

# LEEDing the Way: The SUNY Green Building Experiential Learning Collaborative



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# Project Webpage

[sunypoly.edu/gbelc](http://sunypoly.edu/gbelc)

ABOUT

ACADEMICS

ADMISSIONS

STUDENT LIFE

RESEARCH

CONTACT

## Green Building Experiential Learning Collaborative

POWERED BY SUNY POLYTECHNIC INSTITUTE



### Funded Project

Green Building LEED Certification by Student Experiential Learning

SUNY Performance Improvement Fund Award

7/1/2018 - 6/30/2022

### About the Project

The SUNY Green Building Experiential Learning Collaborative (GBELC) is a partnership between SUNY Polytechnic Institute, SUNY ESF, and SUNY Oneonta supported through the SUNY Performance Improvement Fund for clean energy workforce development. The GBELC is training highly skilled graduates proficient in green building design and with project experience in LEED building certification of campus buildings. It is our hope that the curriculum modules piloted in this collaborative will inspire others and enable adoption of green building experiential learning courses.



# Partners: ESF, Poly, Oneonta

SUNY by the numbers

- 64 Campuses
- 1.3 M students
- 91,000 staff

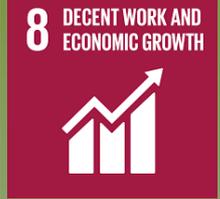


SHOW ALL CAMPUSES

- University Centers and Doctoral Degree Granting Institutions
- University Colleges
- Technology Colleges
- Community Colleges

\* Empire State College has 30+ locations throughout New York State

# Project Objectives



## Make campuses into living laboratories

- Teach new experiential learning courses in which students participate in green certifications of existing campus buildings

## Develop NYS Workforce

- Students earn personal industry credentials (LEED GA)
- Develop capacity of faculty & staff accreditations (LEED AP)

## Scale capabilities across SUNY

- Share expertise and best-practices with other campuses
  - Increase in-house capacity for measuring air quality and performance tracking

