

Green Building Strategies LEED Lab

Fall, 2016

DCP 4930, section 14EA/ 6931, section 14EE

Tuesdays, Periods 5-7 (11:45 AM-2:45 PM)
ARCH 423

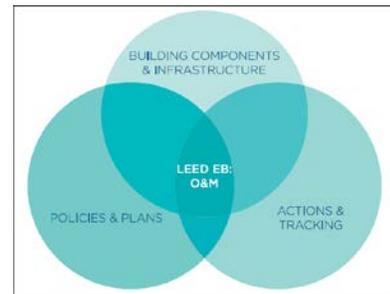
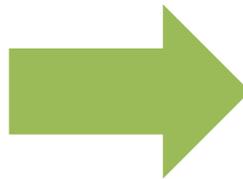
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Office Hours: T 10:00-11:30 AM, or by appointment

Transforming Existing Buildings into High Performance Sustainable Buildings

While the environmental performance of new commercial buildings in the United States has been improving dramatically in recent years, most existing buildings were constructed when energy was less expensive, technologies were less advanced, and environmental performance rarely a priority. Older, existing buildings generally use significantly more energy and water than new buildings of the same size and function. According to the Institute for Building Efficiency, existing buildings that are 20 years and older make up more than 70 percent of the built environment by square footage. Thus, existing buildings offer tremendous opportunities to conserve energy and water as well as provide healthier, more productive work environments. *EPA*



Green buildings help create healthy environment while saving energy, resources, and money.

LEED™ V4 for Existing Buildings: O+M contains performance standards for the sustainable operation of existing buildings that are not undergoing major renovations. It covers building systems, infrastructure, practices, and policies.

Course Description:

This is a multidisciplinary course that utilizes the built environment's performance, operations and maintenance 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.

Campus buildings will be used as laboratory for hands-on learning. Reports and findings will be shared with the campus stakeholder and building occupants, educate building occupants and operation and maintenance staff, and establish guidelines for building measurement and verification, operation, and maintenance, and pursue LEED™ V4 for Existing Buildings Operations and Maintenance certification.

Successful course completion can prepare the student for LEED™ V4 Green Associate and O+M specialty exams credentials.

Course prerequisite:

Minimum junior standing

Learning Objectives

This course is designed to produce the following outcomes:

- Students' ability to assess the performance of existing buildings and facilitate the LEED™ V4 for Existing Buildings: Operations and Maintenance (EB: O+M) process with the goal of certifying the facility.
- Equip students with the skills, knowledge needed to be effective communicators, project managers, critical thinkers, problem solvers, engaged leaders, and team players to meet the needs of today's industry's needs.
- Learn skills and tools needed for energy, water, and lighting audits, and develop policies for best practices in Operations and maintenance of facilities.
- Assess and develop polices and techniques to improve building exterior, site, water and energy consumptions, remodeling, waste management, and purchasing.
- Learn LEED™ V4 project administration, registration, submission, and LEED™ V4 online utilization.
- Recognize how improving building operation and maintenance lead to higher performing buildings.
- At the end of the semester the students can be prepared for LEED™ V4 Green Associate (GA) and LEED™ V4 EB: O+M professional credential exams.

Course Format:

Approach: The course will be approached as a project while working on an actual UF building, this semester Lacrosse Locker Room Facility is selected for LEED™ V4 Lab and LEED™ V4 EB; O+M certification.

Delivery Method: Lectures, discussions, field trips on campus, hands on experience, guest speakers, work in teams, team presentations, quizzes, and end of semester personal statement.

Course Website: <http://elearning.ufl.edu/>: This course's e-learning in Canvas site will contain all course materials, including readings, lecture slides, assignment instructions, quizzes, announcements, and grades. All course material will be posted before class starts.

Communication: Outside of class, barmagh@ufl.edu email is the best and preferred method of communication.

This is a team oriented course working on a real life project. Being a team player will contribute to your team's and class's success, which will lead to achieving project/building LEED™ V4 certification.

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 site visits, make a list of info/data needed before the visit and communicate it with team members. During the site visits make sure the team(s) collected the data needed.
- Communicate with his/her assigned team(s) weekly on the progress of each team member's work before the 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 report and 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 (double spaced) statement via e-mail regarding his/her role including strategies he/she took to manage the team(s), lessons learned, and recommendations for improvement.*

Field Trips and Guest Speakers:

- Multiple field trips will be scheduled to the campus building that is selected for implantation of green strategies and LEED™ V4 EB; O+M certification. Some maybe outside class time.
- Field trips are required.
- Guest speakers on topics related to greening existing buildings.

Required Reading Materials:

LEED™ V4 for Existing Building Operations and Maintenance Reference Guide, short version posted on Canvas along with other resources and readings.

