

HONORS INTERDISCIPLINARY CLIMATE EXPLORATIONS

Prerequisite: All Juniors and Seniors are welcome to participate in ICE. Completion of [--THIS--](#) pre-course enrollment form is required when you enroll.

We believe all students should have access to a rigorous and challenging curriculum, and all students should be equipped with skills to protect our planet and care for the future.

[Honors Interdisciplinary Climate Explorations](#) (ICE) is designed to empower students with interdisciplinary knowledge and resources to address climate change in our communities and beyond. Students investigate the current impacts of climate change through data science and use computational models to make predictions. Students will learn to integrate scientific concepts with engineering disciplines to develop holistic approaches to climate change adaptation and mitigation. The course will introduce students to green technology and career opportunities in sustainable STEM fields. Students will also engage in field learning experiences with climate solutions professionals in the community. Through experiential learning, place-based and project-based research, data analyses, and interdisciplinary collaborations, students will design solutions to address the challenges of climate change, locally and globally.

While this is an honors course with students earning a letter grade at the end of the semester, ICE is an ungraded course. Our focus is on learning and knowledge acquisition without assigning a numerical score to the student's performance. This approach to learning allows students to explore a subject without fear of failure or the pressure to perform for a specific grade. Instead, ungraded courses prioritize the process of learning and encourage students to take risks, ask questions, make mistakes, and engage in metacognitive reflection. We provide ongoing feedback on assignments and projects to help students continuously improve their skills and deepen their understanding of the subject matter.

This learning environment encourages curiosity, fosters creativity, critical thinking, and a love of learning for its own sake.

We celebrate the achievements and successes of individuals and teams, while also recognizing the hard work and effort that went into those achievements.

We believe that intelligence and talent are not fixed traits, but rather that they can be developed and nurtured over time.

We encourage individuals to set ambitious goals for themselves and to approach those goals with resilience and persistence, embracing the challenges and opportunities that come with pursuing those goals.

Understanding and Knowledge

Students will:

Climate Science

- Identify and describe the global interactive systems and elements that create and sustain climate.
- Define climate change and its causes, including the role of human activity in contributing to greenhouse gas emissions.
- Analyze the key sectors and systems that contribute to greenhouse gas emissions, such as energy, transportation, and agriculture.
- Plan and implement data collection strategies in relation to a particular scientific question. [Note: Data can be collected from many different sources, e.g., investigations, scientific observations, the findings of others, historic reconstruction, and/or archived data.
- Explore and evaluate innovative solutions to climate change, including technological, policy, and behavioral approaches and analyze the cost and benefit of these solutions, including considerations of equity and justice.

Data Science

- Use climate models to develop scenarios of future climate change under different emission scenarios and policy options.
- Use statistical and computational methods to analyze climate data, such as temperature and precipitation records, sea level measurements, and satellite observations.
- Form hypotheses and conclusions based on observations, explanations, models, and predictions consistent with evidence while continually re-evaluating those hypotheses as new evidence is discovered.
- Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts on Earth's systems.

Environmental Justice

- Examine the intersectionality of climate change; how climate change intersects with other social and environmental issues.
- Reflect on one's own role and responsibility in promoting environmental sustainability, social justice, and climate actions.

Climate Solutions

- Describe the role of indigenous knowledge systems and practices in mitigating and adapting to climate change, including examples of traditional ecological knowledge and indigenous-led conservation efforts.
- Analyze the pros and cons of climate mitigation versus adaptation measures, including both short-term and long-term impacts.
- Understand the different principles behind climate mitigation strategies focusing on reducing greenhouse gas emissions to prevent or limit the severity of future climate change, and climate adaptation measures focusing on preparing for and responding to the impacts of climate change.
- Take collective action by working collaboratively with others to address climate change and its impacts, including advocating for policy change, participating in community-based initiatives, and supporting local and global efforts to mitigate and adapt to climate change.

Climate Psychology

- Investigate the links between physical and mental health impacts of climate change, including the ways that extreme weather events, air pollution, and other environmental factors can impact both.
- Identify the different ways that climate change can impact mental health, including through direct and indirect effects, such as increased stress, anxiety, depression, trauma, and grief.
- Develop an understanding of the psychological impacts of climate change, including eco-grief, climate anxiety, and other mental health challenges that can arise as a result of climate change.
- Evaluate different coping strategies for managing the psychological impacts of climate change, including mindfulness, self-care, and therapy.

Skills

Students will be able to:

- Investigate scientific phenomena through laboratory investigations and research done independently and as a group by identifying variables that could affect experimental results.
- Plan and carry out investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
- Analyzing data through detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data
- Engage in mathematical and computational thinking by using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
- Ask questions and define problems by formulating, refining, and evaluating empirically testable questions and design problems using models and simulations
- Use, synthesize, and develop models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
- Construct explanations and design solutions to explain and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
- Evaluate the challenges and opportunities associated with transitioning to a low-carbon, sustainable economy.
- Demonstrate, analyze, and reflect upon personal and social responsibility to the world as an informed and conscientious citizen.
- Integrate knowledge and skills from multiple disciplines to solve complex problems.
- Develop and implement strategies to reduce carbon emissions, promote sustainable practices, and mitigate the impacts of climate change in the community.
- Evaluate different climate solutions based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, equity, and justice, as well as possible social, cultural, and environmental impacts.
- Integrate knowledge and skills from multiple disciplines to solve complex problems.
- Collaborate effectively with individuals from different fields of study to create innovative solutions.
- Adapt to changing circumstances and remain flexible in the face of uncertainty.

- Inspire and motivate others through clear communication, setting high expectations, and leading by example.
- Foster a culture of collaboration, trust, and respect within teams, and encourage others to take ownership of their work and personal growth.

Assessment & ESLRs

Students will:

- Engage in science as a human endeavor wherein teams of scientists work together on personal and social perspectives in an effort to understand the world around them.
- Evaluate a range of potential solutions to climate change, including technological, policy, and behavioral approaches.
- Use statistical and computational methods to analyze climate data, such as temperature and precipitation records, sea level measurements, and satellite observations.
- Design and use tables, graphs, computational models, and written analyses to communicate findings and conclusions obtained from collected data while comparing and contrasting other conclusions based on the same data.
- Communicate information by evaluating the validity and reliability of the claims, methods, and designs.
- Use climate models to develop scenarios of future climate change under different emission scenarios and policy options.
- Engaging in argument from evidence by using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
- Develop strategies for addressing environmental injustice at the individual, community, and systemic levels.
- Develop a sense of agency and empowerment by learning about and engaging in climate action and advocacy.
- Cultivate a sense of hope and possibility by exploring positive solutions and opportunities for action.
- Engage in self-reflection to identify personal values and motivations related to climate action.
- Build social connections and a sense of community through engagement with other individuals and groups committed to climate action.
- Learn from diverse perspectives and experiences, including those of marginalized communities and Indigenous peoples who are disproportionately impacted by climate change.
- Practice resilience by developing the skills and resources necessary to adapt to the impacts of climate change, both as individuals and communities.
- Take collective action by working collaboratively with others to address climate change and its impacts, including advocating for policy change, participating in community-based initiatives, and supporting local and global efforts to mitigate and adapt to climate change.