

ENVS 294- W3 Introduction to Sustainable Design

Fall 2020
Online Course

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COURSE DESCRIPTION: Credits 3. With an emphasis on the UN Sustainable Development Goals (SDGs)¹, this interdisciplinary introductory course is aimed to give students with diverse backgrounds an overview to explore: What is sustainability and why is it essential for the future community development? By focusing on design of buildings, landscapes, and urban spaces in the complex web of ecological and man-made systems, it helps students to understand how to create environmentally friendly buildings for a “Green” future. Current green building standards including LEED®², Green Globes™, LBC³, NZEB⁴, WELL Building Standard, etc. will be evaluated for students to understand design principles and best practices. The course will use a mix of brief lectures, readings, videos, films and online discussions to engage students more in learning and provide opportunities for them to move from consumers to creators. The case-based assignments are also designed in different types of literature review, research paper, and project helping 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.

COURSE LEARNING OBJECTIVES (CLOs):

Upon completion of this course the student will be able to:

CLO 1: Explain the impact of buildings as the largest contributor to climate change during 21st century, on natural environment, human health and well-being.

CLO 2: Realize the complexity of sustainability as a multi-dimensional issue, and the significance of sustainable development goals (SDGs).

CLO 3: Describe the concept of sustainable design as an environmentally friendly approach, which considers natural resources as a part of design process, to minimize the negative environmental impacts.

CLO 4: Demonstrate the acquired skills and knowledge associated with the fundamental principles of sustainable building design including site optimization, energy efficiency, water conservation, waste reduction, etc. to create comfortable, safe, healthy and productive environments for occupants.

CLO 5: Identify and compare some of the most widely-used sustainable buildings rating systems such as LEED®, Green Globes™ and LBC, NZEB, WELL Building Standard®, and BREEAM®⁵.

CLO 6: Discuss and analyze the sustainable certified projects as successful case studies, to extrapolate the environmental sound strategies (as lessons learned) to integrate in building design process for a “Green” future.

¹ <https://sustainabledevelopment.un.org/post2015/transformingourworld>

² Leadership in Energy and Environmental Design

³ Living Building Challenge

⁴ Net Zero Energy Building

⁵ Building Research Establishment Environmental Assessment Method

COURSE CONTENT OUTLINE:

Module 1	Week 1: Introduction and Syllabus Review
Module 2	Week 2: Built Environment and Climate Change: Status, Challenges and Opportunities
Module 3	Week 3: Sustainable Development as A Complex and Multidimensional Approach
Module 4	Week 4: The Concept of Sustainable Design: Philosophy and Principles
Module 5	Week 5: Sustainable Architecture: Definitions, Conceptual framework, and Objectives
Module 6	Week 6: Fundamental Principles of Sustainable Building Design: Principle #1 Site Optimization, and Principle #2 Optimize Energy Use.
	Week 7: Principle #3 Using Renewable Energy Resources (Passive Heating/Cooling)
	Week 8: Principle #3 Using Renewable Energy Resources (Passive Cooling/Sustainable Technologies)
	Week 9: Principle #4 Using Eco-friendly/Sustainable Tech Building Materials, and Principle #5 Minimizing Waste and Recycling
	Week 10: Principle #6 Protect and Conserve Water
Module 7	Week 11: Sustainable Buildings Rating Systems: LEED® (Leadership in Energy and Environmental Design)
	Week 12: Green Globes™ and LBC (Living Building Challenge)
	Week 13: NZEB (Net-Zero Energy Building), WELL Building Standard®, and BREEAM® (Building Research Establishment Environmental Assessment Method)
-----	Week 14: Thanksgiving Holiday
Module 8	Week 15: Case Studies: Certified Sustainable Buildings Review
-----	Week 16: Final Exam

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of each module the student will be able to:

