

Research Methods in Engineering Education

EGS 6012, Section EED1

Class Periods: T | Period 6 – 8 (12:50 PM - 3:50 PM)

Location: NSC 520

Academic Term: Spring 2024

Instructor:

- Idalis Villanueva Alarcón, Ph.D.
i.villanueva@ufl.edu

Office Hours:

- **Mondays (virtual)** from 2:30pm to 3:30pm:
<https://ufl.zoom.us/j/92369655426?pwd=TGxVSmRvbWx0N0NHVHBJbnk1dDB1UT09&from=addon>
- **Tuesdays** after class (3:50pm to 4:30pm) in NSC 520
- **By appointment**

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

- None.
- Although there is no official teaching assistant designated to this course, EGS 6012 was developed in coordination with Dr. Amie Baisley in the Department of Engineering Education at UF ([Amie Baisley PhD - Faculty - Department of Engineering Education \(ufl.edu\)](#)). She has a Ph.D. in Engineering Education and serves as an indirect support to this class. She may be available to answer questions about the course, assignments, or final project. Her email is amie.baisley@eng.ufl.edu in case you need to coordinate an appointment with her.

Course Description:

- Introduce basic principles and practices of quantitative, qualitative, and mixed method research methods used in engineering education research. (3 credits)

Course Pre-Requisites / Co-Requisites:

None

Course Objectives:

- Understand the differences and applications for quantitative, qualitative, and mixed research methods.
- Demonstrate ability to analyze quantitative data using statistical analysis.
- Demonstrate ability to analyze qualitative data using a qualitative analysis approach.
- Gain knowledge of the process of creating and conducting a research proposal using one of the methods discussed during the semester.
- Apply course material to a student generated research question using one of the methods discussed during the semester.

Disclaimers and Course Expectations: Can be found in and will be discussed in Canvas.

Materials and Supply Fees:

None

Required Textbooks and Software:

Required Texts:

a. Research Methods, Design, and Analysis (12th edition; used books are fine): Christensen, Johnson, Burke, Turner: ISBN-9780205961252

[Research Methods, Design, and Analysis \(12th Edition\): Christensen, Larry B., Johnson, R. Burke, Turner, Lisa A.: 9780205961252: Books - Amazon.ca](#)

b. The Coding Manual for Qualitative Researchers by Johnny Saldaña (3rd edition, paperback version; used books are fine): [The Coding Manual for Qualitative Researchers: Saldana, Johnny: 9781473902497: Books - Amazon.ca](#)

Required Software:

Free for students via UF Apps: [UFApps \(ufl.edu\)](https://ufapps.ufl.edu). You will need to install Citrix Receiver first and may need to coordinate with the IT representative of your department or college to get administrative approvals.

- a. SPSS Statistics (UF apps)
- b. MAXQDA (UF apps)

Recommended Texts (optional):

- a. *Designing and Conducting Mixed Methods Research (2nd edition)* by John W. Creswell and Vicki L. Plano Clark

Disclaimer: The selection of the materials for this course may include resources, software, examples, and content that does not necessarily reflect the personal views and beliefs of the instructor. However, the resources do provide foundational information that will be important to your ability to fulfill the course learning objectives.

Recommended Materials:

- None

Tentative Course Schedule:

| Week | Course Topic & Brief Description <i>(Any additional changes will be posted in Canvas)</i> | Recommended Readings <i>(Any additional readings will be posted in Canvas)</i> | Assignment/ Project <i>(Changes will be reflected in Canvas)</i> |
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| PART I: Brief Overview of the Foundations of Engineering Education Research | | | |
| 1 (Jan 8 to Jan 12, 2024) | Lesson 1a- Syllabus, Course Expectations, and Brief Introduction to Engineering Education Research Lesson 1b- Brief Introduction to the Research Process Applied to Engineering Education | Required Readings: a. Chapters 1 and 2 of the <i>Research Methods, Design, and Analysis</i> book (p. 1-62). Supplemental Readings: In Canvas | Tasks due by January 19, 2024 at 11:59pm in Canvas: a. Discussion Board b. Pre-assessment |
| 2 (Jan 15 to Jan 19, 2024) | Lesson 2a- Conceptual difficulties from engineers learning qualitative research for the first time. Lesson 2b Workshop: Research Question or Hypothesis? | Required Readings: a. Chapter 3 of the <i>Research Methods, Design, and Analysis</i> book (p. 63-87). b. Borrego, M. (2007). Conceptual difficulties experienced by trained engineers learning educational research methods. <i>Journal of Engineering Education</i> , 96(2), 91-102. Supplemental Readings: In Canvas | Assignment (Section 1) due January 25, 2024 at 11:59pm in Canvas |
| 3 (Jan 22 to Jan 26, 2024) | Lesson 3a- Measuring Variables and Sampling Lesson 3b- Selecting the Research Design | Required Readings: a. Chapter 5 of the <i>Research Methods, Design, and Analysis</i> book (p. 131-157). b. Asenahabi, B.M. (2019). Basics of research design: A guide to selecting appropriate research design. <i>International Journal of Contemporary Applied Research</i> , 6(5), 76-89. Supplemental Readings: In Canvas | Discussion Board: Due February 2, 2024 at 11:59pm in Canvas |
| PART II. Brief Introduction to Qualitative Research Methods Applied to Engineering Education Research | | | |
| 4 (Jan 29 to Feb 2, 2024) | Lesson 4a- Introduction to Philosophical Perspectives and Paradigms and Methodology applied to Qualitative Engineering Education Research | Required Readings: a. Creswell chapter PDF in Canvas that includes an overview of interpretative paradigms. b. Chism, N. V. N., Douglas, E., & Hilson, W. J. (2008). Qualitative research basics: A guide | Assignment (Section 2): Due February 9, 2024 at 11:59pm in Canvas |