- Power point slides and short selected publications posted on Canvas
- Using www.LEEDuser.com as supplemental resource

- LEED™ V4 EB; O+M 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 Lab students. Instructions for payment directly to USGBC and access will be provided after drop add week.

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



Tools and Resources:

- **Building Green, www.buildinggreen.com** ; is an excellent resource in the latest in sustainable built environment, cases studies, articles, materials, and more. This is a membership based site, where University is a member of. That means you have full access to all the site content.
 - o To access this site while on campus, you will automatically be logged in the site and can use it.
 - o To access the site while you are off campus, you can remotely access the site using VPN.
 - o 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 . To get more information about VPN, you can visit: <https://connect.ufl.edu/it/wiki/Pages/glvpn.aspx>.
- If you have problems accessing the site use the following;
<https://www.buildinggreen.com/ufl>
- **LEEDuser, <http://www.leaduser.com>** ; this is another resource with tools and examples on each LEED™ V4 credit. UF has a membership to this resource, you can access on campus. If you need to access off campus through UF VPN Service, follow above steps.
- If you have problems accessing the site use the following;
<http://www.leaduser.com/ufl>
- **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 not allowed.
- 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% |
| 10-11 | 20% |
| Each addition 2 absences | Additional 2% |
| Final presentations | Additional 5% |

- **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 Exam 1; 10/4/2016 Exam 2; 11/15/2016 |
| Assignments, | Individual; complete assignment | 24 | On Canvas. See schedule |
| Attendance & participation | Individual; Read assigned reading, attend class, field trips, and participate in discussions | 10 | 5 points attendance 5 points field trips & discussion |
| Draft final project | Team submission | 6 | On Canvas. 11/29/2016 |
| Final project; see above specifics | Teams; present the summary of the developed procedures with a 3-5 minutes video making a compelling case on the topic | 30 | |

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 Projects/Presentations: Team Delivery

- **Energy team; develop written procedures for energy audit including return on investment (ROI) and reduction in Carbon with a 3-5 minutes video making a compelling case on the topic.**
- **Indoor Environmental Quality team; develop written procedures for air ventilation and IAQ audit including return on investment (ROI) and reduction in Carbon with a 3-5 minutes video making a compelling case on the topic.**
- **Water team; develop written procedures for water audit including return on investment (ROI) and reduction in Carbon with a 3-5 minutes video making a compelling case on the topic.**
- **Lighting audit team; develop written procedures for lighting audit including return on investment (ROI) and reduction in Carbon with a 3-5 minutes video making a compelling case on the topic.**

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

(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.

Weekly Class Schedule

| Date | Topics |
|---|--|
| Module 1: Introduction to Green Building, Benefits, Goals, and Tools | |
| Week 1 T,8/23 | <ul style="list-style-type: none"> - Welcome & Introduction - Review syllabus - Review use of Canvas, course files, material, and paperless approach - UF campus sustainability overview and status - Review green building rating systems with focus on LEED™ V4 EB;O+M - Green building/LEED™ V4 goals, benefits, certification and recertification - Why green? <p><u>Teams</u></p> <ul style="list-style-type: none"> - Identify project team managers, members & responsibilities <p><u>Introduction to the following tools:</u></p> <ul style="list-style-type: none"> - www.buildinggreen.com - www.Leeduser.com - Course instrumentation <p>- Video, Watch Ed Mazria and Peter Calthorpe's Presentation from Congress for the New Urbanism (CNU) 23rd meeting, <i>May 21, 2015</i></p> <p>http://architecture2030.org/watch-ed-mazria-and-peter-calthorpes-presentation-from-cnu-23/</p> |

Skills Learning

Module 2: LEED™ V4 Project Administration

Week 2 Project Planning and Assessment

T, 8/30

Reading:

- *Getting Started*
- *Minimum Program Requirements*
- *Rating system selection*

- **Campus and/or a single building approach**
- LEED™ V4; O+M scorecard
- LEED™ V4 Lab Timing Chart
- Credit structure; establishment and performance
- Identify pre-requisites and credits
- *Assign pre-requisites and credits to project team members*
- *Identify policies needed*
- *Performance period*
- *Performance credits or establishment credits*
- *LEED™ V4 boundary*
- *LEED™ V4 online demonstration and invitation*
- *FTE calculation*
- *Leading sustainability charrette*
- *Integrative Approach*

Database of State Incentives,

www.dsireusa.org

In class: Breakout session

- Each team to meet for introduction and understanding roles and responsibilities.