Module 1: Introduction and Syllabus Review	Week 1	<u>MLO 1-1:</u> Recognize climate change as the biggest problem facing the world; its causes and consequences. (CLO 1) <u>MLO 1-2:</u> Discuss possible solutions to prevent climate change and environmental crisis. (CLO 1, CLO 2, CLO 3)
Module 2: Built Environment and Climate Change: Status, Challenges and Opportunities	Week 2	<u>MLO 2-1:</u> Describe the role of buildings as the largest contributor to climate change. (CLO 1) <u>MLO 2-2:</u> Discuss the salient features of energy use and greenhouse gas emissions (GHGs) from building use and construction. (CLO 1)
Module 3: Sustainable Development as A Complex and Multidimensional Approach	Week 3	<u>MLO 3-1:</u> Describe the concept of sustainable development as a complex and interconnected challenge requiring multiple perspectives and problem-solving strategies. (CLO 2) <u>MLO 3-2:</u> Explain the UN’s Sustainable Development Goals (SDGs), and their importance for future community development. (CLO 2) <u>MLO 3-3:</u> Highlight the benefits of green buildings to achieve the UN’s Sustainable Development Goals. (CLO 2, CLO 3, CLO 4)

<p>Module 4: The Concept of Sustainable Design: Philosophy and Principles</p>	<p>Week 4</p>	<p><u>MLO 4-1:</u> Define the concept of sustainable design as a design philosophy that seeks to maximize the quality of an object/built environment, while minimizing or eliminating negative impacts to the natural environment (CLO 1, CLO 2, CLO 3, CLO 4) <u>MLO 4-2:</u> Explain the sustainable design as thoughtful holistic approach, in respect to the triple bottom line (TBL). (CLO 2, CLO 3)</p>
<p>Module 5: Sustainable Architecture: Definitions, Conceptual framework, and Objectives</p>	<p>Week 5</p>	<p><u>MLO 5-1:</u> Recognize the significance of sustainability to the built environment, and the role it plays in the context of climate change, energy scarcity, materials, and carbon. (CLO 1, CLO 2) <u>MLO 5-2:</u> Define the concept of sustainable construction as the creation and responsible management of a healthy built environment based on resource efficient and ecological principles. (CLO 2, CLO 3) <u>MLO 5-3:</u> Describe the main objectives of sustainable built environment including minimizing non-renewable resource consumption, enhancing the natural environment, and eliminating or minimizing the use of toxins. (CLO 3) <u>MLO 5-4:</u> Demonstrate the understanding of theories, principles and framework for implementing sustainability in building construction. (CLO 3, CLO 4)</p>
<p>Module 6: Fundamental Principles of Sustainable Building Design</p>	<p>Week 6</p>	<p><u>MLO 6-1:</u> Explore the Principle #1 of sustainable building design: site optimization with regard to location (building siting), and discuss its key components of reuse and retrofit, building orientation, walkability, transportation, and security (CLO 4) <u>MLO 6-2:</u> Discuss the Principle #1 of sustainable building design: site optimization in relation to the environment, and discuss its key components of landscaping, runoff, and wildlife. (CLO 3, CLO 4) <u>MLO 6-3:</u> Discover the Principle #2 of sustainable building design: optimize energy and use of the alternative energy sources with low CO2 emissions to reduce the buildings’ energy needs, and enhance their ability to capture or even generate their own energy. (CLO1, CLO 4) <u>MLO 6-4:</u> Identify the environmental, economic, and social benefits of the energy-efficient buildings, and explore strategies to enhance energy efficiency in sustainable building design. (CLO 2, CLO 3, CLO 4)</p>
	<p>Week 7</p>	<p><u>MLO 6-5:</u> Explore Principle #3 of sustainable building design: renewable energy resources with regard to the passive solar heating and daylighting strategies including: Trombe walls, roof ponds, sunspaces, atria, skylights, atrium, external shading devices, etc. (CLO 3, CLO 4) <u>MLO 6-6:</u> Discuss the Principle #3 of sustainable building design: renewable energy resources in relation to the passive cooling and natural ventilation techniques such as badgirs, courtyards, small windows, light colors, and massive construction. (CLO 3, CLO 4) <u>MLO 6-7:</u> Describe the effect of building mass on energy efficiency, and list the key points on passive cooling strategies. (CLO 4)</p>

