

# LEED for Sustainable Design and Construction

Spring 2016

ARC 4684, Sec 06H9 / 6686, Sec 0602

Wednesdays, periods 3-5 (9:35 am-12:35 pm)

ARC 423

**Bahar Armaghani, LEED™ Fellow, LEED™ Faculty**

**ARCH 446 (east end of Architecture Building)**

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*Office Hours: W 12:40-2:00pm, or by appointment*

Sustainability is best thought of as a change process, rather than an end state. [US Executive Order 13423](#) states that sustainability “means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.” In order to achieve such conditions, new ways of designing, constructing and operating buildings and facilities must be identified. *GSA*



## **Course Description:**

This is a multidisciplinary immersion course that utilizes the built environment design and construction to educate and prepare students to become green buildings leaders and sustainability-focused citizens. This course will equip students with the skills, knowledge and expertise needed to be effective communicators, project managers, critical thinkers, problem solvers, engaged leaders, and team players in the field of sustainability.

This semester Stephen C. O’Connell Center project will be used to demonstrate design and construction of high performance buildings, and application of green building technologies. Economics and market development associated with the application of green building rating systems focused on LEED will be covered. Successful course completion can prepare the student for LEED™ V4 Green Associate and BD+C specialty exams credentials.

## **Course prerequisite:**

Minimum junior standing

## **Course Objectives:**

- Introduce students to the concepts of green and high performance buildings; strategies for design of site, water, energy, Indoor air quality, and material selection;

- Think critically about green design and why build green;
- Develop a personal appreciation of green buildings;
- Encourage innovative thinking to minimize building impact on the environment;
- Develop an understanding of the importance of individuals and team actions that contribute to solving environmental problems;
- Address ethical considerations associated with building green;
- Develop an appreciation of integrated design;
- Become familiar with similarities and differences among green building rating systems;
- Learn the nuts and bolts of the LEED rating system, LEED online tool and growing pains associated with green building rating systems;
- Provide an opportunity to participate in an on-campus green building project;
- Learn about the commissioning process and its importance during design, construction, and post occupancy;
- Understand the role of project team members in the design and construction of high performance building;

**Course Format:**

**Approach:** The course will be approached as a project while working on an actual UF project, this semester Stephen O’Connell Center renovation and addition project is selected. The students will be divided into teams with different background and specialty.

**Delivery Method:** Lectures, discussions, field trips, hands on experience on UF project, guest speakers, work in teams, team presentations, quizzes, and reports.

**Course Website:** <https://lss.at.ufl.edu>. This course is on Canvas. It will contain all course material including readings, lecture slides, assignment instructions, quizzes, announcements, and grades. All course material will be posted before class.

**Communication:** Outside of class, [barmagh@ufl.edu](mailto:barmagh@ufl.edu) email is the best and preferred method of communication.

**Project Manager’s role and responsibility:**

- Graduate students will play project manager’s role in the class to accomplish tasks related to the green strategies implementation on campus building throughout the semester.
- The project manager/graduate student is responsible for managing the team(s) during breakout sessions and site visits.
- Communicate with his/her assigned team(s) weekly on the progress of each team member’s work before class.
- Assist team members if needed in finding information, calculations, and support.
- Keep the team on track for data gathering and reporting.
- Review the final credit’s submission with the team(s) and discuss.
- Responsible for all the credits submission, back up review and completion according to the credit requirements.
- ***Each project manager to submit an end of semester two pages statement via e-mail regarding his/her role including strategies he/she took to manage the team(s), lessons learned, and recommendations.***
- **Field Trips:**
  - Field trips and/or attend selected project meetings. These maybe outside class time.
  - Field trips are required.

**Required Reading Materials:**

- LEED v4 for Building Design and Construction Reference Guide (short version) and specific material, posted on Canvas.

- Power point slides and short selected publications will be posted on Canvas.

- LEED™ V4; BD+C Reference Guide web based access for one year for \$50 per student (this is like an electronic book). This is a special offer from USGBC to LEED™ V4; BD+C students. Instructions for payment directly to USGBC and access will be provided after drop add week.

**Requirement for the class to attend spring semester Green Building Learning Collaborative event.**

**Tools and Resources:**

- **Building Green**, [www.buildinggreen.com](http://www.buildinggreen.com); is an excellent resource for the latest in sustainable built environment, cases studies, articles, materials, and more. This is a membership based site, where University is a member.

That means you have full access to all the site content.

- To access this site while on campus, you will automatically be logged in the site and can use it.

- To access the site while you are off campus, you can remotely access the site using VPN.

