ED PSY 824: Advanced Experimental Design and Analysis

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- I do my very best to respond to email within 24 hours during regular business hours. If you do not get a response from me within a couple of work days, please feel free to follow up with a reminder. Note that I may not check and respond to email in the evenings or on weekends.
- Please do check the Canvas course page before emailing to see if the information is posted there. For example, if I already received some questions about a homework problem, I may have posted clarifications on Canvas. If you cannot find the information, do feel free to send me an email.

Office Hours: Please **contact me by e-mail to set up a time** to meet, as necessary.

- We can meet in person, online, or speak by phone.
- Please let me know at least a couple of days in advance of when you would like to meet so we can set up a mutually convenient meeting time and modality.

Course Objectives: This course will introduce students to data analysis techniques appropriate for specific experimental designs, most of which are variations of the Analysis of Variance (ANOVA). The objectives of the course are to enable students to:

- Identify the most appropriate analysis for research questions that involve comparing groups or conditions on an outcome variable of interest (e.g., data collected through experiments);
- Use statistical software to appropriately carry out the data analysis and interpret the statistical information;
- Clearly communicate the results of the statistical analyses to address the research questions of interest.

By the end of the course students should be able to identify the analysis procedure most appropriate to address a particular research question with a given data set, carry out the analysis, and properly interpret/communicate the results. The focus will be to expose students to basic experimental designs and analyses that they may need to use in their own research or encounter in reading research articles.

Pre-requisites: A graduate-level statistics course (e.g., ED PSY 724) that included factorial ANOVA as well as multiple regression and statistical computing (e.g., SAS, SPSS, R).

Textbook: Designing Experiments and Analyzing Data: A Model Comparison Perspective, Third Edition, by Scott E. Maxwell, Harold D. Delaney, and Ken Kelley, published by Taylor & Francis, 2018. ISBN: 9781138892286.

- Note that we will use the third edition of the book for the course.
- We may also discuss journal articles or other readings of relevance throughout the course. If so, these will be posted on Canvas.

Computing: Students will be required to use statistical software (e.g., SAS, SPSS, or R). Students are expected to already be proficient in at least one software package. The **emphasis will be on demonstrating the use of SAS**, so this may be a good opportunity to learn it if you haven't before.

- Please be aware that I will be best able to help you with SAS. If you want to use another software package, you will need to be able to figure out how to obtain the results with that package (the book's web site contains some instructions for SPSS and R, in addition to SAS).
- Further information and instructions on software are available on the course Canvas site under Computing Resources.

Course Web Site and Delivery: This course will make extensive use of its **Canvas** site.

- The Canvas site can be accessed from <u>UWM Canvas Home</u> and instructions/support for using Canvas are available at <u>Student Canvas support</u>.
- Students are expected to check Canvas on a regular basis for announcements, notes, assignments, discussions, and any other course information.
  - You can specify your <u>preferred notification settings</u> in Canvas to make sure you do not miss important information.
- I will plan to post the materials, including **notes** (with and without a voice-over recording), no later than <u>Monday</u> each week. The notes in the posted documents will be up to date and may differ slightly from the notes in the recordings (e.g., if updates or corrections were needed since the recordings were made).
  - You are expected to review the materials and attempt the provided **learning checks** (which are *not* counted towards the course grade) **prior** to the class meetings and before starting the homework assignments (which *will* count towards the course grade).
- We will meet on **Thursdays at 2:30pm in person** (in our assigned classroom).
  - Please plan to attend the classes in person as much as possible. I hope to make remote participation (through zoom) available, but I recommend that you only attend remotely when absolutely necessary rather than just for convenience.
  - In the class meetings I will summarize the material, provide clarifications, answer your questions about any of the material (including assignments and learning checks), and discuss any other course information.

Course structure and student evaluation:

- *Homework:*
  - Homework problem sets will generally be **assigned every week** (based on that week's material) and will be submitted on Canvas.
  - The assignments will typically be due on Thursdays, approximately every 2-3 weeks. Specific due dates will be posted on Canvas. (Note that assignment points may show up as 0 on Canvas but this will be updated once assignments are posted/graded.)
  - <u>Late homework assignments</u> will be accepted with a **10% point-deduction** for each day they are late (in other words, you will lose 10% of the total number of points for the assignment for each day it is late, including weekend days). This penalty may be reduced or exempted if the reason for late submission is acceptable to the instructor, so *please communicate with me (the instructor) in advance of the due date if there are extenuating circumstances and/or your homework will be late*. It is preferable that you submit an assignment that reflects **your best work** and is a bit late than one that does not reflect your best work but is on time.
  - Homework assignments will consist of problems that are intended to give you some hands-on practice with the material. You are expected to clearly demonstrate and communicate your understanding in your answers; see also the **Homework Guidelines** document on Canvas.
  - Each problem (or major component) will be graded on a three-point scale to indicate the level of accuracy and understanding reflected in it:

Points	Description
3	Complete, clear and correct.
2	Some mistakes and/or misconceptions, somewhat unclear or incomplete.
1	Many mistakes and/or major misconceptions, very unclear or incomplete.
0	Not done or barely attempted.

  - Homework grades and comments are designed to provide you with feedback on the level of understanding conveyed in your assignment. Do not put off asking for help if you don't know how to do a problem or do not understand the feedback you received. Better yet, if you are unsure how to do a problem, ask *before* the assignment is submitted. (Note that I will not "pre-grade" your answers but will be happy to clarify anything that is unclear to you.)