	Week 8	<p><u>MLO 6-8:</u> Explore main types of passive cooling systems including cooling with ventilation, radiant cooling, evaporate cooling, and earth cooling. (CLO4)</p> <p><u>MLO 6-9:</u> Identify wind towers and wind scoops, basics and principles, and describe their applications in contemporary sustainable building design. (CLO 4)</p> <p><u>MLO 6-10:</u> Discuss how location affects effectiveness of cool towers, and how they can claim for sustainability. (CLO 4)</p> <p><u>MLO 6-11:</u> Identify the geothermal power, and explain ground source heat pumps (GSHPS) as a highly efficient renewable energy technology for passive heating/ cooling of building. (CLO4)</p> <p><u>MLO 6-12:</u> Describe sustainable technologies and building-integrated systems including BIST, BIPV, BIWT, etc. to reduce the building’s energy needs and/or even generate their own energy. (CLO 3, CLO4)</p>
	Week 9	<p><u>MLO 6-13:</u> Discuss the Principle #4 of sustainable building design regarding eco-friendly and sustainable tech materials with low environmental impact during production, placing and maintenance. (CLO 3, CLO 4)</p> <p><u>MLO 6-14:</u> Identify the Principle #5 of sustainable building design with emphasis on minimizing waste, and recycling during construction, renovation and demolition of buildings. (CLO 4)</p>
	Week 10	<p><u>MLO 6-15:</u> Explore Principle #6 of sustainable building design with regard to the water protection and conservation by minimizing need and maximizing efficiency. (CLO 4)</p> <p><u>MLO 6-16:</u> Identify water efficient equipment to reduce the usage of potable water in buildings. (CLO3, CLO 4)</p> <p><u>MLO 6-17:</u> Explain greywater recycling system (GRS), and discuss how it can solve the ecological problems. (CLO 4)</p> <p><u>MLO 6-18:</u> Identify sustainable drainage systems (SuDS), and use of sequence of techniques that together form a management train. (CLO 4)</p>
Module 7: Sustainable Buildings Rating Systems	Week 11	<p><u>MLO 7-1:</u> Identify the LEED® (Leadership in Energy and Environmental Design) as the most widely-used sustainable buildings rating system in the world. (CLO 5)</p> <p><u>MLO 7-2:</u> Describe the Governing Bodies of LEED®: USGBC + GBCI. (CLO 5)</p> <p><u>MLO 7-3:</u> Explain the LEED® rating systems, and describe their scope and structure. (CLO 5)</p> <p><u>MLO 7-4:</u> Discuss the LEED® credit categories, and certification levels. (CLO 5)</p>
	Week 12	<p><u>MLO 7-5:</u> Describe the Green Globes™ development process. (CLO 5)</p> <p><u>MLO 7-6:</u> List the Green Globes™ rating scales for sustainable buildings. (CLO 5)</p> <p><u>MLO 7-7:</u> Discuss differences between Green Globes™ 2013 and 2019 versions, and their point allocation. (CLO 5)</p> <p><u>MLO 7-8:</u> Explain the Living Building Challenge (LBC) certification. (CLO 5)</p>

		<u>MLO 7-9:</u> Identify the LBC seven performance categories (petals) including place, water, energy, health and happiness, materials, equity, and beauty. (CLO 5)
	Week 13	<u>MLO 7-10:</u> Describe the concept of NZEB (Net-Zero Energy Building) rating system and certification. (CLO 5) <u>MLO 7-11:</u> Define zero energy balance and carbon-positive buildings. (CLO 5) <u>MLO 7-12:</u> Describe the WELL Building Standard and its significance on human health improvement. (CLO 5) <u>MLO 7-13:</u> Discuss the seven areas of WELL certification including air, water, light, nourishment, fitness, comfort, and mind. (CLO 5) <u>MLO 7-14:</u> Explain the BREEAM (Building Research Establishment Environmental Assessment Method) certification and its main credit categories including energy, health and wellbeing, innovation, land use, materials, management, pollution, transport, waste, and water. (CLO 5)
Module 8: Case Studies: Certified Sustainable Buildings Review	Week 15	<u>MLO 8-1:</u> Review and compare the LEED®, Green Globes™, LBC, NZEB, WELL Building Standard®, and BREEAM® certifications and summarizing their main rating criteria. (CLO 5) <u>MLO 8-2:</u> Identify some of the successful certified sustainable buildings as case studies. (CLO5, CLO 6) <u>MLO 8-3:</u> Analyze the certified sustainable building cases, to extrapolate environmental sound strategies (as lessons learned) to integrate in design process for a “Green” future. (CLO 3, CLO4, CLO 5, CLO 6)

REQUIRED TEXT:

- All reference materials for the online course will be provided as posted documents, online articles, weblinks, and videos.