- To access some campus resources when you are physically off campus, you may need to install UF's VPN. The [UF VPN Service](#) is designed to allow University Faculty, Staff, and Students to securely "tunnel" into campus over other networks, such as their home internet connection, and access services as if they were on campus. Basically, it lets your computer appear as if it were located physically on campus. To install, go to [vpn.ufl.edu](http://vpn.ufl.edu). To get more information about VPN, you can visit: <https://connect.ufl.edu/it/wiki/Pages/glvpn.aspx>

- **LEEDuser**, <http://www.leeduser.com>; this is another resource with tools and examples on each LEED credit. UF has a membership to this resource too, you can access on campus. If you need to access off campus through UF VPN Service, follow above steps.

- **GSA**, <https://sftool.gov/>.

**Paperless Activities and Assignments:** E-learning on Canvas will be the hub for the communication, discussion, announcements, turn in assignments, papers/projects, take quizzes, and presentation material.

- Check e-learning on Canvas for the material and presentations that will be covered weekly.

- **Set up and Check your e-mail to receive class announcements from e-learning on Canvas.**

- All assignments/papers/presentations must be turned in electronically through e-learning on Canvas.

**Participation, Attendance and other Policies:**

- Students attend class prepared for active participation and discussion. A quality learning experience in this course rests heavily on interaction and exchange ideas related to sustainable built environment.

- You are encouraged to take notes electronically, but in this case student must e-mail the instructor his/her notes at the end of the class. Also, using cell phones and texting during class is highly discouraged.

- Reading material; **Students must complete the reading before each class.**

- Attendance is required. Arriving late to class (5-10 minutes after start of the class, or falling asleep in the class) will be considered a ½ absence. Leaving early while the class is in session will be considered an unexcused absence.

- The policy for attendance is as follows:

Unexcused Absences	Grade point deduction
4-5	5%
6-7	10%
8-9	15%

Each addition 2 absences	Additional 2%
<b>Final presentations</b>	<b>Additional 5%</b>

- **Only excused** absences can be made up. Excused absences include illness, religious holidays, a death in the family, or participation as an athlete in official UF athletic events; to be excused, absences must be properly documented, for example with a doctor's note.
- All presentations, quizzes, credit submission, and assignments must be turned in on time; projects or assignments may be turned in early. If you will not be in class to turn the assignment in, even if it is an excused absence (e.g. studio field trip), you must turn the assignment in early. Any assignment turned in after it is due will be marked late, and your grade will be penalized.
- Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

**Grading:**

Assignment	Instruction	points	Due date
Exam 1&2	Individual; 15 points each	30	On Canvas <b>Exam 1; 2/17/2016</b> <b>Exam 2; 4/13/2016</b>
Assignments,	Individual; complete assignment	20	On Canvas. See schedule
Attendance & participation	Individual; Read assigned reading, attend class, field trips, and participate in discussions	10	
Final personal statement	Individual, 1000 words personal statement about the class, the outcome, green design and construction, and lessons learned.	10	On Canvas. See schedule <b>4/20/2016</b>
Final project	<b>Team; 5-7 minutes Video and a presentation on your role in this project.</b> <b>Even # teams to present on 4/13</b> <b>Odd # teams to present on 4/20</b>  <b>All videos and presentations to be revised per final presentation comments, finalized, and uploaded to Canvas on team's page.</b>	30	4/13/2016 4/20/2016  <b>4/20/2016</b>

**Grade Scale:**

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Numeric Grade	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59
Quality Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0

See the following link to UF's grade policy:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Exams:**

Exams will be on Canvas. Each exam will cover the material that has been covered in class. These are non-cumulative exams.

### **Final Presentations:**

**Team delivery; 5-7 minutes Video and a presentation on your role in this project.**

### **Online course evaluation:**

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu> Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu>.

## **UNIVERSITY OF FLORIDA POLICIES**

### **Accommodating Students with Disabilities:**

Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

### **Student Honor Code and Academic Honesty**

Under the Student Honor Code see <http://www.dso.ufl.edu/students.php>, "on all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: 'On my honor, I have neither given nor received unauthorized aid in doing this assignment'" (6C1-4.040(a)).

*Papers will be screened for plagiarism using the text-matching Tools Turnitin (<http://turnitin.com/static/index.html>).*

Students must submit work that is original to this course, i.e., not the student's work from another course (unless it is used as a reference and properly cited).

### **Need Help? Don't hesitate to ask**

#### **PROBLEMS WITH e-learning in Canvas**

For issues with technical difficulties for E-learning in Canvas, contact the UF Help Desk at:

[Learning-support@ufl.edu](mailto:Learning-support@ufl.edu)

(352) 392-HELP(4357) - select option 2

<https://lss.at.ufl.edu/help.shtml>

For any other helps contact your instructor.

