BENG 501: Bioengineering Research Methods (3 credits)
Fall 2021 Syllabus and Weekly Schedule

Instructor:
- Title: Michael Buschmann, PhD
- E-mail: mbuschma@gmu.edu
- Office: 3101 Peterson Hall
- Office hours: email me to make a Zoom appointment

Lectures or Labs (Sec(s) XXX):
Thursday   1:30-4:10 PM (Aug 26 to Dec 2)
Nguyen Engineering Building 2608

Website/Course Management System:
https://mymasonportal.gmu.edu/ultra/courses/_431741_1/cl/outline

Important Notes and Dates:
- **Last Day of Classes:** Dec 2

Students should visit http://registrar.gmu.edu/calendars/ for information on the University Academic Calendar.

Course Delivery: In Person

Required Textbook:
Practical Research: Planning and Design, 12th Edition, by Paul D. Leedy, Jeanne Ellis Ormrod
Please obtain a paper or electronic copy of this text :
http://www.mypearsonstore.com/bookstore/practical-research-planning-and-design-plus-mylab-education-9780134802763?xid=PSED

Course Description:
The course provides an understanding of the research process including identifying an important problem, performing a literature search, articulating a goal, formulating hypotheses, making a research plan, writing a research proposal, collecting and analyzing data, interpreting data, drawing conclusions, and research ethics. Specific skills to acquire include how to do literature searches, write manuscripts, write and review research proposals and make oral and poster presentations. Different types of experimental designs and a review of statistical procedures for data analyses and interpretation are also included.

Course Goals and Objectives/Learning Outcomes:
1) Understand the research process of identifying an important problem, performing a literature search, articulating a goal, formulating hypotheses, making a research plan, writing research proposals, collecting and analyzing data, interpreting data, drawing conclusions, research ethics. Specific skills to acquire include
2) Develop the ability to write scientific manuscripts for publication
3) Develop the ability to write research proposals for funding organizations such as NSF and NIH
4) Develop the ability to communicate effectively in oral and poster presentations.

Course Content : (**evaluations/assignments are in red**)
1) The Research Process: An Introduction
Reading : Leedy & Ormrod Ch 1 & 2. Discuss your thesis topic with your supervisor and present an analysis of 2 articles (pdfs) in class.
Evaluation/Assignment : **quiz** on Leedy Chapters 1 & 2

2) How to Do a Literature Review
Training on Library databases for literature searches (by Theresa Calcagno).
Training on Reference Manager Software Zotero (by Chris Magee).
Reading : Skim Leedy Ch3.
Evaluation/Assignment : Literature review **report** (5 pages, 25 references) on your PhD/MS topic due in 4 weeks.

3) Writing a Manuscript for Publication
Reading : 4 Bates and 3 Borja pdfs.
Evaluation/Assignment : Class **presentation** of an analysis of one paper (from your Literature Review) according to the Baylor Sections and identify where the paper corresponds and where it does not to Baylor's suggestions. List and discuss Strengths and Weaknesses of the Writing.

4) The Research Process : Quantitative and Qualitative Research, Experimental Design, Sampling, Sources of Bias, Confounding Variables, Research Ethics.
Reading : Sections of Leedy Ch 4,6,7. Publication Ethics from Elsevier web site
https://www.elsevier.com/editors/perk
Evaluation/Assignment : **quiz** on Leedy Ch 4,6,7

5) Quantitative Analyses and Review of Statistical Procedures
Reading : Leedy Ch11 and completion of the Linked In course on R
Evaluation/Assignment : **quiz** on Leedy Ch 11.

6) Writing and Reviewing Research Proposals
Reading : NSF and NIH pdfs and web sites.
Assignment : You will be a reviewer or reader for 4 grants and participate in a simulated NIH study section. Your grade will be determined by your participation in discussions and submitted reviews. You will submit a 5 page **research proposal** on your topic

7) <u>Making an Oral Presentation</u>
Reading : Two online NIH videos http://videocast.nih.gov/Summary.asp?File=16079&bhcp=1, http://videocast.nih.gov/Summary.asp?File=15993&bhcp=1
Evaluation/Assignment : Take a prior piece of work that you have done and make a 20 minute research **presentation** followed by 10 minutes of audience questions. If not prior work is available, the student can choose a publication and present it in the same format.

Assignments and Examinations:
There will be 8 components contributing to the final grade as follows :
3 quizzes : 8.3% each = 25%
1 paper presentation = 10%
1 literature review report : = 20%
1 research proposal report : = 20%
NIH Study section : 10%
Oral presentation : 15%

Course Policies:
- Students are expected to exhibit professional behaviors and dispositions at all times.
- *Face-Covering and Social Distancing:* Face coverings are required for anyone in all buildings on campus in accordance with University Policy 1415. If you are unable to wear a face mask, you will need to first receive approved accommodation from Disability Services (ODS) and provide this information to me (*and TA if applicable*) before being allowed to remain in the class. Students who fail to comply with the face covering requirement must leave the classroom and will be reported to the Office of Student Conduct. To maintain physical distance, students should fill the classroom beginning with the seat farthest from the door. This process should be reversed in leaving the class. Students should sit in available seats and maintain at least 6 ft. social distance during the class and in entering and exiting the class.