# Green Building Experiential Learning Collaborative

## Project Goals

Teach

**7**

New  
Courses

Certify

**7**

Campus  
buildings

Train

**10**

Faculty &  
staff

Credential

**100**

Students

Progress as of 12/30/20

**9**

New  
Courses

**4\***

Campus  
buildings

**14**

Faculty &  
staff

**48**

Students



**LEED  
v4**

# Why LEED?



**CERTIFIED**  
40-49 points



**SILVER**  
50-59 points

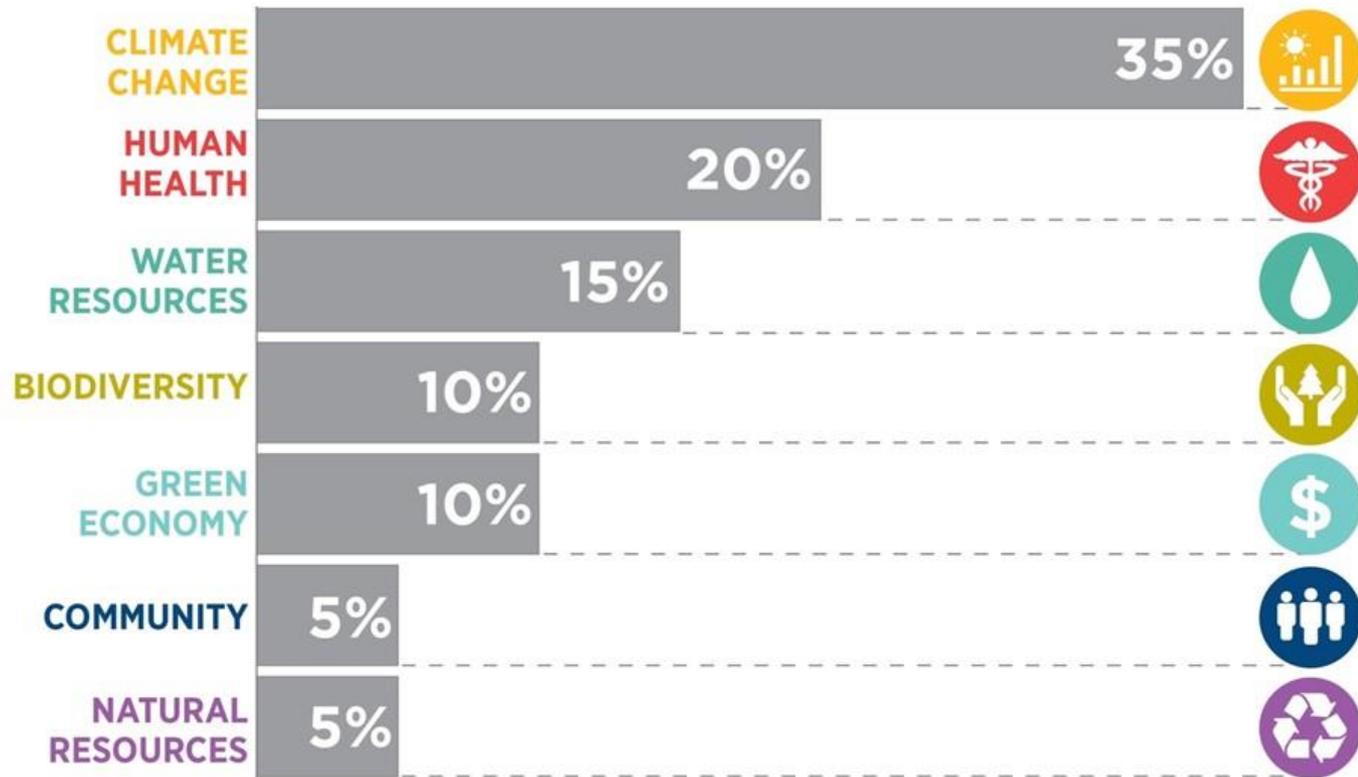


**GOLD**  
60-79 points



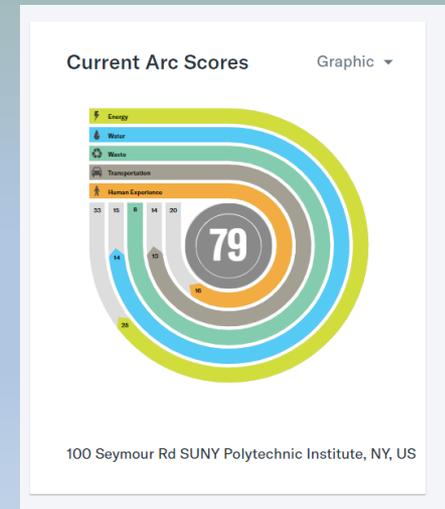
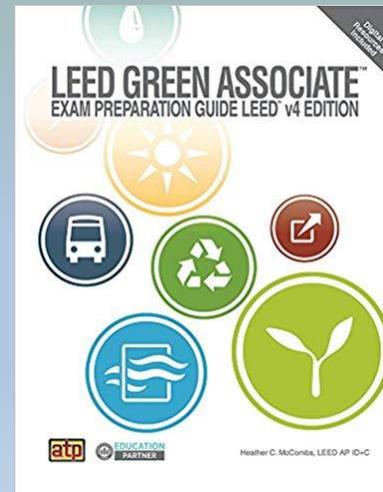
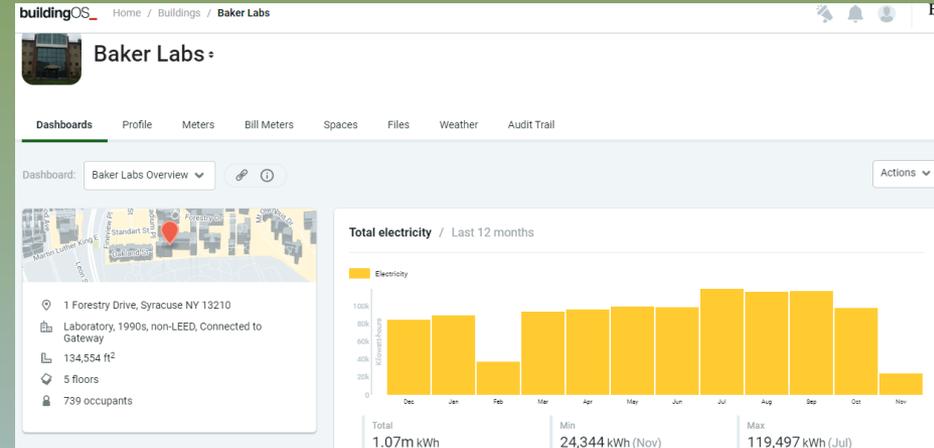
**PLATINUM**  
80+ points

# LEED SYSTEM GOALS



# Advanced Preparation

- Arrange access to building information
  - Meet with facilities staff to discuss their collaboration
    - Project plans & specifications
    - Energy & water use data (historical and current)
- Arrange access to LEED materials
  - Study bundles, exam registration
  - Set up free USGBC accounts
  - LEED Online
  - ARC performance platform
  - LEED v4 Reference Guide