Other resources are available at <http://www.distance.ufl.edu/getting-help> for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints
- Library Help Desk support

**Disclaimer**

*This syllabus represents our current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity, access to the building, and the availability of guest speakers. Such changes, communicated clearly, are not unusual and should be expected.*

**Course Schedule**

Date	Topics
<b>Module 1: Introduction</b>	
<b>Week 1</b> W,1/6	<ul style="list-style-type: none"> <li>- Welcome &amp; Introduction</li> <li>- Review syllabus</li> <li>- Review use of Canvas, course files, material, and paperless approach</li> <li>- UF campus sustainability overview and status</li> <li>- Review green building rating systems with focus on LEED™ V4; BD+C</li> <li>- Green building/LEED™ V4; BD+C goals, benefits and certification</li> <li>- Why build green?</li> </ul> <p>The course is focused on multidisciplinary team approach.</p> <p><b><u>Teams</u></b></p> <ul style="list-style-type: none"> <li>- Identify project team managers, members &amp; responsibilities</li> </ul> <p><b><u>Introduction to the following tools:</u></b></p> <ul style="list-style-type: none"> <li>- <a href="http://www.buildinggreen.com">www.buildinggreen.com</a></li> <li>- <a href="http://www.Leeduser.com">www.Leeduser.com</a></li> </ul> <p><b>Video 2014</b>, The blueprint for a carbon-free and just built environment by 2050.  <a href="https://vimeo.com/101548831">https://vimeo.com/101548831</a></p> <p><b>Assignment #1: Establish a USGBC account</b></p>
<b>Module 2: LEED™ V4; BD+C Project Administration</b>	
<b>Week 2</b> W, 1/13	<b>Project Planning and Assessment</b>
<ul style="list-style-type: none"> <li>- <i>Getting Started (Reading)</i></li> <li>- <i>Minimum Program Requirements (reading)</i></li> <li>- <i>Rating system selection (reading)</i></li> </ul>	
<ul style="list-style-type: none"> <li>- LEED™ V4; BD+C scorecard</li> <li>- Categories and credits structure</li> <li>- Identify pre-requisites and credits</li> <li>- <i>Assign pre-requisites and credits to project team members</i></li> <li>- <i>LEED™ V4; BD+C boundary</i></li> <li>- <i>LEED™ V4; BD+C online demonstration</i></li> <li>- <i>FTE calculation</i></li> <li>- <i>Owner Project Requirements (OPR)</i></li> <li>- <i>Basis of Design (BOD)</i></li> <li>- <i>Leading sustainability charrette</i></li> </ul>	

	<p>- <i>Integrative Approach</i></p> <p><u><i>In class: Breakout session</i></u></p> <ul style="list-style-type: none"> <li>- Each team to meet for introduction and understanding roles and responsibilities.</li> </ul> <p>Field trip, walk through building, User's group</p>
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## Module 3: Understanding the Project Scope and the Integrative Process

<p><b>Week 3</b> W, 1/20</p>	<ul style="list-style-type: none"> <li>- Understand and review the project program and OPR</li> <li>- Review the project BOD</li> <li>- Review the LEED™ V4 Boundary</li> <li>- Building occupancy schedule and hours of operation</li> <li>- Full time equivalent (FTE), part time &amp; transient</li> <li>- Learn about the stakeholders and building occupants</li> <li>- Assess LEED™ V4; BD+C checklist for this project</li> </ul> <p>Check for resources; <a href="http://www.leaduser.com">www.leaduser.com</a></p>
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### Reading; Integrative Process and Location and Transportation

*In class: Breakout session*

- Each team to make an assessment on LEED™ V4; BD+C checklist for O'Connell Center for this module's credits
- Each team to discuss strategies to be implemented
- Each team member to understand the credits' intent and requirements
- Team to make a list of tools they used to meet the credit requirements
- Review the Integrative approach

National Charrette Institute; <http://www.charretteinstitute.org/resources.html>

Assignment #2, individual team members, outline for charrette agenda and outcome with preliminary assessment of LEED™ V4; BD+C checklist for this project.