Assignment #1: Establish a USGBC account

Module 3: Reading and Understanding Building Drawings

Week 3 Building Review

T, 9/6

- Learn about Lacrosse Locker Room Facility
- Building drawings, site, architecture, and Mechanical, Electrical, Plumbing (MEP)
- Utility data analysis
- Building green features, Review of prior LEED™ NC certification
- Building occupancy schedule and operation
- Occupancy, Full time equivalent (FTE), part time & transient
- Learn about the stakeholders that you need to know and work with including: building occupants, maintenance & operation, purchasing staff, utilities, energy, grounds, facilities management, and Waste management department.
- Assess LEED™ V4; O+M scorecard for Lacrosse/campus approach

Check for resources; www.leaduser.com

In class: Breakout session

- Think about a charrette for the project, identify your role in this project charrette
- *Each team understand their roles and responsibilities for credits/pre-requisites completion and upload to LEED™ V4 online.*

- Each team member to confirm his/her access to LEED™ V4 online
- Each team member to get familiar with the LEED™ V4 online credits Forms and required documentations

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

Invite students to join LEED online

All credits will be discussed and addressed in class, but only the pre-requisites and attempted credits will require backup documentation and upload to LEED™ V4 online

Module 4: Energy Audit and Energy Star Rating

Week 4 Energy Conservation Strategies and Measures

T, 9/13

Energy Audit Team

-Introduction to energy and air quality instrumentation for building measurement and verification

- Energy efficiency and conservation strategies overview
- ASHRAE Level 1, energy audit process, approach, equipment/tools, data collection, reporting. Prepare for site energy audit
- ASHRAE 62.1-2010, Minimum Indoor Air quality Performance, process, calculations, tools, reporting. Prepare for site air performance audit.
- Existing building Commissioning (Cx)analysis, implementation, and ongoing, approach, tools, analysis, reporting

Check for resources; www.leaduser.com

Reading; Energy and Atmosphere category to Existing Building Commissioning credit

Energy Star target finder

<https://portfoliomanager.energystar.gov/pm/targetFinder;jsessionid=604A5298165C35755993E38D12CB0816?execution=e1s1>

In class: Breakout session

- Each team to review the policies in the module
- Perform Energy Star rating
- Review all the forms needed for ASHRAE Level I audit
- Energy Star Portfolio Manager; demonstration
- Discuss and decide Campus or building approach

Assignment #2, individual team members, outline for charrette agenda and outcome with preliminary assessment of LEED™ V4 checklist for Lacrosse project.

Guest speaker; Robert Chronic; Energy audit

Module 5: Lighting Audit and Cost Benefits and ROI And (Cont.) Energy Conservation Strategies

Week 5

T, 9/20

Lighting audit

- Energy efficiency best management practices
- Optimize energy performance
- Advanced energy metering

| | |
|--|--|
| Lighting audit team | <ul style="list-style-type: none"> -Demand response -Renewable energy and carbon offsets -Enhanced refrigerant management -Existing building commissioning analysis -Existing building commissioning implementation -Ongoing commissioning -Building level energy metering -Fundamental refrigerant management <p>Reading: Energy and Atmosphere category from existing building commissioning credit to the end.</p> <p>Check for resources; www.leaduser.com</p> <p><i>In class: Breakout session</i></p> <ul style="list-style-type: none"> - Each team to review the policies in the module - Prepare for site visit, assign site visit tasks/teams - Develop policies associated with this module - Review utility data consumption with focus on electric, steam, chill water, gas - Discuss and decide Campus or building approach |
| Guest Speaker, John Lawson: Lighting audit | |
| Module 6: Building Visit Measurement and Verification | |
| Week 6 T, 9/27 | <ul style="list-style-type: none"> - Meet at the building, The south east gate - Conduct ASHRAE Level 1 audit - Conduct water audit - Conduct lighting audit - Use class instrumentation <p style="background-color: #00FF00; padding: 2px;">Due to access to the building, this site visit may be outside class time.</p> <p style="background-color: yellow; padding: 2px;">Assignment #3: Energy Star rating for Lacrosse Locker Room Facility and another example building will be provided.</p> <ul style="list-style-type: none"> - Confirm what is on the drawings with what is installed - Use the forms used in class to record data during walk through - Take necessary photos for documentation and report - Share the data in next class |
| Guest speaker; Robert Chronic; Energy audit | |
| Module 7: Water audit, conservation and strategies | |
| Week 7 T, 10/4 Water audit team | <ul style="list-style-type: none"> - Water efficiency and conservation strategies overview - Indoor water use reduction - Building level water metering - Outdoor water use reduction - Indoor water use reduction - Cooling tower water use - Water metering -Review water meter data for at least past three years - Review WaterSense at http://www.epa.gov/watersense/our_water/start_saving.html |

Reading; Water Efficiency category

Check for resources; www.leeduser.com

EPA interactive water budget tool; outdoor water
http://www.epa.gov/watersense/water_budget/application.html

water budget data finder; http://www.epa.gov/WaterSense/new_homes/wb_data_finder.html