# Course Development

- Followed existing USGBC [LEED Lab](#) model
- Engaged stakeholders for staff and faculty support
- Three different approaches
- ESF – CME 496 experimental course, option for degree program requirement, co-taught
- Poly – CE/ME 448 & IDS 251 formally approved by campus curriculum committee as electives, one co-taught
- Oneonta – five new courses developed for online delivery, hired new full-time visiting faculty

# LEED Lab Participating Institutions



Hosted by Everis University with the collaboration of Everis Ingeniería and Green Building Factory



# Course Development

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- Three different approaches
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# Tracking Performance in LEED v4.1

## Energy

Energy Consumption



Tracking Energy Consumption

## Water

Water Consumption



Tracking Water Consumption

## Waste

Either Waste Audit or Ongoing Waste Tracking



Choosing a Waste Audit or Tracking Waste Production

## Transportation

Result of Transportation Survey



Conduct a Transportation Survey

## Human Experience

Combination of Air Quality Testing and Survey Results



Conduct Air Quality Testing and the Occupant Survey

SUNY Poly Wildcat Field House, New York, United States

1000121445

Upgrade my account

+ Add to Portfolio

- Overview
- Performance
- Meters & Surveys**
- Models
- Leadership
- Performance Certificates
- Re-Entry
- LEED Certifications
- Reports
- Manage

Meters & Surveys



ENERGY METER

Electric

All Changes Saved

SUNY Poly Wildcat Field House 79 / 100

Building Settings

Energy 28 / 33

Solar PV

Natural Gas

**Electric**

Solar Thermal

Natural Gas historical

Water 14 / 15

Water main

Main Meter (Sensus ...)

Data Details Documents

Add Row

Upload from Spreadsheet



Filter

START DATE	END DATE	READING (kWh)	COST (USD)	DOCUMENTATION
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### Add Energy Data



1. Create a Meter



2. Enter Your Data



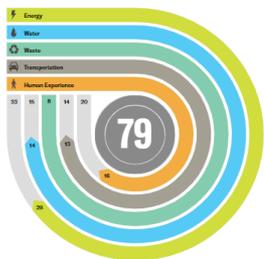
3. Upload Documentation

Next

Cancel

#### Current Arc Scores

Graphic



100 Seymour Rd SUNY Polytechnic Institute, NY, US

🚗 **Transportation** 13 / 14

Transportation Survey

🧑 **Human Experience** 16 / 20

Occupant Satisfaction Survey

**Carbon Dioxide**

Total Volatile Organic Compounds

PM2.5

Ozone

Carbon Monoxide

Acetaldehyde

START DATE

Nov 13, 2019

END DATE

Nov 13, 2019

READING (ppm)

520.6

SOURCE



DOCUMENTATION



AZ-0001  
AZ-0018





Suny Polytechnic Institute  
Solid Waste & Recycling Review  
September 2020



## SUNY Poly

### SOLID WASTE & RECYCLING REVIEW

### SUMMARY & RECOMMENDATIONS

ONEIDA-HERKIMER  
SOLID WASTE AUTHORITY



recycleone  
ONE AND DONE



# CE 448/ ME 448 Green Building Strategies

Fall  
2019

EXISTING  
BUILDINGS  
OPERATIONS AND  
MAINTENANCE



LEED v4.1



20

LEED  
GREEN  
ASSOCIATE

12

LEED  
AP

2

0+M



# CE 448/ ME 448 Green Building Strategies

Fall  
2020

EXISTING  
BUILDINGS  
OPERATIONS  
AND  
MAINTENANCE



LEED v4.1



8

LEED  
GREEN  
ASSOCIATE

4 + 1

LEED  
AP

+1

BD+C



# IDS 251 Principles of Green Buildings

Spring  
2021



INTERNATIONAL  
**LIVING FUTURE**  
INSTITUTE™



**CARBON**  
CERTIFICATION



**LEED  
GREEN  
ASSOCIATE**

Hilltop Residence Hall



State University of New York  
College of Environmental Science and Forestry

# CME 496

## Principles of Green Buildings

### - Spring 2019 -

**Delivery:** Co-taught

**Lectures and Project:** LEED O+M v4

**Project:** one building

**Quizzes:** LEED Green Associate exam prep

**Notable Outcomes:**

- 21/31 passed the LEED GA exam; 1/2 passed the LEED AP O+M exam

**Student Feedback:**

- Overall rating: 3.5/5
- *“it was a good course to learn project management skills”*
- *“the material was extremely relevant to my major and real world use.”*

**Suggestions:**

- *“... spend more time focusing on [...] the green associate exam.”*
- *“There should be more time given to study LEED BD+C, not just O+M.”*