*All credits will be discussed and addressed in class, but only the pre-requisites and attempted credits will require backup documentation*

## Module 4: Location & Transportation

<p><b>Week 4</b> W, 1/27</p>	<p>Discuss strategies used for the site selection, density, and transportation including:</p> <ul style="list-style-type: none"> <li>- LEED for Neighborhood Development Location</li> <li>- Sensitive Land Protection</li> <li>- High Priority Site</li> <li>- Surrounding Density and Diverse Uses</li> <li>- Access to Quality Transit</li> <li>- Bicycle Facilities</li> <li>- Reduced Parking Footprint</li> <li>- Green Vehicles</li> </ul> <p>Check for resources; <a href="http://www.leaduser.com">www.leaduser.com</a></p>
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**Reading: Materials and Resources**

***In class: Breakout session***

- Review the credits for this module
- Assess and determine which credits in this module the project can pursue
- List tools used to meet the requirements for this module credits.

**Guest Speaker, Architect and Interior Designer**

**Assignment #3: complete the density and transportation credits with mapping.**

**Module 5: Building Material Selection**

**Week 5**

W, 2/3

- Discuss strategies for:
- Storage and collection of recyclables
  - Construction and demolition waste management planning



- Building life-cycle impact reduction
- <http://www.athenasmi.org/our-software-data/ecocalculator/>

- Building product disclosure and optimization - environmental product declarations
- Building product disclosure and optimization - sourcing of raw materials
- Building product disclosure and optimization - material ingredients

Check for resources; [www.leeduser.com](http://www.leeduser.com)

**Reading; Sustainable Site**

***In class: Breakout session***

- Each team to review the Athena calculator
- list the information needed for the calculator
- Develop outline for Construction waste management plan
- Develop a letter for vendors on building product disclosure and optimization
- Assess and determine which credits in this module the project can pursue

**Assignment #4: submit the output of the Athena calculator**

**Guest Speaker, Structural engineer**

**Module 6: Sustainable Site**

**Week 6**

W, 2/10

Discuss strategies for the project site selection and impact including:

- Construction Activity Pollution Prevention
- Site Assessment
- Site Development - Protect or Restore Habitat
- Open Space
- Rainwater Management
- Heat Island Reduction
- Light Pollution Reduction

Check for resources; [www.leeduser.com](http://www.leeduser.com)

	<p><b>Reading; Water Efficiency inside and outside the building</b></p> <p><i><u>In class: Breakout session</u></i></p> <ul style="list-style-type: none"> <li>- Assess and determine which credits in this module the project can pursue</li> <li>- List tools needed for this module</li> </ul>
<h2>Module 7: Water Conservation and strategies</h2>	
<p>Week 7 W, 2/17</p>	<p>Water efficiency and conservation strategies overview for:</p> <ul style="list-style-type: none"> <li>- Outdoor Water Use Reduction</li> <li>- Indoor Water Use Reduction</li> <li>- Building-Level Water Metering</li> <li>- Outdoor Water Use Reduction</li> <li>- Indoor Water Use Reduction</li> <li>- Cooling Tower Water Use</li> <li>- Water Metering</li> </ul> <p>- Review WaterSense at <a href="http://www.epa.gov/watersense/our_water/start_saving.html">http://www.epa.gov/watersense/our_water/start_saving.html</a></p> <p><b>Check for resources; <a href="http://www.leeduser.com">www.leeduser.com</a></b></p> <p><b>Reading; Energy &amp; Atmosphere</b></p> <p><b>EPA interactive water budget tool;</b> <a href="http://www.epa.gov/watersense/water_budget/application.html">http://www.epa.gov/watersense/water_budget/application.html</a></p> <p><b>water budget data finder; <a href="http://www.epa.gov/WaterSense/new_homes/wb_data_finder.html">http://www.epa.gov/WaterSense/new_homes/wb_data_finder.html</a></b></p> <p><b>WaterSense® Water Budget Approach;</b> <a href="http://www.epa.gov/watersense/docs/home_final_waterbudget508.pdf">http://www.epa.gov/watersense/docs/home_final_waterbudget508.pdf</a></p> <p><b>Calculate your personal water saving;</b> <a href="http://www.epa.gov/watersense/our_water/start_saving.html#tabs-3">http://www.epa.gov/watersense/our_water/start_saving.html#tabs-3</a></p> <p><i><u>In class: Breakout session</u></i></p> <ul style="list-style-type: none"> <li>- Review the tools and data needed for water calculations indoor and outdoor</li> <li>- Assess and determine which credits in this module the project can pursue</li> </ul> <p style="background-color: yellow;"><b>Guest Speaker: Water conservation outside the building</b></p> <p style="background-color: yellow;"><b>Assignment #5: use LEED™ V4; BD+C online to calculate water saving and be prepared to share with the class. This include indoor and outdoor water calculations</b></p>
<h2>Exam 1 on Canvas</h2>	
<h2>Module 8: Energy Conservation and Commissioning</h2>	
<p>Week 8 W, 2/24</p>	<p>Discuss strategies for energy conservation measure including:</p> <ul style="list-style-type: none"> <li>- Fundamental Commissioning and Verification</li> <li>- Minimum Energy Performance</li> <li>- Building-Level Energy Metering</li> <li>- Fundamental Refrigerant Management</li> <li>- Enhanced Commissioning</li> <li>- Optimize Energy Performance</li> </ul>