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| | Lesson 4b- Positionality and Framing of Research Questions applied to Engineering Education | for engineering educators. <i>Rigorous Research in Engineering Education</i> , 1-65. c. Clough, P., & Nutbrown, C. (2012). <i>A student's guide to methodology</i> . Sage. Supplemental Readings: In Canvas | |
| 5 (Feb 5 to Feb 9, 2024) | Lesson 5a- Frameworks and Research Quality of Qualitative Research applied to Engineering Education Lesson 5b- Qualitative Data Sources in Engineering Education | Required Readings: a. Magana, A. J. (2022). The role of frameworks in engineering education research. <i>Journal of Engineering Education</i> , 111(1), 9-13. b. Walther, J., & Sochacka, N. (2014, October). Qualifying qualitative research quality (The Q3 project): An interactive discourse around research quality in interpretive approaches to engineering education research. In <i>2014 IEEE Frontiers in Education Conference (FIE) Proceedings</i> (pp. 1-4). IEEE. c. Walther, J., Sochacka, N. W., Benson, L. C., Bumbaco, A. E., Kellam, N., Pawley, A. L., & Phillips, C. M. (2017). Qualitative research quality: A collaborative inquiry across multiple methodological perspectives. <i>Journal of Engineering Education</i> , 106(3), 398-430. Bring the Handout (in paper or electronically) provided in Canvas. | Assignment (Section 3): Due March 1, 2024 at 11:59pm in Canvas |
| 6 (Feb 12 to Feb 16, 2024) | Lesson 6a- Qualitative Coding (First Cycle: Code Determination, Intercoder Agreement, and Memoing). Lesson 6b Workshop- MAXQDA 2022 (Part 1- Getting Started and First Cycle of Coding) | Required Readings: a. Chapter 13 from <i>Research Methods, Design, and Analysis</i> book (p. 343-363). b. Chapter 3 from <i>The Coding Manual for Qualitative Researchers</i> book (p. 67-210) with a specific focus on those pages that discuss the overview of first cycle methods, inductive coding, <i>a priori</i> coding, <i>in vivo</i> coding and holistic coding. Required Viewings: In Canvas | N/A |
| 7 (Feb 19 to Feb 23, 2024) | Lesson 7a- Qualitative Coding (Second and/or Third Cycle: Theme Identification, Member-Checking, and Codebook Generation) Lesson 7b- Workshop- MAXQDA 2022 (Part 2- Second and/or Third Cycle of Coding, Theme Identification, Member-Checking) | Required Readings: a. Chapters 4-6 from <i>The Coding Manual for Qualitative Researchers</i> book (p. 211-273) with a specific focus on those pages that discuss the pattern coding, focused coding, axial coding, magnitude coding, and theoretical coding. Required Viewings: In Canvas | N/A |
| 8 (Feb 26 to Mar 1, 2024) | Lesson 8a- Interpreting and Writing Qualitative Research Findings Lesson 8b- Workshop-APA Style | Required Readings: a. Chapter 16 from <i>Research Methods, Design, and Analysis</i> book (p. 447-477). Supplemental Readings: In Canvas | Check-in Assessment: Due March 1, 2024 at 11:59pm in Canvas. |
| PART III. Brief Introduction to Quantitative Research Methods Applied to Engineering Education Research | | | |
| 9 (Mar 4 to Mar 8, 2024) | Lesson 9a- Choosing a Quantitative Research Design | Required Readings: a. Chapter 5 (p. 134-136) and Chapter 6 (p. 159-181) of the <i>Research Methods, Design, and Analysis</i> book. | Discussion Board: Due by March 22, 2024 at |