**Delivery:** 1 instructor

**Lectures:** LEED GA (BD+C, et al.)

**Project(s):** 3 buildings

**Notable Outcomes:**

- 14 / 15 *would have* passed LEED GA
- COVID: online
  - *Introduction* to Building Energy Modeling

**Student Feedback:**

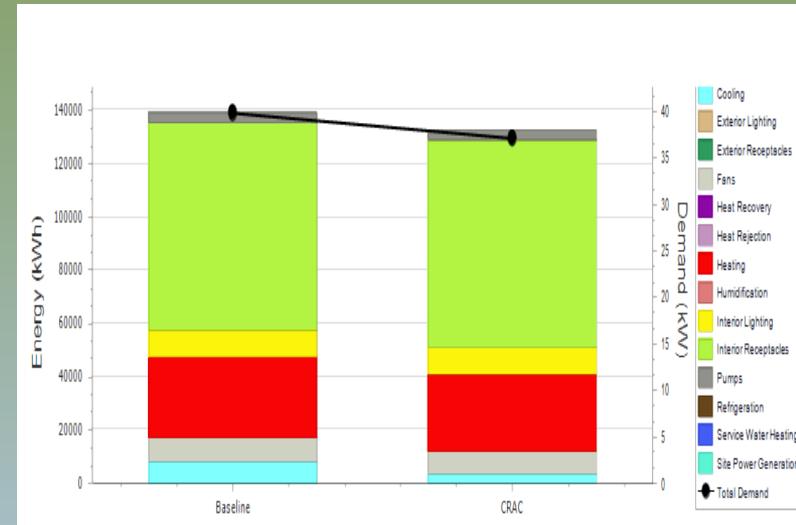
- Overall rating: 4.1 / 5
- “made me think about the plethora of sliding scales that must be balanced for a building to be both Green and comfortable”

**During emergency remote teaching, what class activities contributed most to your learning?**

- “the building modeling”
- “The BEM project. [...] one major upside was that it gives me the experience and therefore the confidence to put something like “basic building energy modeling skills” on my resume.”

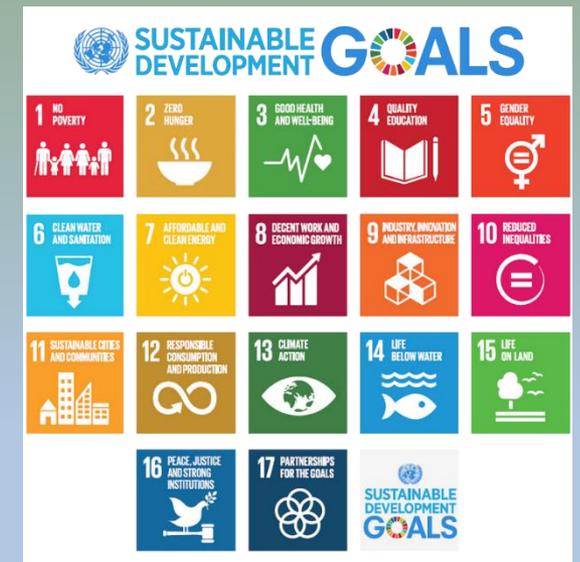
**During emergency remote teaching what were the biggest hindrances to your learning?**

- “Class discussion became next to nothing and learning dipped considerably”



# Interdisciplinary Online Courses on Sustainable Design at **SUNY Oneonta**

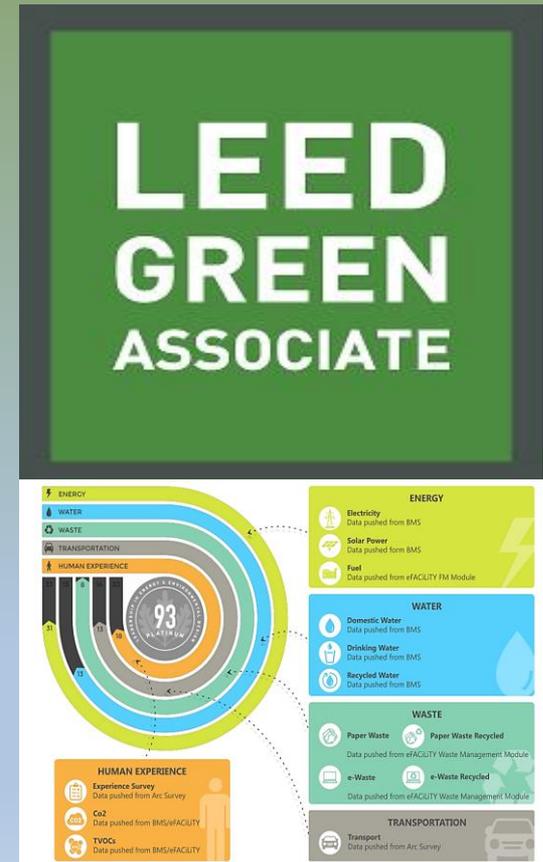
- **SUNY Oneonta**, as part of the **SUNY PIF Project 264** (Green Building LEED Certification by Experiential Learning), developed **five (5) online interdisciplinary courses on “Sustainable Design”**, in alignment with the mission of the Department of Geography and Environmental Sustainability, and the objectives of PIF grant to meet the **UN’s SDGs**)
- Our mission is to **equip students (and professionals) with a toolkit to prepare them for industry-specific credentials exams** like LEED GA, LEED AP, LEED ND, PHD/C, GRP, etc. offering them practical knowledge and skills required for the **sustainability job market**.
- Environmentally focused occupations are projected to grow “faster than average” or “**much faster than average**” (United States Bureau of Labor Statistics) and the **demand for green building professionals is one of the fastest growing job markets within sustainability**.