Course Schedule

Date	Class Number		Assignments
Week 1			
08/26/20	1	Course introduction : Syllabus, Leedy Ch1	Read Leedy Ch1&2. Discuss your PhD topic with your supervisor and decide the subject of your literature review report.
Week 2			
09/02/20	2	Leedy Ch2 Zotero and Literature searches https://coursemedia.gmu.edu/media/Zotero/1_hbkvo79z Leedy Ch3 focusing on the red items in the ppt. Discussion of Literature review assignment.	Upload to Blackboard "Choosing Your Research Project Assignment". Read Leedy Ch3 in particular pages 69-78. Read "Searching for literature". Start "Literature Review Assignment".
Week 3			
09/09/20	3	Quiz on Leedy Ch1&2. Leedy Ch 4, 6 focusing on the red items in the ppt. Library Skills and Services (Theresa Calcagno). Discussion of Literature review assignment.	Read Leedy Ch4,6.
Week 4			
09/16/20	4	Writing a Manuscript for Publication –> Bates and Borja pdfs. Discussion of the Literature Review Assignment.	Read 4 Bates and 3 Borja pdfs on Blackboard. Upload the Literature review outline onto Blackboard.
Week 5			
09/23/20	5	Class Presentation (5-10 minutes) of a Paper from your Literature Review. Identify where the paper corresponds to the sections in Bates and where it doesn't. List Strengths and Weaknesses of the Writing. Discussion of Literature Reviews.	
Week 6			
09/30/20	6	The Research Process : Quantitative and Qualitative Research, Experimental Design, Sampling, Sources of Bias, Confounding Variables, Research Ethics (Ch 7) Quantitative Analyses and Review of Statistical Procedures (Ch 11) Publication Ethics	Reading Leedy Ch7,11. Publication Ethics from Elsevier web site: https://www.elsevier.com/editors/perk
Week 7			
10/7/20	7	No Class – Please complete the Literature Review	

Week 8			
10/14/20	8	Research Integrity & Assurance (Dr. Christopher DiTeresi) Quiz on Leedy Ch 4,6,7 Quiz on Leedy Ch 11	The Literature Review report is due on Blackboard
Week 9			
10/21/20	9	Writing and Reviewing a Research Proposal	Reading : NSF and NIH pdfs and web sites on Blackboard. Start "Research Proposal Assignment".
Week 10			
10/28/20	10	NIH study section simulation	Assignment : Discuss and evaluate 3 grants. Each student is a reviewer for one grant and reader for another. Each reviewer writes and submits a review according to the 5 NIH criteria.
Week 11			
11/04/20	11	Making Oral and Poster Presentations	See instructions for Oral Presentation assignment
Week12			
11/11/20	12	Discussion of your Research Proposals	Prepare a 5-10 slide 5-10 minute presentation of your proposal. Write out your purpose, specific aims, hypotheses on one or two of the slides
Week13			
11/18/20	13	Oral Presentations (6)	A 12 minute ppt using your own project and data or from an article in your literature review.
11/25/20		Thanksgiving	
Week15			
12/02/20	14	Oral Presentations (6)	A 12 minute ppt using your own project and data or from an article in your literature review.

Note: the instructor reserves the right to make any changes in the course determined academically advisable. Changes will be announced in class and updated in the syllabus (where appropriate). It is your responsibility to keep up with any changed policies.

If the campus closes or class is canceled due to weather or other concern, students should check Blackboard [or other instruction as appropriate] for updates on how to continue learning and information about any changes to events or assignments. Note, the university will move to all-online instruction on November 30, following the Thanksgiving holiday.

Student Expectations, Policies and Resources:

University Policies
Students must follow all university policies. [See https://universitypolicy.gmu.edu/all-policies/].
Responsible Use of Computing: students must follow the university policy for Responsible Use
of Computing. [See https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/].

Safe Return to Campus for Fall 2021
All students taking courses with a face-to-face component are required to follow the university's
public health and safety precautions and procedures outlined on the university Safe Return to
Campus webpage (https://www2.gmu.edu/safe-return-campus). Similarly, all students in face-to-
face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a
week. The COVID Health Check system uses a color code system and **students will receive either
a Green, Yellow, or Red email respons**e. Only students who receive a "green" notification are
permitted to attend courses with a face-to-face component. **If you suspect that you are sick or
have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask
you to show them that you have received a Green email and are thereby permitted to be in
class.**

Academic Integrity
It is expected that students adhere to George Mason University's Honor Code. Please see the
University Catalog or https://oai.gmu.edu/mason-honor-code/full-honor-code-document/ for a full
description of the code and the honor committee process. The principle of academic integrity is
taken very seriously and violations are treated gravely. Any instances of misconduct will be
referred to Mason's Office of Academic Integrity the consequences of which could significantly
affect your career.   Depending on the level of severity and the number of recorded incidents this
could result in academic suspension or even permanent dismissal.

