

# EGN 4943: Interdisciplinary Capstone Design Project I (IDCD I)

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## Catalog Description

A senior-level capstone design experience for interdisciplinary engineering students. This culminating design experience begins with IDCD I, which will focus on problem definition, stakeholder and system analysis, requirements definition, global implications of design, ethics of design, ideation, teamwork, and design communication. Students will work on a team of their peers to begin a client-based project that will conclude in Interdisciplinary Capstone Design Project II (IDCD II).

NOTE: This is also a Global Learning Discipline-Specific course that counts toward the Global Learning graduation requirement.

## Course Description

The final year, capstone design experience is the culminating design experience within your undergraduate engineering experience. The purpose of this two-semester, team-based, project-based design experience is to provide you with a valuable opportunity to (1) integrate the knowledge you have learned in previous engineering and non-engineering courses, (2) collaborate with a diverse group of your peers on an interdisciplinary, client-based engineering project, (3) practice your professional skills (i.e., teamwork, communication, reflection), and (4) refine your abilities to approach engineering challenges from a systematic, human-centered perspective. In addition, you will explore how your project work connects to global markets, communities, and systems. IDCD I will be the first semester of a two semester capstone that will prepare you to be leaders and exemplary collaborators in multidisciplinary, global engineering work environments and will support your during your job search experience.

## Course Objectives

Through the activities within this course, you will further your abilities to:

1. Apply a systematic engineering design approach to break down an interdisciplinary problem, identify technical, commercial, social, global and environmental constraints, formulate design requirements, and generate and evaluate potential design solutions. [LO #1]
2. Articulate and integrate the disciplinary knowledge (from multiple disciplines) necessary to complete a project. [LO #2]
3. Collaborate, reflect, and identify specific areas (e.g., time management, communication, cooperation, technical contribution, etc.) in which they and their group members can improve for future collaborations. [LO #3]
4. Communicate technical information clearly and concisely within written assignments, reports, and class presentations. [LO #4]
5. Critically reflect on their work as an engineer by examining the ethical issues that may arise during the design process. [LO #5]

## Global Learning Course Objectives

As part of these objectives, you will connect your engineering design work with your development as a global learner and citizen through the following objectives. Through the activities within this course, you will further your abilities to:

1. **Articulate and analyze the interrelationships** among their experiences and education as global, interdisciplinary engineer. [GLO #1 - Global Awareness]
2. **Conduct a systems and stakeholder analysis** of their interdisciplinary design problem to further motivate the necessity for their project, its potential positive and negative impacts on stakeholders and society globally, and to define global constraints for the project. [GLO #2 – Global Perspective]
3. **Collaborate on interdisciplinary design teams** to develop solutions that **address interdisciplinary and complex local, global, and/or international engineering problems.** [GLO #3 – Global Engagement]

## Course Organization

**Course Materials.** There are no required textbooks. Most course materials will be posted to Canvas. Online course materials will be based on engineering design, interdisciplinary engineering, and systems engineering research, including but not limited to:

### PODCASTS/TALKS:

- Lorna Davis's - [A Guide to Collaborative Leadership](#)
- Ernesto Sirolli's [Want to help someone? Shut up and listen!](#)

### READINGS:

- [Google's Manifesto Mess: The Indisputable Case for EQ](#)
- [Chapter 4: Rethinking Design Thinking \(Links to an external site.\)](#) from *The Way to Design*
- "[Leverage Points: Places to Intervene in a System](#)" by Donella Meadows
- Crismond, D. And Adams, R.S. (2012) "The Informed Design Teaching and Learning Matrix". *Journal of Engineering Education*, 101 (4) pp. 783-797
- Selections from: Gibson, J.E., Scherer, W.F., Gibson, W.F., and Smith, M.C. (2016) *How to do Systems Analysis: Primer and Casebook* John Wiley & Sons.
- Selections from: Cross, N. (2004) *Engineering Design Methods: Strategies for Product Design*, 3rd Edition, Wiley.
- Selections from: Brown, V.A., Harris, J., & Russell, J.Y. (eds) (2010). *Tackling Wicked Problems: Through the Transdisciplinary Imagination*. London: Earthscan.
- Selections from: Kumar, V. (2015) *101 Design Methods: A Structured Approach for Driving Innovation in your Organization*. John Wiley & Sons.
- Selections from: Norman, D. (2013) *Design of Everyday Things*. Hachette Book Group.

**Evaluation.** This class will provide you with many opportunities to engage with the topics and skills that are central to this course. Assignments will be predominantly collaborative work, but will also include individual assignments. Your course grade will be a weighted sum of the assignments.

