600	\$8,750	\$11,200
TOTAL (Add 1 – 7)	\$22,907	\$105,597	\$459,142	\$336,683	\$391,316

1. Number of per course faculty: 1, 2, 3, 4, and 4 for Years 1-5, respectively. Used a 4/4 teaching load as 1 FTE.
- 1.a. Per course faculty: Year 1: 8 credits at \$5,600/3-credits. Year 2-5: Number of per course faculty historical increases. Teaching Faculty in support of Core due to larger enrollment: 0.5FTE in Years 1-2 and 1.0 FTE in Years 3-5. Salaries benchmarked to CUPA and AACSB. Salaries increase 3% per year.
- 1.b. Years 1-2 \$4,500/3-credits; Years 3-5 \$4,700/3-credits Per course faculty benefit is FICA only, while Teaching faculty have benefit rate of 30.34% in years 1-3 and 30.70% in Years 4-5.
2. Lab Manager; Year 4: Full time, \$60,750
3. Program Administrator: Year 2: half-time split between BA and BS degrees; becomes full time, split between BA and BS degrees, in Year 4. Lab Manager: Year 4: Full time, \$60,750.

3.b. Anticipated 3% annual increase in salary is included

3.c. Current fringe benefit is FICA only, while Teaching faculty have a benefit rate of 30.34%
in