Syllabus

NEUR 702

Research Methods

Fall Semester 2025

Weekly schedule: Starting Aug. 25, 2025, each week runs from Monday (12:01 am) to Sunday (11:59 pm).

Instructor: Frank Krueger, Ph.D.

Department: School of Systems Biology

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Office Hours: By appointment (via Zoom)

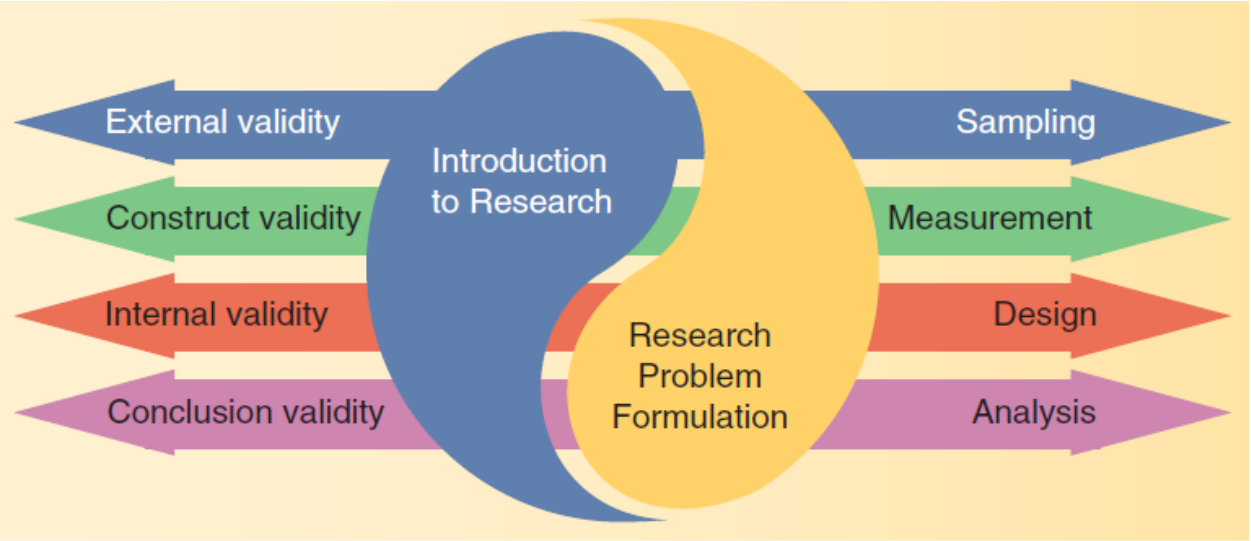
Course Description

In this course, students will learn about the fundamental steps of a *research road map* that underlie all research, consisting of interconnected research processes such as problem formulation, sampling, measurement, design, analysis, and conclusion. Furthermore, students will get introduced to the Yin and the Yang of research —stressing the inherent complementarities of theory and practice of research— to become better researchers. Finally, students will develop their research project, provide constructive peer feedback to their fellow students related to their research project, and apply fundamental principles of research methods, bringing theory (i.e., introduction to research) and practice (i.e., research problem formulation) together.

The course consists of *five building blocks* that serve as key components for an introduction to the field of research methods:

- **Building block 1** provides an *introduction to research methods,* including foundations of research enterprise (e.g., conceptualizing, language, structure, and validity of research), ethics (historical cases of unethical research, evolution of modern system of research ethics, and ethics in the production and publication of scholarly work), and qualitative approaches (e.g., context for qualitative research, qualitative methods and data, and assessing qualitative research).
- **Building block 2** offers an *introduction to sampling,* such as foundations of sampling (e.g., terminology, sampling methods, and theories of non- and probability sampling).
- **Building block 3** presents an *introduction to measurement*, dealing with foundations of measurement (e.g., levels of measurement, quality of measurement, integration of reliability and validity), scales, tests, indexes (e.g., the purpose of scaling, test construction, constructing, and index), and survey research (e.g., survey methods, survey design, and interviews).