The course is broken down into the following areas:

- **65% Project Deliverables, including**

- *Team Experience Design Assignments* [LO #3, GLO #3] – Whether through intentionally designing how you and your team will collaborate or assessing your and your peers' global engagement and leadership abilities, these assignments will seek to help you develop as a team member and a leader prepared to work on cross-disciplinary and diverse teams.
- *Design Report Submissions* [LO #1-2, 4, GLO #3] – These submissions will capture the process and final solution your team develop during this design experience. Your team will submit components of your final design report throughout the semester for feedback.

- *Interdisciplinary and Global Learning Components* – Given that you will be working on multi-disciplinary design teams with students from other senior design courses, you will be asked to incorporate two sections of the report that articulate the interdisciplinary and global nature of your design project.
  - *Disciplinary Grounding Statement* [LO #2,4]
  - *Global Systems and Stakeholder Analysis* [LO #4, 5, GLO #2]– This statement will serve as an assessment of the Global Perspective outcome as you and your team share the results of your analysis of project stakeholders and systems at a local and global scale.
- *Midpoint Project Review Presentation* [LO #1-2, 4, GLO #3] – Your team will present to faculty and practicing engineers from a variety of disciplines. In anticipation of that presentation, you will get practice and feedback through in-class activities and practice sessions.
- **10% Professional Preparedness Portfolio [LO #2 & 4, GLO #1]**
  - The portfolio will be an individual assignment that includes community feedback sessions during class to support you in reflecting on your experiences and developing your portfolio.
  - The portfolio is broken down into several draft grades and a final assessment based on criteria that align with your development as a global, interdisciplinary engineer.
- **10% Designer Development Assignments (DDAs) [LO #1-3, 5; GLO #2]** – These assignments will expose you to different perspectives of design and help you further your skills as a human-centered, systems-minded designer. As such, the DDAs will incorporate opportunities for you to develop your Global Awareness and Global Perspective.
- **15% Participation [LO #3, GLO #3]** (including class participation and participation as a contributing member of project teams)

The grading scale for the course is included below.

Letter	Range (%)	Letter	Range (%)	Letter	Range (%)
A	Above 93	B-	80 - 83	D+	67 - 70
A-	90 - 92	B	77 - 79	D	64 - 66
B+	87 - 89	B+	74 - 76	D-	61 - 63
B	84 - 86	B-	71 - 73	F	< 61

### Major Assignments

**Project Deliverables.** This course is grounded on a year-long, interdisciplinary, client-based project experience. As such, the project deliverables have been designed to scaffold your experience, provide formative feedback throughout the project, and also provide you and your team opportunities to take ownership over your design project and process. As part of the project experience, you and your team will explore the interdisciplinary and global nature of your project through in-class activities. The project will culminate in a final design report and a presentation at FIU’s Senior Design Showcase. Within IDCD I, the end of term deliverables will be a mid-point design report and a presentation to practicing engineers and faculty.

**Professional Preparedness Portfolio.** In this project, you are invited to construct a professional preparedness portfolio to articulate connections among your activities, experiences, engineering education, and global education at FIU as well as to demonstrate how you are prepared for your professional goals post-graduation. The project requires you to ask yourself about your values, your goals, your experiences, and your aspirations. Through these internal discussions and portfolio community feedback sessions, you will create an online portfolio that highlights: (1) an achievement history that highlights how you arrived in the IDE program, (2) a mission and vision statement, (3) a professional statement that describes the way in which you are prepared for your post-graduation professional goals (including your development as an interdisciplinary and global engineer), (4) artifacts that provide evidence for your preparedness, and (5) annotations for each of the artifacts to provide context and explain how the artifacts support what you articulated in your professional statement. The final deliverable will be a private online portfolio that you may choose to publish and/or to use in your job search/graduate school application.

**Designer Development Assignments.** These individual assignments will both focus on your development as a global, interdisciplinary designer as well as engage you in critical reflection around your project topic. You will complete these assignments prior to class sessions and we will engage collaboratively in class around the assignment.

## Course Expectations and Policies

As your instructor, my role is to create learning experiences that will support your development as a designer and leader. These learning experiences are based on my view of this class as a learning community, where we all actively participate and support each other's learning within this course.