WaterSense® Water Budget Approach;
http://www.epa.gov/watersense/docs/home_final_waterbudget508.pdf

Calculate your personal water saving;
http://www.epa.gov/watersense/our_water/start_saving.html#tabs-3

In class: Breakout session

- Each team to review the policies in the module
- Each team review credits pursuing in this module
- Discuss and decide Campus or building approach

Assignment #4; Final project draft due

Exam 1 on Canvas**Module 8: Data review****Week 8**

T, 10/11

In class review energy, water, and lighting data collection and completing forms and calculations. Each to have a rough draft of the procedure and formula for ROI

Reading; Transportation and site categories to Rainwater management

Module 9: Site and Transportation Survey and Assessment**Week 9**

T, 10/18

- Site and transportation Overview
- Location & Transportation; Alternative transportation
- Site management policy
- Site development – protect and restore habitat
- Rainwater management

- Heat island reduction
- light pollution reduction
- Site management
- Site improvement plan
- Joint use of facilities

Check for resources; www.leeduser.com

Reading; Site categories from Rainwater management to the end of site category

In class: Breakout session

- Each team to review the policies in the module
- Each team review credits pursuing in this module
- Discuss and decide Campus or building approach

Assignment #5: Calculate water saving and be prepared to share with the class. This include indoor and outdoor water calculations.

Guest speaker; Sanjyot Bhusari; Commissioning

Module 10: Building Operations, Material Consumption

- Week 10
T, 10/25
- Building operations and material consumption overview
 - Ongoing purchasing and waste policy
 - Facility maintenance and renovation policy
 - Purchasing-ongoing
 - Purchasing-lamps
 - Purchasing- facility maintenance and renovation
 - Solid waste management-ongoing
 - Solid waste management-facility maintenance and renovation

Check for resources; www.leaduser.com

Reading; Material category

In class: Breakout session

- Each team to review the policies in the module
- Each team review credits pursuing in this module
- Discuss and decide Campus or building approach

T 10/25 **Guest Speaker, Katie/ Allen Masters; UF Recycling**

Module 11: Indoor Environmental Quality, Health and Wellbeing

- Week 11
T, 11/1
IAQ audit team
- Building indoor environmental quality and health and wellbeing overview
 - Minimum indoor air quality performance
 - Environmental tobacco smoke control
 - Indoor air quality management program
 - Enhanced indoor air quality strategies
 - Thermal comfort
 - Interior lighting
 - Daylight and quality views

Check for resources; www.leaduser.com

Reading; Indoor Environmental Quality categories

Harvard Study Shows Elevated CO2 Levels Directly Affect Human Cognitive function, 10/26/2015
<http://www.hsph.harvard.edu/news/press-releases/green-office-environments-linked-with-higher-cognitive-function-scores/>

In class: Breakout session

- Each team to review the policies in the module
- Each team review credits pursuing in this module
- Discuss and decide Campus or building approach

Assignment #6: ASHRAE 62.1 calculation.

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|--|--|
| | |
| Field trip | Shands hospital under construction |
| Module 12: Indoor Environmental Quality, Health and Wellbeing | |
| Week 12 T, 11/8 IAQ audit team | <ul style="list-style-type: none"> - Green cleaning policy -Green cleaning-custodial effectiveness assessment -Green cleaning products and materials -Green cleaning –equipment -Integrated pest management -Occupant comfort survey <p>Check for resources; www.leaduser.com</p> <p>Reading; Indoor Environmental Quality categories continue</p> <p><i>In class: Breakout session</i></p> <ul style="list-style-type: none"> - Each team to review the policies in the module - Each team review credits pursuing in this module - Discuss and decide Campus or building approach |
| Module 13: Innovation and Regional Priority, Quality Control of the Documentations and final Review | |
| Week 13 T, 11/15 | <ul style="list-style-type: none"> - Review strategies for innovations and regional credits - Each team to review the documentations and all backup information for each credit - Each team to upload information into Canvas on the team’s page - Review all policies and pre-requisites including: <ul style="list-style-type: none"> ➤ Site management policy ➤ Indoor water use reduction ➤ Building level water metering ➤ Energy efficiency best management practices ➤ Minimum energy performance and metering <p>Reading; ID and RP category</p> |
| Exam 2 on Canvas | |
| Module 14: LEED™ V4 Green Associated (GA) exam review | |
| Week 14 T, 11/22 | <ul style="list-style-type: none"> - Review LEED™ V4 accreditation exam - Registration for the exam - Preparation for the exam - Review sample exam questions |
| Final Presentation | |
| Week 15 T, 11/29 | <ul style="list-style-type: none"> - 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. |

| | |
|-----------------------|---|
| | - 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 11/29/2016. |
| Week 16 T, 12/6 | Final Presentations 35 minutes per team presentation including video and Q/A |