RECOMMENDED TEXT:

1. McLennan, j. F. 2004. The Philosophy of Sustainable Design, Ecotone Publishing Company LLC, ISBN: 978-0974903309.
2. Iyengar, K. 2015. Sustainable Architectural Design: An Overview, 2015, Routledge, ISBN: 978-0415702348.
3. Sassi, P. 2006. Strategies for Sustainable Architecture, Routledge, ISBN: 978-0415341424.
4. Fleming, R., Saglinda, S. H. 2019. Sustainable Design for the Built Environment, Routledge, ISBN: 978-1138066182.
5. USGBC. 2014. LEED Core Concepts Hard Copy: An Introduction to LEED and Green Building, U.S. Green Building Council, 3rd Edition, ISBN: 978-1-932444-32-2.
6. Kubba, S. 2016. Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes, Butterworth-Heinemann, ISBN: 978-0128104330.

COURSE ACTIVITIES/ TEACHING STRATEGIES: The course will use a mix of brief lectures, readings, videos, films, and other instructional strategies for online courses such as virtual field trips and guided tours to engage students more in learning and provide opportunities for them to move from consumers to creators. Students are required to take one (1) exam, three (3) self-assessment quizzes, and seven (7) assignments in different types of questions, project, etc. Seven (7) online discussion forums are also designed as a part of class, to encourage students to explore the topics and exchange ideas on

philosophy, conceptual framework, objectives, design principles, and evaluation process (rating systems) of sustainable design. Students are required log in to the Blackboard to access the provided materials and follow the instructions of each module on weekly basis.

ADDITIONAL UNIQUE ASPECTS OF COURSE:

1. This course enhances the **acquired skills and knowledge** associated with the varied facets of **sustainable design in the solving of complex environmental problems.** With a focus on the sustainable building concept, goals, fundamental design principles, and some widely-used rating systems such as LEED®, Green Globes® and LBC, NZEB, WELL Building Standard®, and BREEAM®, etc. this course helps students to apply these standards as an integral part of their design projects to create a more sustainable world in the future, as **sustainability-focused citizens.**
2. This course highlights the **mission of department of geography and environmental sustainability at SUNY Oneonta,** to “give students the geographic and/or environmental sustainability knowledge and skills they need to interpret social, physical and environmental influences at local, regional and global scales”⁶. It encourages students to consider sustainable design as an integral part of everyday life, to reduce greenhouse gas emissions, energy and resource consumption while showcasing SUNY Oneonta’s commitment to sustainability.
3. This course also fulfils the **SUNY General Education attributes NS3** to help students to “understand the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis; and application of scientific data, concepts, and models in one of the natural sciences”.⁷

COURSE REQUIREMENTS:

GENERAL REQUIREMENTS:

- **Course Format:** This course is delivered completely online asynchronously (so you will need consistent, reliable access to the Internet) via Blackboard. The tools that are part of Blackboard (grading, information posting, emails, etc.) will be used for administration and general communication. A discussion board will be the primary tool for interaction within the class. Microsoft Office, Adobe Acrobat, Google Earth, etc. will be used to develop and view materials as well as demonstrate concepts being discussed or presented. Media to be used will include digital documents, video and audio. The media will be a combination of instructor developed material as well as material available in print or web based. The tools and media are selected in conjunction with each course module and the associated learning objectives. Course components include online material, multimedia, threaded discussions and e-mail. This course is primarily **asynchronous** (not “real time”); please keep in mind that each module is designed to be completed within the designated timeframe and will include specific "due dates" for each part of the module's assignments.
- **Attendance Policy:** Success in this course is dependent on your active participation and engagement throughout the course. You need consistent, reliable access to the Internet via Blackboard, as it delivers online using an asynchronous (not “real time”) format. As such, students are required to complete all assignments by the due date, and to actively participate in class discussions. Additionally, students are expected to:
 - Log on at least three times a week – on different days in order to completely weekly assignments, assessments, discussions and/or other weekly deliverables as directed by the instructor and outlined in the syllabus;