In my role as an instructor, I will be expected to:

- Arrive to class prepared (with an agenda for the day's class session and the graded assignments)
- Support you in the various activities and assignments by
  - Communicating expectations clearly
  - Providing constructive feedback at regular intervals, and
  - Being available for assistance virtually.
- Show respect for you by
  - Grading fairly and consistently, and
  - Accepting feedback with an open-mind and adjusting the course and schedule as appropriate

**As members of this learning community and students in this course, I will expect you to:**

- **Attend class sessions:** Given the team- and projects-focused nature of this course, we will ask you to consider the impact of your absence on your teammates, your projects, and your learning. However, if you are sick, please get well, and do not come to class. Please let me and your teammates know about your illness via email as soon as possible, and we'll help you catch up on things you missed. If you have a different reason for missing class, contact us as early as possible.
- **Arrive to class on time and be prepared by**
  - **Submitting all assignments on time:** Assignments should be submitted on Canvas and brought to class when specified in the assignment description. Assignments submitted more than 10 minutes after the deadline will be considered late assignments. Late assignments will receive a grade deduction.
  - **Bringing necessary reading, assignments, supplies, drafts, etc. to class**
- **Participate in class by**
  - **Asking questions and engaging in small group and class discussions,**

- **Refraining from using cellphones and web browsers for reasons unrelated to the course, and**
- **Completing in-class activities with enthusiasm and a commitment to learning**
- **Accept and provide constructive feedback:** Feedback is a critical part of the learning process and the course design process. I strongly encourage providing constructive feedback about the course and will seek to provide you with constructive feedback about your development both in our remote learning environment and on assignments.
- **Inform me of any necessary accessibility needs or accommodations:** Any student who feels a need for accommodation based on the impact of a documented disability should contact me privately to discuss specific needs. Students who have questions or may need an accommodation should reach out to the Disability Resource Center.

The [Disability Resource Center](#) collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The DRC provides FIU students with disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact the Center at 305-848-3533 or visit them at the Graham Center GC 190.

- **Show respect for your peers, your instructor, and the academic community. This includes**
  - **Submitting original work and cite your sources appropriately:** Engineers and designers work collaboratively to solve complex problems. As such, this course is designed to engage you and your peers in team projects. You will collaborate on all phases of the project. Nevertheless, there will be assignments which we require individual work only. Those assignments will be clearly stated as such. **Plagiarism, false claims of performance, and unauthorized collaboration will be damaging to the community we are building in this course and are unacceptable in this or any other course you take at Florida International University.** Therefore, any aspects of the submission (including images in a presentation) that may have been borrowed from a previous work or another individual must be clearly cited (i.e., identified and referenced with information about the author, title of the work, and where and when it appeared).
  - **Demonstrating integrity and academic honesty at all times:** Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

**NOTE:** This syllabus is subject to change based on student progress and feedback.

## EGN 4943 -Course Schedule

WEEK	EGN 4943
1	Course Introduction & Project Development
	<p><i>Session Topics/Plans:</i></p> <p>First Day Activity! Why Interdisciplinarity?                      Define individual and collaborative goals for the semester,                      Discuss project formulation plan.</p>
2	Team Formation & Leadership
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>• Project Formulation</li> <li>• Design Process Overview</li> <li>• Self-evaluation using informed designer rubric</li> </ul> <p><b>What's Due This Week?</b>                      Designer Development Assignment (DDA) #1: Exploring Leadership and Teamwork in Design                      - READ: <a href="#">Google's Manifesto Mess: The Indisputable Case for EQ</a>                      - WATCH: Lorna Davis's - <a href="#">A Guide to Collaborative Leadership</a>                      - WATCH: Ernesto Sirolli's <a href="#">Want to help someone shut up and listen</a>                      - COMPLETE: Guide to Working with Me [LO #1; GLO #3]</p>
3	Project & Portfolio Kick-Off
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>• Portfolio Project Overview</li> <li>• Do Your Project in 45 Minutes!</li> </ul> <p><b>What's Due This Week?</b>                      Professional Preparedness Portfolio Achievement History:                      Create a visual "achievement history" – this could be in the form of a paper or be mostly visual. Describe and assess where you are now in your career/professional development. Then go back and identify the critical incidents and turning points or other experiences that help to account for how you've gotten to where you are now in your education.</p>
4	Breaking Down the Problem
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>• Breaking Down the Problem</li> <li>• Report Introduction and Discussion</li> </ul> <p><b>What's Due This Week?</b>                      Team Experience Design - Collaboration Plan [LO #3; GLO #3]</p>
5	Disciplinary Grounding & Knowledge Development
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>• Taking stock of what you know, what you don't know</li> <li>• Defining success</li> </ul> <p><b>What's Due This Week?</b>                      DDA #2 - Project Decomposition Activity [LO #1, 2]</p>
6	Thinking Globally - Stakeholders and Systems Analysis
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>• A collaborative, global look at your interdisciplinary project topics</li> <li>• Check in about Thesis Submission and Portfolio</li> </ul>