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| | Lesson 9b- Principles of Reliability and Validity for Quantitative Research | b. Chapter 10 (p. 293-329) of the provided PDF in Canvas of Creswell, J. W. (2012). <i>Educational research</i> . Pearson. Supplemental Readings: In Canvas | 11:59pm in Canvas |
| SPRING BREAK | | | |
| 10 (Mar 18 to Mar 22, 2024) | Lesson 10a- Writing a Research Question or Hypothesis for a Quantitative Research Design Lesson 10b- Collecting Quantitative Data | Required Readings: a. Chapter 4 (p. 109-139) of the provided PDF in Canvas of Creswell, J. W. (2012). <i>Educational research</i> . Pearson. b. Chapter 5 (p.140-173) of the provided PDF in Canvas of Creswell, J. W. (2012). <i>Educational research</i> . Pearson. Supplemental Readings: In Canvas | Assignment (Section 4): Due April 19, 2024 at 11:59pm in Canvas |
| 11 (Mar 25 to Mar 29, 2024) | Lesson 11a- Cleaning and Analyzing Quantitative Data Lesson 11b- Interpreting Quantitative Data | Required Readings: a. Chapter 6 (p.174-203) of the provided PDF in Canvas of Creswell, J.W. (2012). <i>Educational research</i> . Pearson. | N/A |
| 12 (Apr 1 to Apr 5, 2024) | Lesson 12- Workshop 1: Descriptive Statistics and Hypothesis Testing using Statistical Analysis Software | No readings | N/A |
| 13 (Apr 8 to Apr 12, 2024) | Lesson 13- Workshop 2: Validity and Reliability Evidence and Testing using Statistical Analysis Software | No readings | N/A |
| PART IV. Brief Introduction to Multi-Methods, Mixed-Methods & Multi-Modal Research Approaches Applied to Engineering Education Research | | | |
| 14 (Apr 15 to Apr 19, 2024) | Lesson 14a- Introduction to Multi-Methods, Mixed-Methods, and Multi-Modal Method Designs Lesson 14b- Triangulation Considerations for Multi-Modal, Mixed-Methods, and Multi-Modal Research Methods | Required Readings: a. Borrego, M., Douglas, E. P., & Amelink, C. T. (2009). Quantitative, qualitative, and mixed research methods in engineering education. <i>Journal of Engineering education</i> , 98(1), 53-66. b. Schutz, P. A., Chambless, C. B., & DeCuir, J. T. (2003). Multimethods research. In <i>Foundations for research</i> (pp. 283-298). Routledge. c. Villanueva Alarcón, I., Anwar, S., & Atiq, Z. (2023). How multi-modal approaches support engineering and computing education research. <i>Australasian Journal of Engineering Education</i> , 1-16. | Discussion Board: Due April 26, 2024 at 11:59pm in Canvas |
| PART V. FINAL PROJECT | | | |
| 15 (Apr 23 to Apr 26, 2024) | Open Work Time for Final Project | No readings | N/A |
| 16 (Apr 29 to May 3, 2024) | No Class; Virtual Office Hours upon request | No readings | N/A |

Attendance Policy, Class Expectations, and Make-Up Policy:

This course is interactive so attendance is expected. Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Evaluation of Grades:

| Assignment | Percentage of Final Grade |
|--|----------------------------------|
| Assignments | 40% |
| Final Project | 30% |
| Discussion Board | 16% |
| Peer-Evaluation of Group Contributions | 5% |
| In-Class Participation | 5% |
| Bonus (TBD) | 4% |
| | 100% |

Required and Supplemental Readings:

Due to the nature of the course and the large amount of content to cover, there will be a set of required readings prior to the lesson that you are very strongly encouraged to read. While I will do my best to cover as much content as I can in class, there may not be sufficient time to go through all the important items you need for this course. As such, supplemental readings are provided as optional readings and to support any assignment, discussion board, or project during the course. Both readings should serve as a resource for you as needed. Additional details are provided in Canvas.

Assignments:

There will be a total of four assignments, each aimed to support a better understanding of the content and components of the final project. The assignments are either individual or group-based. Each assignment will reflect the parts of the course covered under both qualitative and quantitative methods. On average, assignment due dates will be between 2-5 weeks of its release date.

Final Project:

The purpose of the group final project is to help you see the larger picture of the role that Research Methods in Engineering Education play on the overall research design, data collection, data analysis, and interpretation of its findings. Also, this final project aims to help your team and you to establish connections between the learned content and the procedures involving quantitative and qualitative research methods. The project will ask your group to extend a research design process into one of three research method pathways: a qualitative, a quantitative, and a mixed-method. Additional details are provided in Canvas.

