

54 >>>>> in Engineering Education

Fall 202	23	Department of Engineering	Education, University of Florida	
Instructor: De Telephone: 3 Email: <u>rivera.</u> Office: Werth	r. Sir 52-8 <u>jime</u> eim	ndia M. Rivera-Jiménez (Dr. Rivera) 46-1974 <u>nez@eng.ufl.edu</u> 463	Class Times (Room): Tue 1:55 PM - 2:45 PM (NSC 0520) Thu 1:55 PM - 3:50 PM (NSC 0520)	
Offline Office Hours	 In-person: Ask me before/after class or visit my office on Tuesdays between 3 pm to 4pm Virtually: For short questions send me a message via Microsoft Teams chat everyday between 1 pm to 5 pm. 			

• For longer questions, set up an appointment via email, text via Microsoft Teams, or using the Calendly link available in Canvas



This graduate course explores the fascinating yet challenging field of learning in engineering education. Over the past ten decades, research on the mind has provided profound insights into cognitive and affective dimensions of learning, significantly impacting educational practices in higher education and workplaces. This course focuses on cognitive psychology, educational learning theory, and instructional design, introducing novice engineering and computer science graduate students to essential concepts and processes for research and instructional practice. Students from other disciplinary areas are also welcome!

Through readings, special speakers, and reflection as part of a community of practice, students in this course will delve into selected topics from human learning, including the nature of expertise, knowledge organization, and implementation, transfer of learning, and cognitive skill assessment from a practical, rather than theoretical, perspective.

Course Pre-Requisites / Co-Requisites: None

WHAT'S IN THIS SYLLABUS

COURSE OBJECTIVES

- Critically describe and apply research-based information to build a foundation of knowledge and skills that facilitate the integration of content (or curriculum) and pedagogy for learning modules, courses, and program design.
- Develop and articulate an engineering design approach for content (or curriculum) and pedagogy based on learning theory and cognition.
- Apply principles and theories to design a learning module, course, program, or other learning environments.

MEET YOUR INSTRUCTOR



Dr. Rivera She/her/ella

My teaching philosophy for this course is centered around fostering a design thinking approach to create innovative learning environments in engineering education. Drawing inspiration from scholars such as Boling, Cross, Lawson, and Nelson, instructional designers play a dynamic role in the design process, harnessing their knowledge, experience, and intuition to continuously refine problems and solutions. Just as in the engineering practice, learning experience design heavily relies on the judgment of designers. They balance various design elements while drawing from their unique reservoir of design knowledge, shaped by their individual perspectives and experiences. This design knowledge is cultivated over time through accumulated episodes, including historical choices and their consequences – what we call design precedents. To empower designers in facing complex challenges, reflective thinking becomes crucial. It offers a pathway for designers to critically contemplate and re-examine their design precedents.

In this graduate course, I will emphasize the importance of reading academic literature and exploring other educators' precedents. Through critical reflective thinking, I want my students to leverage past experiences to enhance their judgment, make well-informed decisions, and take meaningful action. The class employs three central teaching methods: writing reflections on academic literature and precedents, collective knowledge constructions through evidence-based social learning systems (e.g., a community of practice), and problem-based learning. Students will maintain reflective journals, documenting and analyzing their design processes, helping them gain insights into their strengths, weaknesses, and growth as designers. I foster a collaborative and supportive community of practices, allowing students to engage in open discussions, share insights, and exchange feedback with peers. By integrating reflective journals and cultivating this community, I aim to instill in my students the habit of thoughtful introspection and promote continuous learning while designing learning environments. This approach enhances their design capabilities and equips them to tackle complex challenges in engineering education. I aim to create an enriching and empowering learning experience through these tools and methods, preparing my students to become innovative and influential contributors in their fields of study. Scholars mentioned: Elizabeth Boling, Neil Cross, Bryan Lawson; Wayne A. Nelson

REQUIRED TEXTBOOK, MATERIALS & SUPPLY FEES



All materials offered in this course are freely available as open-source resources. If you prefer a printed version of the materials, I can provide you with the necessary details through Canvas for your convenience. There are absolutely no additional fees for any materials or supplies associated with this course.

Recommended Materials: Refer to Canvas for a complete list of recommended readings.