- **Building block 4** includes an *introduction to design*, incorporating foundations of design (e.g., research design and causality, developing a research design, and types of designs), experimental design (e.g., classifying experimental designs, factorial designs, and randomized blocked designs), and quasi-experimental design (e.g., nonequivalent group design, regression-discontinuity design, and other quasi-experimental designs).
- **Building block 5** offers an *introduction to analysis and reporting*, comprising the foundation of data analysis (e.g., conclusion validity, data preparation, and descriptive statistics), inferential analysis (e.g., general linear model, experimental analysis, and quasi-experimental analysis), and research communication (e.g., written reports, presentations, and posters).



The Yin and Yang of Research (Trochim et al., 2016, p. xv)

Learning outcomes

By the end of this course, students will be able to:

1. Understand the principles of the research road map (e.g., problem formulation, sampling, measurement, design, analysis, and conclusion);
2. Comprehend the inherent complementarities of theory and practice of research to become a better researcher<
3. Develop a research project in their field of study by applying the learned knowledge about research methods; and
4. Use software tools to conduct a literature review, write a research project, and present a research project.

Prerequisite

Prerequisites are the completion or concurrent enrollment in all other required general education courses or permission of the instructor.

Course Materials

Required Texts: Trochim W, Donnelly JP, Arora K. *Research Methods: The Essential Knowledge Base***.** Cengage.

Course Logistics

This course will use a distance learning format; the primary meeting space will be on Canvas, and we will use other means of keeping in touch, such as e-mail and Zoom. This is a rigorous course: you will accomplish the following activities in a typical week:

- reading about 35-50 pages, reflecting on the content, and discussing the material with your classmates;
- completing online activities and responding to weekly requirements; and
- working on assignments, completing them in Canvas according to the assignment schedule.

Though the delivery method is different, it should take the same time as a typical full-semester course. You should **expect to spend approximately 9 hours on coursework each week** (including the time you would have spent in a classroom). It is critical to keep up with weekly requirements. Each week, I will provide announcements via e-mail and a module in our Canvas course to specify required activities and assignments (available by clicking on 'Weekly Modules' on the course menu in Canvas).

Canvas (Available on Aug. 25, 2023)

We will use Canvas for the course. Additional guidance on individual assignments and discussion questions will be posted there. All assignments will be submitted through Canvas for grading. Please visit our Canvas site regularly.

Access Canvas by following these steps:

1. Go to http://mymason.gmu.edu.
2. Log in using your NETID and password.
3. Click on the 'Courses' tab.
4. Click ' Research Methods' under the 'Course List' heading.

Instructor-Student Communication

I will respond to your emails within 24 hours from Monday (9 am) through Friday (6 pm). If I am away from email for more than two days, I will notify the class via announcement.

Before sending an e-mail with questions, please check the following (available on your Canvas course menu) **unless the e-mail is personal**:

1. Syllabus.
2. Canvas tutorials on how to use Canvas features.
3. Canvas Q&A (resources specific to Mason).
4. Technology Requirements.

Mason E-MAIL

- Mason requires that the Mason e-mail be used for all courses. I will be sending messages to your Mason e-mail, and you are responsible for ensuring you have access to these messages.
- You may forward your Mason e-mail to other accounts, but always use your Mason e-mail when communicating with me to verify your identity.
- You must regularly check your Mason e-mail account and maintain your mailbox so that messages are not rejected for being over quota.
- When you email me, include '**Research Methods**' at the beginning of the subject heading to alert me that I have received a message from one of my online students.

Participation

Netiquette For Online Discussions

Our discussion should be collaborative, not combative; you create a learning environment, share information, and learn from one another. Respectful communication is essential to your success in this course and as a professional. Please re-read your responses carefully before you post them so others will not take them out of context or as personal attacks. Be positive to others and diplomatic with your words, and I will try my best to do the same. Be careful when using sarcasm and humor. Without face-to-face communication, your joke may be viewed as criticism. Experience shows that even an innocent remark in the online environment can be easily misconstrued.