- o Please feel free to post any questions (or helpful information for other students) in the **Discussions** section on Canvas.
- o <u>A note on working with others</u>: The goal of the homework assignments is to make sure you are learning and understanding the material, so it would defeat the purpose if you get the right answer without really understanding why. Thus, while you are allowed to discuss the concepts on homework assignments with classmates, it is recommended that you always attempt to complete the assignments on your own. In addition, **the work you submit must be your own**, and it is considered academic misconduct to submit anyone else's work (or words) as your own. Also note that you will <u>not</u> be allowed to discuss or work with others on the final exam.

- *Course Project:*
  - o <u>Overview</u>: The purpose of the project is to provide an opportunity for you to apply the procedures we cover in the course to a data set and research question that is (preferably) of interest to you. You will be asked to **obtain a data set** (e.g., from your field of study) that can be analyzed using the procedures covered in the course, develop a relevant research question, and use the data to address the question.
    - The data set should contain at least one continuous variable of interest (i.e., the outcome or dependent variable), and at least 2 categorical variables that constitute groups, conditions, or "levels" that you would want to compare (in terms of the outcome variable).
    - Please make sure you have an adequate sample size (about 10 observations per group combination should be adequate for most purposes, though more is better).
    - The data set can consist of data collected for another purpose (e.g., your research), but the projects should be original and should **not** consist of analyses conducted for another class or purpose.
  - o <u>Groups</u>: To encourage interaction with classmates, these will be group projects with 2 students per group. Group members are expected to contribute equally to the project, and students may have an opportunity to evaluate the contributions of their project partner.
    - There is a **survey** on Canvas (under Quizzes) where you can indicate your project partner preference. Partners should be set by about the third week of the semester.
  - o <u>Components</u>: The project will consist of **two parts**. The first part will involve a presentation of your proposed project to the class, and the second part will consist of a written report of the completed project.
    - The first part will serve as a proposal, describing the data set, the research question(s), planned analyses, and possibly some descriptive statistics or preliminary results. This will be presented to the class so you can receive feedback and suggestions for improvement before completing the project. All students should plan to attend all project presentations.
    - The second part will consist of the final written report, which will be submitted on Canvas and will include the full analyses, results, and conclusions.
  - o The projects will be graded based on the suitability and accuracy of the analyses as well as clarity and level of understanding demonstrated in the written summary.
  - o Further details on all project components will be posted on Canvas closer to the due dates.

- *Final Exam:*
  - o There will be a final exam ("take-home") that will be due during finals week.
  - o Students are expected to **complete the exam independently** and with the utmost regard for academic integrity. Students will **not** be allowed to discuss the exam with anyone (other than the instructor) and violations of this will be considered academic misconduct.

The weights assigned to each of these components will be:

Homework		**25%**
Project:	**Proposal/presentation**	**10%**
	Final report	**25%**
Final exam		**40%**

There will be NO extra credit option in this course.

Using these weights, final scores (out of 100) will be computed and these will be converted to letter grades as follows:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
90-100	85-89	80-84	75-79	70-74	67-69	63-66	60-62	57-59	53-56	50-52	below 50

*Academic Integrity***:**
- It is better to receive an honest grade on your own work than to risk committing plagiarism or academic misconduct. If you are unsure what is acceptable, or need help, please ask.
- Excerpts from UWM's Academic Integrity Online page:
  - Ask your instructor if you are unsure about how to complete an assignment or course requirement appropriately.
  - When collaborating with other students, collaborate for a better understanding of the material, not for answers. (*Note: No collaboration of any kind is allowed on the exam in this course.*)
  - If you are unable to complete assignments, the instructor may be flexible with the deadlines, and receiving a late penalty is far better than academic dishonesty.
- There is additional information and resources for avoiding plagiarism at Plagiarism.org

University Policies:
Policies regarding participation of students with disabilities, accommodations for religious observances, academic misconduct, student complaints, grade appeals, sexual harassment, attendance, assignment of a grade of "incomplete", etc., are available at this Syllabus Links document. ***Students should review these policies at the start of the course***.

Time Investment:
This will vary by student and by week, but my expectation is that students will spend a total of about 150 hours on the course (as would be the case for an in-person 3-credit course). This document provides a more detailed breakdown. This is an estimated workload and students will be assessed on their performance (as indicated in the syllabus), not on the time put into the course.

Tentative Schedule

Week	Date	Topic	Reading
1	Jan. 26	Review: One-way Analysis of Variance	Chapters 1-3
2	Feb. 2	Review: One-way ANOVA and group comparisons	Chapters 3-4
3	Feb. 9	Multiple contrasts / group comparisons	Chapter 5
4	Feb. 16	Two-way ANOVA and non-orthogonal designs *Project partners are set*	Chapter 7
5	Feb. 23	Factorial ANOVA	Chapters 7-8
6	Mar. 2	Factorial ANOVA *Presentation date signup*	Chapter 8
7	Mar. 9	ANCOVA and Blocking	Chapter 9
8	Mar. 16	ANCOVA and Blocking	Chapter 9
9	Mar. 23	***Spring Break***	
10	Mar. 30	Random or Nested Factors *Project proposal presentations*	Chapter 10
11	Apr. 6	One-way Within-subjects (repeated measures) ANOVA: Univariate approach *Project proposal presentations*	Chapter 11
12	Apr. 13	One-way Within-subjects (repeated measures) ANOVA: Multivariate approach *Project proposal presentations*	Chapter 13
13	Apr. 20	Higher-order Within-subjects (repeated measures) ANOVA: Multivariate approach *Project proposal presentations*	Chapter 14
14	Apr. 27	Within- and Between-subjects ANOVA designs: Multivariate approach *Project proposal presentations*	Chapter 14
15	May 4	Within- and Between-subjects ANOVA designs: Multivariate approach (continued)	Chapter 14
16	May 11	Catch-up and/or review ***Project (final report) due***	TBD
Finals week	May 18	➤ ***Final exam due***	