EGS6054: Cog, Learn, & Pedagogy Eng. Ed. Dr. Rivera Fall 2023



** This schedule is subject to change. Please refer to Canvas for any updates and announcements.

Unit 1: Fo	oundations of Cognition, Learning, and Instruction	Assigned Readings and Assignments Due (
Week 1	Introduction to the Course, Reading Strategies and Reflexive	Read Syllabus and Check our Canvas		
Aug 24	Practices	Recommended: Martinez (2010)- Ch1; Halupa (2019); Tracey (2010)-Ch1		
Week 2	Introduction to Education and Theory-based methods	Varpio (2020); National Research Council (2000)-Ch1; Tracey		
Aug 29 & 31	Aug 31: Class Discussion by Rivera (RR1)	(2010)-Ch4 ; Christen (2008) Due: <u>arkti</u>		
Week 3	Overview of Cognitive Science and Learning Theories	Greeno (1996); Glaser (1992); Due: *RR2		
5 & 7		Sep 7: Class Discussion by Team T (RR2)		
Week 4	Implications of Cognitive Science and Learning Theories for STEM	Brown, D. (2001); Johri (2014)-Ch-2 ; Kay (2016) *RR3		
Sер 12 & 14	Sep 12: Nov 7: Faculty Panel: Fist Year Design	Sep 14: Class Discussion by Team 2 (RR3)		
Week 5	Instructional Theory- A Framework for Design and Research of	Honebein (2020); Richey 2005; Domez (2016) *RR4		
Sep 19 & 21	Innovative Learning Environments Sep 19: Class Discussion by Rivera (R4)			
19 0 21	Sep 21: Workshop 1 by Amy Buhler, EED Librarian.			
Unit 2: B	ehavioral, Social, and Cognitive Views of Learning	Assigned Readings and Assignments Due (
Week 6	Behaviorist Principles and Applications for Instruction	Ormrod (2021)-Ch 3 (page: 40-43); Ertmer (1993); Walther		
Sep	Ӧ <u>Sep 26-</u> Project Support to work on Deliverable 1	(2007); Azambuja (2017) * RR5		
20 & 28	Osciel Osciative and Learning Theories and Applications	Sep 28: Class Discussion by Team 3 (RR5)		
Oct	Social Cognitive and Learning Theories and Applications Image: Cognitive and Learning Theories and Cognitive and Cognitite and Cognite and Cognitite and Cognitite and Cognitive and Cogn	\mathbf{V} Oct 5: Class Discussion by Team 4 (RR6)		
3&5	<u></u>			
Week 8	The Nature of Knowledge-Defining Expertise and Decision Making	Hoffman (1996); Dreyfus (2004); Mestre (2001)) <u>*RR7</u>		
10 &12	Oct 12: Class Discussion by Rivera (RR7)	Oct 6: Deliverable 1 Due on Canvas 11:59 pm		
Week 9	Constructivists Design Theories: Apprenticeship, PBL,	Tracey (2010)-Ch8; Nair (1997); Moreno (2007) *RR8		
0ct 17 & 19	Scaffolding, Collaboration Oct 17: Class Discussion by Dr. Rivera (RR8)			
	Oct 19: Workshop 2: Starting with Instructional Design (Zoom)			
Week 10	Metacognition, Reflection, and Learning	Chi (1994); Vos (2007); Lawanto (2013) *RR9		
24 & 26	 Oct 26: Workshop 3: "Instructional Design in Practice (In-person) 			
		Assigned Readings and Assignments Due (
Unit 3: D	esign Learning Experiences	*RR=Reactions to Readings due every Monday 11:59pm		
Week 11 Oct 31	Knowledge Acquisition, Use, and Transfer	National Research Council (2000)-Ch3; Ball (2004); Johnson (2011) *R10		
Nov 2		Nov 2: Class Discussion by Team 6 (RR10)		
Week 12	Mental Models of Physical Systems and Conceptual Change	Collings (1987); Mayer (2022); Endsay (200) diSessa (1998)		
7 & 9	Nov 9: Class Discussion by Dr. Rivera (RR11)			
Week 13	Engineering Design: Theory and Assessment	Johri (2014)-Ch11; Johri (2014)-Ch13; Sheppard (1996)		
Nov 14 & 16	<u>Nov 14</u> : Project Support to work on Deliverable 2	*R12 Nov 16: Class Discussion by Team 7 (RR12)		
Week 14	Creative Engineering Design	Hayes (1989); Dorst (2001); Christiaans (2005) *R13		
Nov 21 8. 22	Class Discussion by Rivera (RR13)- Via Zoom			
Week 15	Assessing Expertise	Goldschmidt (1998); Simon (1979); Cajander (2011); Atman		
Nov	Nov 28: Class Discussion by Rivera (RR14)	(2008) <u>*R14</u>		
20 & 30 Wook 16	VINOV 30: VISIT TO THE NATURAL SCIENCE MUSEUM	Dog 6: Deliverable 2 Due on Conveg 11:50 nm		
Dec 5	Presentations Day- Need to arrange a common time for 3 hrs	Dec o. Deriverable 2 Due on Canvas 11:59 pm		
	session.			