# Interdisciplinary Online Courses on Sustainable Design (Fall 2020)

## 1. ENVS 294- W1 Green Building Design Principles and Practices

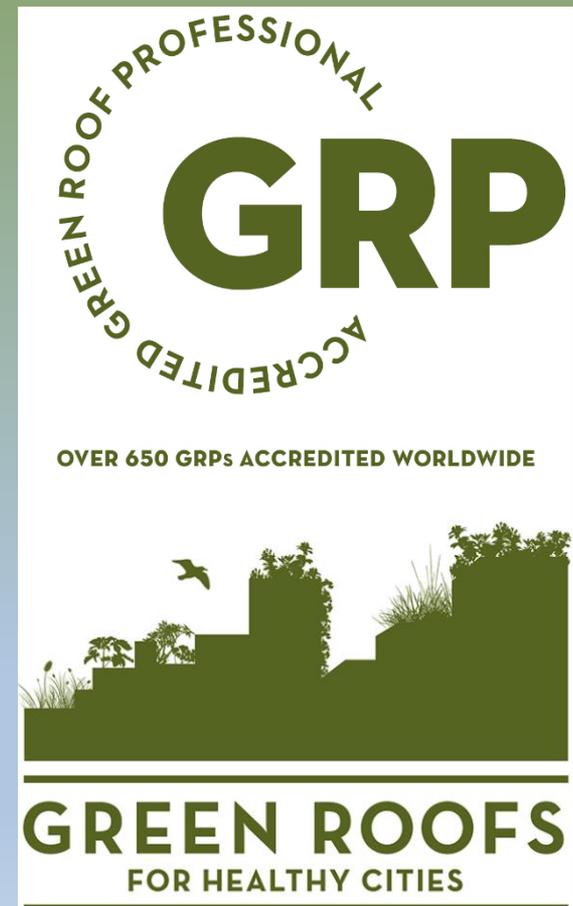
- This multidisciplinary course focuses on LEED® (Leadership in Energy and Environmental Design) as the most widely used green building rating system in the world and reviews its main eight credit categories, prerequisites, requirements, total possible points, and four (4) levels of certifications.
- Students explore the Arc digital platform to evaluate sustainability performance of campus buildings, by recording five sustainable aspects of operational use including energy, water, waste, transportation and human experience.
- This course addresses UN SDGs 3, 6, 7, 11, 12, 15.
- It prepares students for the LEED Green Associate exam.



# Interdisciplinary Online Courses on Sustainable Design (Fall 2020)

## 2. ENVS 294- W2 Green Roofs/Green Walls for Sustainable Healthy Cities

- This interdisciplinary course explores the economic, social and environmental benefits of green infrastructure to provide a healthy community for residents. It helps students to understand how well-designed green roofs/walls can contribute to a sustainable building by reducing energy use, mitigating heat island effect, reducing air pollution and GHG emissions, enhancing storm water management and water quality, and improving health, well-being and quality of life (QOL).
- This course addresses UN SDGs 2, 3, 6, 9, 11 .
- This course (in part) prepares students for the Green Roof Professional (GRP) exam.