	<p><b>What's Due This Week?</b>                  DDA #3 – Systems and Stakeholder Analysis [GLO #2] – Based on readings and videos about global design projects, create stakeholder and systems diagrams for your project topic.</p>
7	Portfolio Community Feedback
	<p>Session Topics/Plans:</p> <ul style="list-style-type: none"> <li>• Communication &amp; Storytelling</li> <li>• Peer discussion on mission and vision statements. Share experiences and do a peer-based reflection on what the mission and vision statements could look like</li> </ul> <p><b>What's Due This Week?</b>                  Professional Preparedness Portfolio – 5-10 Year Reflection                  Project Deliverable – Introduction and Project Management Design Report Sections</p>
8	Design Thinking, Systems Thinking, Business Thinking
	<p>Session Topics/Plans:</p> <ul style="list-style-type: none"> <li>• Revisiting leverage points. How can these ways of thinking be used in an engineering design process?</li> <li>• Ideation and Decision Making</li> </ul> <p><b>What's Due This Week?</b>                  DDA #4 – Exploring Design Thinking, Systems Thinking, and Business Thinking  <ul style="list-style-type: none"> <li>• Read <a href="#">Chapter 4: Rethinking Design Thinking (Links to an external site.)</a> from <i>The Way to Design</i></li> <li>• Review/Read "<a href="#">Leverage Points: Places to Intervene in a System</a>" by Donella Meadows</li> </ul> </p>
9	Communication, Part 2 & Career Exploration
	<p>Session/Plans:</p> <ul style="list-style-type: none"> <li>- Professional Pathways Interview Management Prep - Who will you interview and what will you ask?</li> <li>- Elevator Pitches</li> </ul> <p><b>What's Due This Week?</b>                  Team Experience Design – Peer &amp; Self Assessments [LO #3; GLO #3]</p>
10	Portfolio Community Feedback
	<p>Session Topics/Plans:</p> <ul style="list-style-type: none"> <li>- Peer review session on portfolio draft</li> <li>- Simulation and Validation</li> </ul> <p><b>What's Due This Week?</b>                  Professional Preparedness Portfolio – Draft Mission and Vision Statements, Outline of Professional Statement with Connection to Global Education [GLO #1], Drafts of at least two artifacts                  Project Deliverable – Elevator Pitch [LO #4]</p>
11	Interview De-Brief
	<p>Session Topics/Plans:</p> <ul style="list-style-type: none"> <li>- Debrief the interviews</li> <li>- Validation and Testing</li> </ul> <p><b>What's Due This Week?</b>                  Interview Notes for Discussion</p>
12	Project Work Time
	<p>Session Topics/Plans:</p> <ul style="list-style-type: none"> <li>- Project Work Time</li> </ul> <p><b>What's Due This Week?</b>                  DDA #5 – Professional Pathways Interview Reflection Paper</p>

13	In-Class Feedback
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>- In-Class Feedback</li> <li>- Project Work Time</li> </ul> <p><b>What's Due This Week?</b>  <i>Project Deliverables</i> – Drafts for review (i.e., Disciplinary Grounding statement, Background Research, Global Systems and Stakeholder Analysis) [GLO #2]</p>
14	Portfolio Community Feedback & Final Presentation Practice
	<p><i>Session Plans/Topics:</i></p> <ul style="list-style-type: none"> <li>- Practice Presentation</li> <li>- Portfolio Community Feedback</li> </ul> <p><b>What's Due This Week?</b>  <i>Professional Preparedness Portfolio</i> - Updated mission and vision statement, professional statement, drafts of all artifacts  <i>Project Deliverables</i> – Practice Presentation</p>
15	Final Presentation & Reflections
	<p><i>Session Topics/Plans:</i></p> <ul style="list-style-type: none"> <li>- Final Presentation!</li> <li>- Review Informed Design Matrix and Collective Reflection on the Semester</li> </ul> <p><b>What's Due This Week and During Finals Week?</b>  <i>Midpoint Design Report</i> [LO #1, 2, 4, 5 &amp; GLO #2-3]  <i>Midpoint Project Review Presentation</i> [LO #1, 2, 4 &amp; GLO #2-3]  <i>Team Experience Design - Peer and Self-Assessments</i> [LO #3]  <i>Professional Preparedness Portfolio</i> – For in-class celebration (Due during Finals Week) [LO #3-4 &amp; GLO #1]</p>

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