ASSIGNMENTS OVERVIEW

In this class, we will utilize a variety of teaching and learning methods to enhance understanding and engagement. Scientific readings from journal articles and book chapters will be available on Canvas, encouraging critical reading from contemporary literature. Students will actively participate in meaningful discussions using a community of practice approach and will engage in multiple classroom activities. The classroom experience will be dynamic, incorporating group discussions, individual exercises, short lectures, workshops and guest talks. Hands-on exercises in designing learning environments, reflective writing, and journaling will foster personal growth. Project-based learning will offer a practical approach to studies, and the course will culminate with a poster or panel presentation to showcase acquired knowledge and skills.

The following is a description for each assignment this semester. More details can be found on Canvas.

- 1. **Reaction to Readings:** Read the assigned readings before coming to class and for each article/chapter write a Reaction. The purpose of writing Reactions is to have you think more deeply and critically about the readings, have a personal dialogue with its implication in your own teaching practices, and reflect on your final project. Your Reaction is NOT a summary of the readings. To prevent random thoughts without a coherent thread, there will be three prompted questions that you need to respond each week (these assignments are for all reading assignments in Week 2-15). Postings are to be made on Canvas (how to do this will be discussed in class) by Monday at 11:59 P.M. This deadline allows enough time to read the postings before coming to class.
- 2. Lead classroom discussions of the week's readings. We will all take turns leading discussions of the readings. Each week a "presenter" will prepare a short PowerPoint presentation outlining the main points of the readings (e.g., study design and findings-this should only take about three to six slides and serve more as reminders since we have all read the article), and then put up all the responses (for all 3 prompted questions) for discussion based on the posted Reactions. The presenter needs to identify any redundant or similar responses to those questions. That same person will coordinate the discussion by calling on individuals and keeping track of whose turn it is to speak. I would like to spend the last 5-10 minutes of the class for a final reflection summarizing what has been learned through the reading and class discussion. Presenters will facilitate the class discussion on Thursdays. See the list of topics above to know when your team will be leading a discussion.
- 3. Participate in the class discussions. You will be expected to contribute actively to the class discussions, at times agreeing with colleagues and adding complementary arguments, and at other times disagreeing with colleagues and providing a rationale for doing so. I seek a lively class where arguments and ideas are presented and debated. The only thing I ask is that we all remain respectful of each other's views and offer constructive criticisms when disagreeing with a colleague.
- 4. **FINAL PROJECT-Designing of a learning environment.** You must complete the following deliverables after selecting a topic of personal interest to you related to human learning, transfer, or assessment.
 - a. **Deliverable 1:** This deliverable will consist of two parts. **Part 1:** Write a 6 to8 page (not including list of references, single space, APA format) annotate bibliography that portraits the benefits, importance, issues/challenges and applications associated with your selected topic, and their connection to learning theory and cognition. Your annotated bibliography must include at least 12 literatures (or articles) from which two should come from literature discussed in this class. Each annotated bibliography must include a brief explanation of why each source is credible and relevant to the topic (There will be a workshop in class for you to learn this skill). **Part 2:** Mid-semester Critical Reflection.
 - b. Deliverable 2: This deliverable will consist of two parts. Part 1: Now, that you have learned more experience in the class, use the annotated bibliography to write a 1–2-page literature review that introduces the benefits, issues and applications associated with your selected topic and their connection to learning theory and cognition. At this point, you can expand your references as you get more familiarized with the class concepts. Part 2: End of semester Critical Reflection. Part 3: On the last week of the semester, each student must present 13 minutes (10 + 3 mins for Q&A) presenting the final design of their learning module demonstrating the application of principles and theories of learning and cognition discussed in class. The presentation should include why the topic

selected is important (benefits), challenges and how the proposed learning environment design. Each student must submit Part 1 and the slides used for Part 2 in Canvas.

i. For the last class meeting, we will have a symposium to present, share, and celebrate our learning of this semester. Depending on the final number of students enrolled in this course, we will decide on the appropriate time and format of the symposium together. The content of the presentation will be the research design and data collection methods of your proposed study (GREAT opportunity to get feedback!).

COURSE POLICIES

Class Attendance, Missed Work, and Extra Credit

Students are expected to be present for all classes since much material will be covered only once in class. Attendance is not monitored, but each student is responsible for the content of all classes, including issues raised in the spontaneous class discussions. If you must miss a class, please request notes from your classmates. It is expected that no students will miss any due dates for the course requirements. Unavoidable missed due dates may be excused by the instructor, provided **advanced notice and official documentation** that aligns with UF policies for excused absences. No planned opportunities for extra credit exist in this course.