	<ul style="list-style-type: none"> <li>- Advanced Energy Metering</li> <li>- Demand Response</li> <li>- Renewable Energy Production</li> <li>- Enhanced Refrigerant Management</li> <li>- Green Power and Carbon Offsets</li> </ul> <p>Check for resources; <a href="http://www.leaduser.com">www.leaduser.com</a></p> <p><b>Reading; Energy and Atmosphere</b></p> <p><i><b>In class: Breakout session</b></i></p> <ul style="list-style-type: none"> <li>- Review the tools and data needed for water calculations indoor and outdoor</li> <li>- Assess and determine which credits in this module the project can pursue</li> <li>- Discuss and list tools needed for this module</li> </ul> <p><b>Guest speaker; Energy Modeling</b></p>
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**Week 9, 3/1, Spring Break**

**Module 9: Continue Energy & Atmosphere**

Week 10	<b>Reading; Indoor Environmental Quality</b>
W, 3/9	<b>Guest Speaker, Commissioning</b>

**Module 10: Indoor Environmental Quality, Health and Wellbeing**

Week 11	<p>Discuss strategies for building indoor environmental quality and providing be better environment for the health and wellbeing of the occupants including:</p> <ul style="list-style-type: none"> <li>- Minimum Indoor Air Quality Performance</li> <li>- Environmental Tobacco Smoke Control</li> <li>- Enhanced Indoor Air Quality Strategies</li> <li>- Low-Emitting Materials</li> <li>- Construction Indoor Air Quality Management Plan</li> <li>- Indoor Air Quality Assessment</li> <li>- Thermal Comfort</li> <li>- Interior Lighting</li> <li>- Daylight</li> <li>- Quality Views</li> <li>- Acoustic Performance</li> </ul> <p>Harvard Study Shows Elevated CO2 Levels Directly Affect Human Cognitive function, 10/26/2015</p> <p><a href="http://www.hsph.harvard.edu/news/press-releases/green-office-environments-linked-with-higher-cognitive-function-scores/">http://www.hsph.harvard.edu/news/press-releases/green-office-environments-linked-with-higher-cognitive-function-scores/</a></p> <p>Check for resources; <a href="http://www.leaduser.com">www.leaduser.com</a></p> <p><b>Reading; Indoor Environmental Quality</b></p> <p><i><b>In class: Breakout session</b></i></p> <ul style="list-style-type: none"> <li>- Review the tools and data needed for indoor air quality calculations</li> <li>- Assess and determine which credits in this module the project can pursue</li> <li>- Discuss and list tools needed for this module</li> </ul>
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	- Discuss the Harvard study on elevated CO2 level indoors and the cognitive function. <b>Guest Speaker, Mechanical engineer</b>
<b>Module 11: (Cont.) Indoor Environmental Quality</b>	
Week 12	Check for resources; <a href="http://www.leaduser.com">www.leaduser.com</a>
W, 3/23	<b>Reading; Innovation and Regional Priority</b> <b>Assignment #6: Final personal statement</b>
<b>Module 12: Innovation and Regional Priority, Quality Control of the Documentations and final Review</b>	
Week 13	- Discuss strategies for Innovations in the project - Determine the Regional Priority for this project - Review the documentations and all backup information for each credit - Each team to upload credit information into Canvas on the team's page - Review all the tools used to achieve credit requirements
W, 3/30	
<b>Module 13: LEED™ V4; BD+C Green Associated (GA) exam review</b>	
Week 14	- Review LEED™ V4; BD+C accreditation exam - Registration for the exam - Preparation for the exam - Review sample exam questions
W, 4/6	
<b>Final Presentation</b>	
Week 15	- Each team to present one combined final PowerPoint presentation on your team's role, approach, strategies, and lessons learned. - Each team to present one 5-7 minutes video on your team's role in this project and achieving certification and lessons learned. - <b>All credit submittals with its back up and a copy of completed LEED online form to be uploaded to Canvas on your team's page by 4/20/2016.</b>
W, 4/13	
<b>Exam 2 on Canvas</b>	
Week 16	Continue final presentations
W, 4/20	