Netiquette prepared by Charlene Douglas, Associate Professor, College of Health & Human Services, GMU.

Technology Requirements

Technology requirements for the course are:

- Internet connection (DSL, LAN, or cable connection desirable).
- Supported web browsers (e.g., Internet Explorer, Chrome, Safari) and allowed users to use Adobe Connect for live class sessions.
- MS Office 365 ProPlus is free via the Microsoft Student Advantage Program (Access is tied to your @gmu.edu e-mail address).

Student Responsibilities

Mason E-mail

Students are responsible for the content of university communications sent to their George Mason University e-mail account and are required to activate their account and check it regularly. For accessibility and privacy, the university, school, and program will send communications to students solely through their Mason e-mail account —students should respond accordingly.

Patriot Pass

Once you sign up for your Patriot Pass, your passwords will be synchronized, and you will use your Patriot Pass username and password to log in to the following systems: Canvas, University Libraries, Mason E-Mail, myMason, Patriot Web, Virtual Computing Lab, and WEMS. [See]

AI Guidelines

These resources provide a framework and guidance for the responsible and ethical use of AI across our academic community. [See]

Students with Disabilities

Students with disabilities who seek accommodations in a course must register with the George Mason University Office of Disability Services (ODS) and inform their instructor in writing at the beginning of the semester. [See]

Academic Integrity

Students must be responsible for their work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be the foundation of our university culture. [See]

Honor Code and Virtual Classroom Conduct

Students must adhere to the guidelines of the George Mason University Honor Code. [See]

University Policies

Students must follow university policies. [See]

Responsible Use of Computing

Students must follow the university policy for Responsible Use of Computing [See].

University Calendar

Details regarding the current Academic Calendar [See].

University Catalog

The current university catalog [See].

Student Services

Writing Center

The George Mason University Writing Center staff provides various resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. ESL Help: The program was designed specifically for students whose first language is not English who feel they might benefit from additional, targeted support throughout the semester [See].

University Libraries

University Libraries provide resources for distance students [See].

Counseling and Psychological Services

The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counselors, clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops, and outreach programs) to enhance students' personal experience and academic performance [See].

Family Educational Rights and Privacy Act (FERPA)

The Family Educational Rights and Privacy Act of 1974 (FERPA), or the 'Buckley Amendment,' is a federal law protecting student educational records and providing students with certain rights. [See].

Weekly Schedule

Distance learning is dynamic; weekly schedules may shift to support learning outcomes. Fairness, clarity, and academic goals will guide any approved changes. Each week, you'll spend about 9 hours on readings, a research methods quiz, discussion posts, and research project writing using various software tools. The table below outlines the weekly schedule, key activities, assignments, points, and due dates. Final grades are based on the total points earned.

Weeks	Major Topics and Method	Assignments (graded)	Points	Due Date
Week 1 Monday, Aug. 25 — Sunday, Aug. 31	Part 1: Foundations Foundations of Research Methods Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Topic: Discussion (Part 2) Project: How to use the Word Software Package Introduction Orientation Quiz	5 5 5 5 10 5 5	Thursday, 8/28 Sunday, 8/31