Discussion Board:

During set times in the course, a discussion board will be presented to students to respond to questions connected to the learned course content. It is expected that you post one original comment and comment on at least one other person's comments. Additional details are provided in Canvas.

Peer-Evaluation:

At the end of the semester, you will be provided with a short questionnaire that will only be visible to me about your evaluation of the group members you have been assigned to in the semester. If there is consensus that a member of the group did not contribute to the group work or final project, up to a letter grade may be deducted from the final course grade! Additional details are provided in Canvas.

In-Class Participation:

It is expected that students in the class will participate, inquire, and complete course activities with a respectful attitude to learn and grow. In class participation will be taken for every class. There may be instances where the class may be conducted virtually. Said classes will be announced in Canvas.

Bonus- Pre-assessment and check-in assessment and GatorEvals:

Counted as a bonus, a pre-assessment will be used primarily to assess course expectations and needs as well as to determine group pairing for designated assignments and projects in the course. This pre-assessment will not be used for any other purpose. Around the middle of the semester, a check-in assessment will be provided for the purpose of course improvement in future semesters and to address any potential concerns about the existing course. The check-in assessment will be anonymized and solely to be used for course improvement. This will be counted as part of your bonus. Also, a percentage of this bonus will go towards completion of the Gator Evals (see below for more details). If over 70% of students complete the GatorEvals, a bonus grade will be added (TBD). Students will be notified when the 70% completion rate is reached.

Late Submissions:

While the course deliverables have been created to allow for sufficient time to complete the tasks, sometimes things happen that is outside of your control. I get it. Life happens. For this reason, I have included a three-day grace period for every course deliverable. To ensure that this process is applicable equitably to all students, any late submissions past the original deadline will undergo a 10% penalty to the course deliverable grade.

Grading Policy:

| Percent | Grade | Grade Points |
|--------------|-------|--------------|
| 90.0 - 100.0 | A | 4.00 |
| 87.0 - 89.9 | A- | 3.67 |
| 84.0 - 86.9 | B+ | 3.33 |
| 81.0 – 83.9 | B | 3.00 |
| 78.0 - 80.9 | B- | 2.67 |
| 75.0 - 77.9 | C+ | 2.33 |
| 72.0 – 74.9 | C | 2.00 |
| 69.0 - 71.9 | C- | 1.67 |
| 66.0 - 68.9 | D+ | 1.33 |
| 63.0 - 65.9 | D | 1.00 |
| 60.0 - 62.9 | D- | 0.67 |
| 0 - 59.9 | E | 0.00 |

For this course, no grade-grubbing is allowed at any point of the course. You may request a grade adjustment if there was a genuine mistake identified during grading but no extra credit or raising of grades simply because you would like a better grade will be granted. It is important that you put your best effort forward in the course. More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Course Disclaimer and Expectations:

In the EGS 6012 course shell there will be disclaimers and expectations that will be mutually agreed upon and discussed during the first 3 weeks of class. We will discuss, clarify, or add any needed item. Upon agreeing, I will date and stamp this to be used for future reference in the spring 2024 semester. This will mark an agreement between the students and instructor and will set the precedent for the remainder of the course.

Gen-AI:

With the advent of Gen-AI tools such as ChatGPT and others, it may be tempting to want to rely on these tools for context, grammar, and content. While I cannot stop you from engaging in said activities, I ask that you use these tools in a limited manner and in a small capacity for the sole purpose of fact-checking, identifying inaccuracies, or inspiring ideas. One of the caveats of this research methods course is that you are both a researcher and a participant. This means that your unique experiences and voices are just as important as the process of communicating these processes and experiences. If you submit an assignment, project, discussion board, or any other course material, please be transparent about what you used Gen-AI in (e.g., highlighting the content generated from Gen-AI) and document with evidence its use (e.g., screenshots with timestamps). Furthermore, you will need to include in said course material, the reason why you used Gen-AI tools and how you abided by the course integrity rules and instructor guidelines. In the same manner, if I use these tools, I will be transparent with you and show you proper documentation as well.

Use of Course Materials:

It is my expectation that you do not use the provided example data or any content of this course for your personal gain (e.g., publications, dissertation, presentations) but rather for your educational growth and development. In the same vein, the material that I have developed for this course is UF's and my intellectual property. You are not permitted to download a copy of my instructional material or share with others without my expressed, written consent at any point in time during or after the class. A template of the permission letter has been provided on Canvas.

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 <https://disability.ufl.edu/students/get-started/>. 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/>.

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 (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) 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 broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Pamela Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@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: <https://registrar.ufl.edu/ferpa.html>

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 umatter@ufl.edu 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: <http://www.counseling.ufl.edu/cwc>, 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 **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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/>.

Academic Resources

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

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. 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.
<https://teachingcenter.ufl.edu/>.

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

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.