# Interdisciplinary Online Courses on Sustainable Design (Fall 2020)

## 3. ENVS 294- W3 Introduction to Sustainable Design

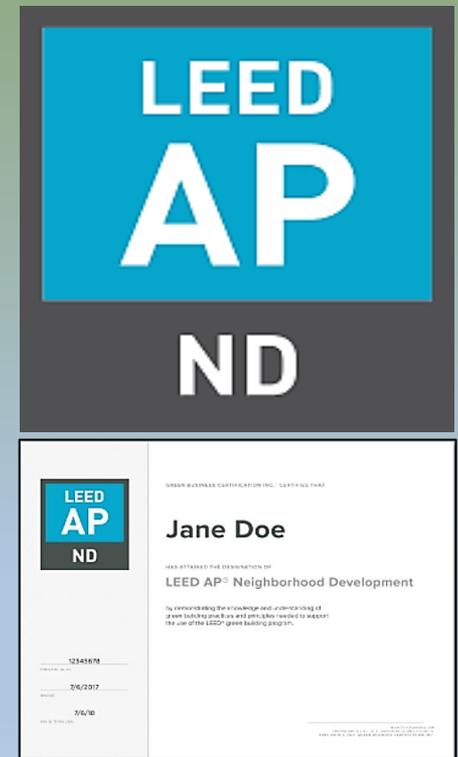
- With an emphasis on the UN Sustainable Development Goals, this interdisciplinary introductory course is aimed to give students with diverse backgrounds an overview to understand how to create environmentally friendly buildings for a “Green” future.
- It reviews different green building rating systems including Leadership in Energy and Environmental Design (LEED®), Green Globes™, Living Building Challenge (LBC), Net Zero Energy Building (NZEB), WELL Building Standard, etc. provide the opportunity for students to understand the emerging theories and practice of sustainable design to directly inform architectural practice, to apply in their design projects and living as sustainability-focused citizens.



# Interdisciplinary Online Courses on Sustainable Design (Spring 2021)

## 4. ENVS 294- W4 Neighborhood Development and Sustainable Communities

- This interdisciplinary course focuses on LEED® for Neighborhood Development (LEED ND), and reviews its main credit categories, prerequisites, requirements, total possible points, and certification process.
- It covers the major prerequisites and credits of LEED ND including Smart Location and Linkage (SLL), Neighborhood Pattern and Design (NPD), Green Infrastructure and Buildings (GIB), and Innovation and Design Process (IDP).
- This course addresses the UN SDGs 3, 5, 8, 11, 16.
- It prepares students for LEED AP ND exam.



# Interdisciplinary Online Courses on Sustainable Design (Spring 2021)

## 5. ENVS 294- W5 Passive House and Net-Zero Energy Buildings

- With a focus on the concept of highly energy-efficient buildings, this interdisciplinary course explores the passive buildings design ideas, tools, and strategies to use renewable energies for heating, cooling, ventilation and lighting. It also explains building-integrated systems in net zero energy buildings to convert renewable energies into electrical energy.
- It reviews PHIUS and NZEB certification programs, requirements, and process, as evaluation systems of energy efficient buildings.
- It addresses the UN SGGs 3, 7, 8, 9, 11, 12, 13.
- This course (in part) prepares students for Passive House exam.



# Teaching Methodology (Online, Asynchronous)

- These interdisciplinary courses are open to all **students** and **professionals** (from all built environment-related majors), **regardless of the educational background**, work experience, or expertise.
- They **don't require prior knowledge** and are geared to **anyone with an interest in sustainable design** and/or **plan to take industry-specific credential exams** (**No prerequisites before course enrollment**).
- They are delivered **completely online (asynchronously)** (not “real time”). This provides **benefits** like **schedule flexibility and convenience**.
- They use a **mix of online materials** including **recorded lectures**, **readings**, **videos**, **online forums**, **discussion boards**, **assignments**, and **quizzes** to engage students more in learning, explore the topics in detail as well as exchange ideas.

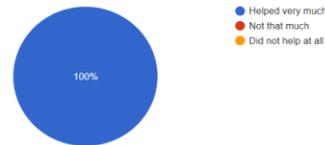


# Course Evaluation (Students Survey)

**Q#10:** **100%** of students believe that these courses enhance their knowledge on sustainable design strategies (passive heating/cooling, green infrastructures, eco-friendly materials and so on).

10. How helpful was this course into enhancing your knowledge of sustainable building design strategies such as passive cooling/heating, energy/water efficiency, environmental -friendly materials, waste management, green infrastructures, green roofs/walls, etc. (please answer based on your current course)

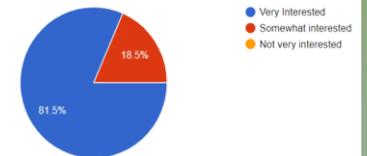
27 responses



**Q#20:** **82%** of students are interested to participate to the campuses building assessment, to submit for LEED certification.

20. If you have an opportunity, are you interested in participating to the campus green building assessment, to apply for LEED certification?