⁶ <https://suny.oneonta.edu/geography-environmental-sustainability>

⁷ <https://suny.oneonta.edu/academic-advisement/general-education>

- Participate in the weekly threaded discussions, this means that, in addition to posting a response to the thread topic presented, students are expected to respond to each other and comment and questions from the instructor and/or other students;

If you find that you cannot meet the class' minimum discussion requirements due to such a circumstance, please contact your instructor as soon as possible. Students will not be marked present for the course in a particular week if they have not posted on the discussion forum and/or submit assignment/essay or complete assessment if administered in that week.

SPECIFIC REQUIREMENTS:

1. **Exams/Quizzes:** There will be **one (1) exam** (see the attached course schedule for the exam dates). In addition, there will be **three (3) self-assessment quizzes**. Quiz material will be drawn from the previous discussions and assigned readings. Exam/quizzes will consist of a mix of multiple choice, true/false, and short answer questions about the material covered in that unit.
2. **Discussions/Forums:** Students are required to participate in **seven (7) online discussion forums** as a part of class, **to explore a topic in detail and exchange ideas**. Attendance by way of online participation is considered in the calculation of the student's final grade, as each activity is assigned a value and is counted toward the student's final grade. The instructor reserves to issue a failing grade for lack of online presence in this course.
3. **Homework Assignments:** Students are required to conduct **seven (7) assignments**. All assignments should be completed independently unless they are specifically indicated as a team assignment by your instructor (directions for the homework assignments and group assignments will be made available on Blackboard). **Students are expected to complete all assigned readings prior to each class;** these may include materials supplemental to the textbook posted on Blackboard. Students must always properly cite their sources and properly credit all words, thoughts and images to the original author. Students are also responsible for completing all assignments by due dates and times. Due dates will be announced when the assignment becomes available on the Blackboard calendar. **You have to submit your assignments in Microsoft Word or PDF format using the Blackboard Assignment tool (digital drop boxes) on Blackboard** (please plan ahead in case there are technical difficulties) unless there are extenuating circumstances, **emailed papers will not be accepted**.

*****NOTE:** I always aim to have assignments graded within a week of the due date, often sooner. If you don't see a score within a week, please check to make sure it was received. DO NOT WAIT until the end of the semester to check. To iterate, I will not accept missing material or reconsider missing grades after the final class.

LATE ASSIGNMENT/ MAKE-UP TEST POLICY: All assignments must be submitted online on Blackboard on the due date announced unless otherwise noted by the instructor. If you cannot submit work on time, let me know beforehand and we'll make alternate arrangements. Unexcused late work will only be accepted for up to one week after the due date, with reduced credit.

METHOD OF EVALUATION & BASIS OF FINAL COURSE GRADE DETERMINATION:

Assessment Methods:

- Professor will regularly interact with the students through discussion forums, and provide feedback validating their understanding of the fundamental course material delivered through posted readings and videos and posts, papers and projects presented by other students. Discussions will be evaluated utilizing an associated Discussion Board Participation rubric and assigned points for each discussion forum.
- Posted module assignments will be discussed and critiqued by the professor and other students. The student will be evaluated utilizing an associated Written Assignment Assessment rubric and assigned points for each assignment.

- Self-assessment quizzes will be provided in seven modules to assist the student in assessing their understanding of the reading assignments. All quizzes are graded items and their weights are indicated in the course.

*****NOTE:** All rubrics and their associated assessment criteria will be available to the student.

Course Grading: Your final letter grade is determined on a **percentage-based scale**. Please don't assume that percentages from other classes guarantee a particular final grade in this class. You can track your progress throughout the semester by adding up points you've earned out of the total possible.