Excused absences must be consistent with university policies in the Graduate Catalog (<u>https://catalog.ufl.edu/graduate/regulations</u>) and require appropriate documentation. Additional information can be found here: <u>https://gradcatalog.ufl.edu/graduate/regulations/</u>

Office Hours and Email Response Policy

Please adhere to the following guidelines when contacting me for effective communication and assistance. Before emailing, consider initiating a conversation through Microsoft Teams. When emailing, ensure the subject line reads "ECH60544: TOPIC" for streamlined communication. Expect my response within 24 hours on weekdays and up to 48 hours on weekends. In-person office hours are available at my office on Tuesdays from 3 pm to 4 pm. Any changes to these hours will be promptly communicated through Canvas. For brief queries, you can connect with me virtually via Microsoft Teams chat between 1 pm to 5 pm daily. Longer inquiries can be addressed through appointments set up via email, Microsoft Teams chat, or the Calendly link available in Canvas.

Don't hesitate to ask questions before or after class and leverage Microsoft Teams for additional support. Your questions and inquiries are important to me, and I am committed to providing you the support you need to excel in this course. By following these guidelines, we can ensure effective communication and a productive learning experience.

Class Expectations

I understand that at this point in your graduate studies, you are likely at different stages of developing your dissertation projects. In this class, I would like to meet you where you are. I encourage you to reach out to me to discuss your methodological interest and potential research topics, preferably earlier in the semester so that I can have your research interest and intellectual needs in mind when I prepare the class.

I hope you will not feel deflated or intimidated by the complexity of some of the readings. One important goal of this class is for you to learn the appropriate way to approach and evaluate theoretical and methodological materials and make the best use of them for your graduate study. I don't expect you to completely understand everything assigned for the class. In fact, I will not grade you negatively for misunderstanding the content of the readings, and you can surely do a good job without mastering everything in the readings. Nevertheless, you will need to demonstrate your engagement with the class by reading the course materials thoroughly, attending the class with good preparation, and completing your writing assignments thoughtfully.

In this course, we will cover subjects that may be sensitive and/or challenging. As in all our courses, we do this not to indoctrinate but to instruct, to prepare you to be the most effective and successful educator or scholar

that you can be. We encourage you to understand all concepts presented in class, but we cannot determine your personal beliefs. What you personally choose to believe is your business.

INCLUSION STATEMENT

It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

LIVED NAME/PRONOUN STATEMENT

I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Evaluation of Grades and Make-Up Policy

Categories	Points each (Total Points)	Percentage of the Final Grade	Make-up Policy
Reaction to Readings	5 (70)	47%	Can only drop 1 out of the 14 assignments, if student has an acceptable excuse,
Class discussions by Team	8 (8)	5%	Cannot be dropped
Deliverable 1	35 (35)	24%	Cannot be dropped
Deliverable 2	35 (35)	24%	Cannot be dropped

Final grades will be assigned based on the scale below. Unless a computational error has been made, grades will not be changed after the end of the semester.

Overall course	percent Grade	Overall course percent	Grade
93.0% - 10	D0% A	73.0% - 76.9%	С
90.0% - 92	2.9% A-	70.0% - 72.9%	C-
87.0% - 89	9.9% B+	67.0% - 69.9%	D+
83.0% - 86	5.9% B	63.0% - 66.9%	D
80.0% - 82	2.9% B-	60.0% - 62.9%	D-
77.0% - 79	9.9% C+	59.9% or less	E

INSTITUTIONAL POLICIES

Students Requiring Accommodations. Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <u>https://disability.ufl.edu/students/get-started/</u>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording. Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy. UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. 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." The Honor Code (<u>https://sccr.dso.ufl.edu/process/student-conduct-code/</u>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment. The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- · Your academic advisor or Graduate Program Coordinator
- HWCOE Human Resources, 352-392-0904, <u>student-support-hr@eng.ufl.edu</u>
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use. All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy. There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <u>https://registrar.ufl.edu/ferpa.html</u>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact <u>umatter@ufl.edu</u> so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <u>https://counseling.ufl.edu</u>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **<u>Office of Title IX Compliance</u>**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, <u>title-ix@ufl.edu</u>

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

<u>Academic Resources</u>

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <u>https://lss.at.ufl.edu/help.shtml</u>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, <u>http://cms.uflib.ufl.edu/ask</u>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <u>https://teachingcenter.ufl.edu/</u>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <u>https://writing.ufl.edu/writing-studio/</u>.

Student Complaints Campus: <u>https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu</u>.

On-Line Students Complaints: <u>https://distance.ufl.edu/getting-help/;</u> <u>https://distance.ufl.edu/state-authorization-status/#student-complaint</u>.