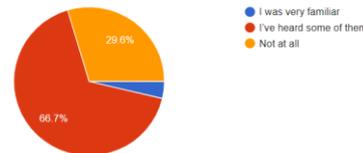
27 responses



**Q#11:** **Only 4%** of students were familiar with green building certification systems like LEED, Green Glob, Well, LBC, etc., before taking this course

11. Before taking this course, were you familiar with green building certification systems such as LEED®, Green Globes™, LBC, NZEB, WELL Building Standard, etc.

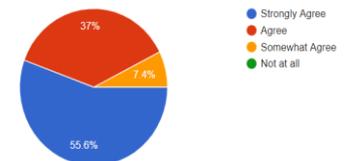
27 responses



**Q#17:** **56%** of students strongly agree that department offer more courses on sustainable design in future.

17. Would you like your department to offer more courses on sustainable design?

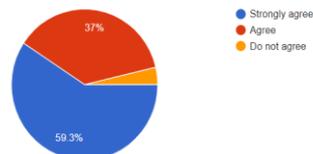
27 responses



**Q#13:** **60%** of students believe that these courses will help them with sustainability job market.

13. Do you believe these courses will help you with your sustainability job search?

27 responses



**Q#14:** **100%** of students recommend these courses to their friends and classmates.

14. Would you recommend taking this course to your friends and classmates?

27 responses



## Course Evaluation (**Students Testimonials**)

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**Course Title:** ENVS 294- W1 Green Building Design Principles and Practices

**Student Name:** Cindy Lehr, PE , **Construction Site Rep, Facilities**, SUNY Oneonta

**Major:** **Civil Engineering** (Graduated in 2003)

**University:** **University of Illinois at Urbana-Champaign**

**Link:** <https://www.youtube.com/watch?v=fG1WREp3OC8&t=1s>



**Course :** ENVS 294- W2 Green Roofs/Green Walls for Sustainable Healthy Cities

**Student Name:** Christopher Martinovic

**Major:** **Geography**

**University:** **SUNY Oneonta**

**Link:** <https://www.youtube.com/watch?v=DloPqlvBiuQ&feature=youtu.be>



**Course Title:** ENVENVS 294- W3 Introduction to Sustainable Design

**Student Name:** Chloe Dymak

**Major:** **Sustainability & GIS**

**University:** **Suffolk County Community College**

**Link:** <https://www.youtube.com/watch?v=IOzQydS2OIk&feature=youtu.be>

## Course Evaluation (**Students Testimonials**)

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**Course :** ENVS 294- W1 [Green Building Design Principles and Practices](#)

**Student Name:** Chloe Tarlen

**Major:** [Environmental Sustainability & Geography](#)

**University:** **SUNY Oneonta**

**Link:** <https://www.youtube.com/watch?v=MMKfUj7erX0&feature=youtu.be>



**Course :** ENVS 294- W1 [Green Building Design Principles and Practices](#)

**Student Name:** Katie Ulrich

**Major:** [Environmental Design & Architecture](#)

**University:** **University at Buffalo**

**Link:** <https://www.youtube.com/watch?v=WU8w4aJ-x6M&feature=youtu.be>



**Course :** ENVS 294- W2 [Green Roofs/Green Walls for Sustainable Healthy Cities](#)  
ENVS 294- W3 [Introduction to Sustainable Design](#)