Week 2 Monday, Sept. 1 — Sunday, Sept. 7	Part 1: Foundations Ethics Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Ethics Project: Revision	5 5 5 5 5 10 5	Thursday,9/4 Sunday, 9/7
Week 3 Monday, Sept. 6 — Sunday, Sept. 14	Part 1: Foundations Ethics Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: How to use Zotero Software Package Project: Revision	5 5 5 5 5 10 5	Thursday, 9/11 Sunday, 9/14
Week 4 Monday, Sept. 15 — Sunday, Sept. 21	Part 2: Sampling Sampling Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Background Project: Revision	5 5 5 5 5 10 5	Thursday, 9/18 Sunday, 9/21
Week 5 Monday, Sept. 22 — Sunday, Sept. 28	Part 3: Measurement Introduction to Measurement Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Gap of Knowledge Project: Revision	5 5 5 5 5 10 5	Thursday, 9/25 Sunday, 9/28
Week 6 Monday, Sept. 29 — Sunday, Oct. 5	Part 3: Measurement Scales, Tests, and Indexes Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Goal Project: Revision	5 5 5 5 5 10 5	Thursday, 10/2 Sunday, 10/5
Week 7 Monday, Oct. 6 — Sunday, Oct. 12	Part 3: Measurement Survey Research Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Hypothesis Project: Revision	5 5 5 5 5 10 5	Thursday, 10/9 Sunday, 10/12

Week 8 Monday, Oct. 13 — Sunday, Oct. 19	Part 4: Design Introduction to Experimental Design Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Sample Project: Revision	5 5 5 5 5 10 5	Thursday, 10/16 Sunday, 10/19
Week 9 Monday, Oct. 20 — Sunday, Oct. 26	Part 4: Design Experimental Design Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: How to use the PowerPoint Software Package Project: Revision	5 5 5 5 5 10 5	Thursday, 10/23 Sunday, 10/26
Week 10 Monday, Oct. 27 — Sunday, Nov. 2	Part 4: Design Quasi-Experimental Design Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Experimental Design Project: Revision	5 5 5 5 5 10 5	Thursday, 10/30 Sunday, 11/2
Week 11 Monday, Nov. 3 — Sunday, Nov. 9	Part 5: Analysis and Reporting Introduction to Data Analysis Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Structuring Presentation Project: Revision	5 5 5 5 5 15 5	Thursday, 11/6 Sunday, 11/9
Week 12 **Monday, Nov. 10** **—** **Sunday, Nov. 16**	Part 5: Analysis and Reporting Inferential Analysis Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Data Analysis Project: Revision	5 5 5 5 5 10 5	Thursday, 11/13 Thursday, 11/16
Week 13 Monday, Nov. 17 — Sunday, Nov. 23	Part 5: Analysis and Reporting Research Communication Research Project	Topic: Discussion (Part 1) Topic: Glossary Topic: Quiz Project: Feedback Topic: Discussion (Part 2) Project: Creating a Presentation Project: Revision Course Evaluation	5 5 5 5 5 15 5 15	Thursday, 11/20 Sunday, 11/23

Week Monday, Nov. 24 — Sunday, Nov. 30	Thanksgiving Recess			
Week 14 Monday, Dec. 1 — Sunday, Dec. 7	Part 6: Research Project	Project: Submission Project Project: Giving a Presentation Make-up Assignments Final Reflection Portfolio	20 20 15 20	Thursday, 12/4 Sunday, 12/7
			Total 700	

Grading Scale (points)

Final grades for this course will be based on the percentage of total points earned, calculated from a core total of **700 points**. In addition to the required weekly assignments, you can earn up to **50 extra points** through optional activities. These include a *Make-up Assignment (15 points), Final Reflection Portfolio (20 points)*, and submission of your *GMU course evaluation (15 points)*. While not required, these bonus points can help boost your final grade, compensate you for missed work, or even move you into a higher-grade bracket. Your final grade will be determined solely based on the 500-point core, and any extra credit will be added on top. As a result, earning more than 100% is possibly a meaningful reward for students who go above and beyond. These opportunities are a chance to enrich your experience, reflect deeply, and demonstrate your full engagement with the course.

Letter Grade	Percentage	Points	Performance
A^+	98-100%	686-700+	Superb Work
A	93-97%	651-687	Excellent Work
A^-	90-92%	630-650	Nearly Excellent Work
B^+	87-89%	609-629	Very Good Work
B	83-86%	581-608	Good Work
B^-	80-82%	560-580	Mostly Good Work
N/A	<80%	<560	Failing Work