Course Grading:		Total Percentage
Final Exam	1@15%	15%
Self-assessment quizzes	3@5% each	15%
Assignments	7@5% each	35%
Discussion forums	7@5%	35%
Total		100%

Distribution: The distribution of your final grade will be based on the following:

A 90-100 B 80-89 C 70-79 D 60-69 F Below 60

Please do not email to ask if I will give you extra points or if you can complete missing assignments or extra credit after grades are posted (especially since I am required to submit final grades to the Registrar within 48 hours of the exam).

STUDENTS WITH DISABILITIES: All individuals who are diagnosed with a disability are protected under the Americans with Disabilities Act, and Section 504 of the Rehabilitation Act of 1973. As such, you may be entitled to certain accommodations within this class. If you are diagnosed with a disability, please make an appointment to meet with Accessibility Resources, 133 Milne Library, ext. 2137. All students with the necessary supporting documentation will be provided appropriate accommodations as determined by the Accessibility Resources Office. It is your responsibility to contact Accessibility Resources and concurrently supply me with your accommodation plan, which will inform me exactly what accommodations you are entitled to. You will only receive accommodations once you provide me with an Accessibility Resources accommodation plan. Any previously recorded grades will not be changed.

ACADEMIC INTEGRITY: You are expected to know and abide by SUNY Oneonta's Academic Integrity Policy⁸. Plagiarism in any form—including copying and pasting text from websites or other materials without using quotation marks and/or referring to information without properly crediting sources—will not be tolerated. If you unethically copy the work of another student or outside source, you will receive NO CREDIT for the entire assignment.

COURSE SCHEDULE:

Module	Topic	Task to Complete	Due Date
Week 1 (8/24-8/30)	Introduction and Syllabus Review	W1_Ice Breaker (DB)	8/27
		W1_Discussion Board	8/30
Week 2 (8/31-9/6)	Built Environment and Climate Change: Status, Challenges and Opportunities	W2_Discussion Board	9/6
Week 3 (9/7-9/13)	Sustainable Development as A Complex and Multidimensional Approach	W3_Assignment	9/13

⁸ <http://www.oneonta.edu/development/judicial/code.pdf>

Week 4 (9/14-9/20)	The Concept of Sustainable Design: Philosophy and Principles	W4_Quiz	9/20
Week 5 (9/21-9/27)	Sustainable Architecture: Definitions, Conceptual framework, and Objectives	W5_Discussion Board	9/27
Week 6 (9/28-10/4)	Fundamental Principles of Sustainable Building Design: Principle #1 Site Optimization, and Principle #2 Optimize Energy Use.	W6_Assignment	10/4
Week 7 (10/5-10/11)	Principle3# Using Renewable Energy Resources (Passive Heating/Cooling)	W7_Discussion Board	10/11
Week 8 (10/12-10/18)	Principle3# Using Renewable Energy Resources (Passive Cooling/Sustainable Technologies)	W8_Assignment	10/18
Week 9 (10/19-10/25)	Principle #4 Using Eco-friendly Building /Sustainable Tech Building Materials, and Principle #5 Minimizing Waste and Recycling	W9_Assignment	10/25
Week 10 (10/26-11/1)	Principle #6 Protect and Conserve Water	W10_Discussion Board W10_Quiz	11/1
Week 11 (11/2-11/8)	Sustainable Buildings Rating Systems: LEED® (Leadership in Energy and Environmental Design)	W11_Assignment	11/8
Week 12 (11/9-11/15)	Green Globes™ and LBC (Living Building Challenge)	W12_Assignment	11/15
Week 13 (11/16-11/22)	NZEB (Net-Zero Energy Building), WELL Building Standard®, and BREEAM® (Building Research Establishment Environmental Assessment Method)	W13_Assignment W13_Quiz	11/22
Week 14 (11/23-11/29)	Thanksgiving Holiday	No Class	-----
Week 15 (11/30-12/6)	Case Studies: Certified Sustainable Buildings Review	W15_Discussion Board	12/6
Week 16 (12/7-12/13)	Final Exam	Final Exam	12/13