**Student Name:** Brianna Klein

**Major:** [Early Childhood/Childhood Education](#)

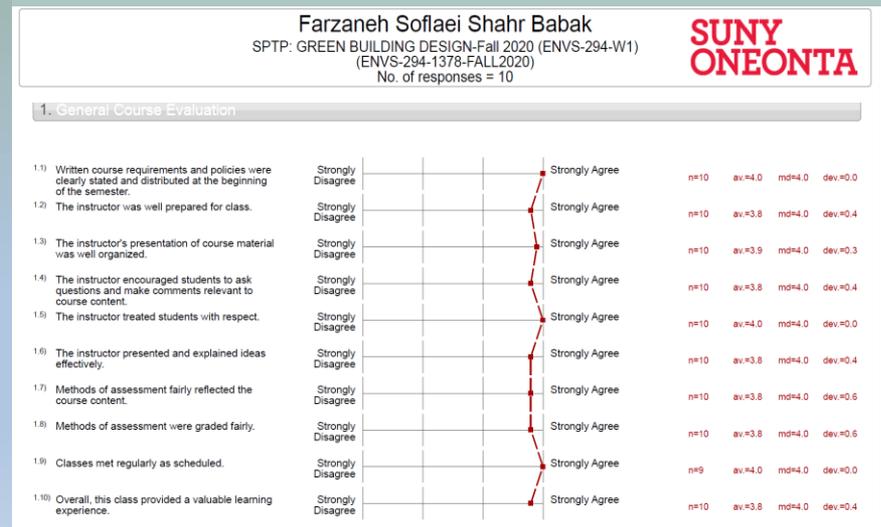
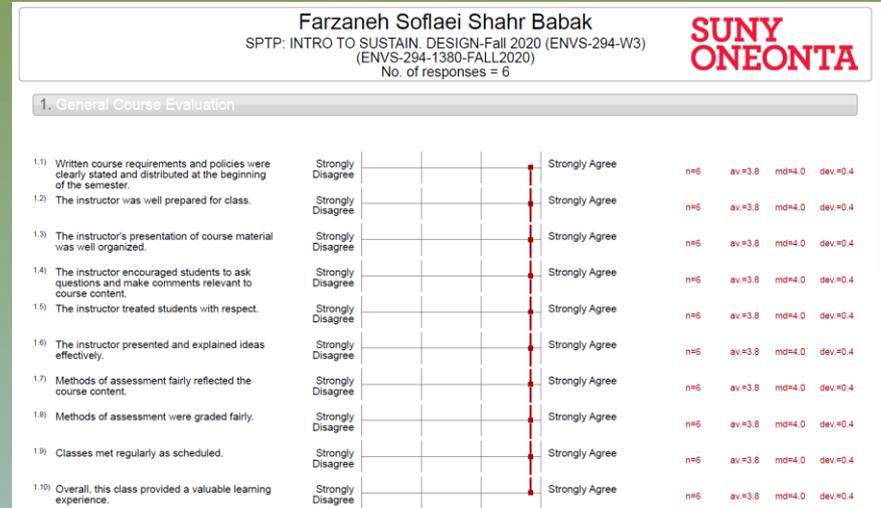
**University:** **SUNY Oneonta**

**Link:** [https://www.youtube.com/watch?v=\\_kluVGxhRqw&feature=youtu.be](https://www.youtube.com/watch?v=_kluVGxhRqw&feature=youtu.be)

# Course Evaluation (Students Evaluation)

## Students' Feedback:

- “This class was extremely interesting and broadened my understanding of sustainable design. I liked how organized it was and having videos in the course because they helped me visualize so much. I think this class prepared me very well for a future career.”
- “I really liked how this course was asynchronous, particularly I liked discussion boards and being able to talk about a wide variety of topics and sharing my thought with others. I think It was perfect!”
- “The course was well-organized and informative. It was outside of my major, but I hope to apply it in my future career. I greatly appreciate you and your class.”
- “I learned a lot of valuable information from this class, It was a good experience.”
- “Great class for those aspiring to learn about the LEED rating system! I feel well-prepared for the LEED GA exam.”



# Green Building Experiential Learning Collaborative

## Course Lessons

- Experimental/special topics course development was flexible & fast
- Curriculum committee course action 6+ months ahead
- Coordination with facilities staff and building occupants for measurement activities involving students
- Define visitors & count for weighted occupancy calculation
- Cost per student \$220 (education materials + LEED GA exam fee)
- Building registration fee \$1200
- Building certification fee \$4000 + \$0.0228/sf (\$5620 – \$7044)

# Green Building Experiential Learning Collaborative

## Admin Lessons

- Good communication among stakeholders
  - Copy relevant staff on communications
- Shared google doc for related emails, calls, and meeting minutes
- Adequate time for project coordination, course release and compensation
- Meet with staff early in the planning stages to review requirements
- IRB exemption application for survey
- Cost for staff accreditation \$600 (education materials + LEED AP exam fee)
- Compensate staff for their time
- Lengthy approval process for new policy adoption

# Green Building Experiential Learning Collaborative

## Future

- Lead with pilot projects at partner campuses
- Share course templates and best-practices with other campuses
- Develop a SUNY inter-campus Sustainable Building Design and Operations certificate
- Expand building performance monitoring
- Expand use of indoor air quality testing as teaching tools



# Acknowledgements



- Performance Improvement Fund



- [Dr. Zhanjie Li](#), Assistant Professor, Civil Engineering
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- Alvito DiStefano, Intern
- Susan Head, Senior Associate Vice President for Finance



- [Dr. Paul Crovella](#), Co-PI, Assistant Prof., Forest and Natural Resources Management
- Josh Arnold, Director of Energy Management & Utilities
- Patrick Whitford, Undergraduate Student & Intern



- [Rachel Kornhauser](#), Co-PI, Sustainability Coordinator
- Tracy Allen, Interim Dean, School of Sciences

# Q & A

[sunypoly.edu/gbelc](http://sunypoly.edu/gbelc)



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