Students should not cheat, plagiarize, steal and/or lie in matters related to academic work. What
does academic integrity mean in this course? Essentially this: when you are responsible for a task,
you will perform that task. When you rely on someone else's work in an aspect of the performance
of that task, you will give full credit in the proper, accepted form. Another aspect of academic
integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course,
with the firm expectation that all aspects of the class will be conducted with civility and respect
for differing ideas, perspectives, and traditions.

Posting or sharing of instructor-created course content (e.g. instructor lecture notes, assignments,
exam and quiz questions, or anything else not credited by the student) using any non-electronic or
electronic medium where it is accessible to anyone other than the individual student constitutes
stealing/copyright infringement and is considered a violation of the honor code. In particular use
of public online study sites to access assignment, exam or quiz questions for this class; access
exam, quiz, or assignment answers for this class; upload any of the instructor's materials,

assignments, quizzes, or exams; and uploading any of your own answers or finished work violates Mason's honor code. This is strictly prohibited without prior instructor approval.

When in doubt (of any kind, including what constitutes an honor code violation) please ask your instructor for guidance and clarification. Students must be responsible for their own work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university culture.

Diversify and Inclusion
The Bioengineering Department is committed to providing an inclusive and equitable work and learning environment. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. Please also refer to the Center for Culture, Equity, and Empowerment (CCEE). CCEE is located in the Student Union Building I (SUB I), Suite 2400. Email:odime@gmu.edu | Phone: (703) 993-2700.
[See https://ccee.gmu.edu/]

If you wish, please share your name and gender pronouns with me and how best to address you in class and via email. I use <preferred pronouns> for myself and you may address me as "XXXX" in email and verbally.

Mason Email
Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. Note, student accounts have now migrated from @masonlive.gmu.edu to @gmu.edu (MasonLive is no longer available to students). All communication from the university, college, school, and program will be sent to students solely through their Mason email account.

Privacy:
Family Educational Rights and Privacy Act (FERPA) of 1974, also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See http://registrar.gmu.edu/privacy]. Note, all course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class. This includes video recordings (whether made by instructors or students) and live video conference meetings that can identify specific students (via name, voice, or image).

Students with Disabilities:
Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in the Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474.

Learning Services and Peer Mentoring:
Students can reach out to Learning Services for assistance. They provide free, experience-based learning opportunities through one-on-one academic coaching, academic success workshops, and online resources. Learning Services is located in the Student Union Building I (SUB I), Room 3129. Email:lsstaff@gmu.edu | Phone: (703) 993-2380. [See https://learningservices.gmu.edu/]. You can also reach out to VSE's Peer Mentoring Center for assistance in engineering, computer science, and information technology courses. Note, you should also contact them if you want to serve as a peer mentor. The peer mentor center is located in the Nguyen Engineering Building, Room 2614. Phone: 703-993-1511. [See https://volgenau.gmu.edu/about/current-student-resources/peer-mentor-center].

University Career Services:
University Career Services provides a variety of career-related resources and services (e.g. career advising, resume help, and interview prep). They also host various career-related events including the Fall and Spring career fairs, on-campus interviews, and workshops. Career Services is located in the Student Union Building I (SUB I), Room 3400. Email: careers@gmu.edu | Phone: (703) 993-2370. [See https://careers.gmu.edu/].

Writing Center
The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [*See* http://writingcenter.gmu.edu/]. You can now sign up for an Online Writing Lab (OWL) session or for a face-to-face session in the Writing Center, which means you set the date and time of the appointment! Learn more about the Online Writing Lab (OWL) (found under Online Tutoring).

University Libraries
The Mason library provides resources for both in-class [See http://library.gmu.edu/] and distance students. [See http://library.gmu.edu/distance].

Counseling and Psychological Services
The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and 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. CAPS is located in the Student Union Building I (SUB I), Room 3129. Phone: (703) 993-2380. [See http://caps.gmu.edu].

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence
As a faculty member, I am designated as a "Responsible Employee," and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak to someone confidentially, please contact one of Mason's confidential resources, such as the Student Support and Advocacy Center (SSAC) at 703-380-1434 (24-hr. crisis line) or Counseling and Psychology Services (CAPS) at 703-993-2380 or 703-380-1434 (crisis line). You may also seek assistance from Mason's Title IX Coordinator by calling: 703-993-8730 or emailing titleix@gmu.edu.

<u>The Student Support and Advocacy Center</u>
The Student Support and Advocacy Center (SSAC) provides various support services for students including one-on-one consultations, educational programming, and resources in the areas of sexual and interpersonal violence, financial well-being, substance use, and collegiate recovery. In particular during this challenging time, they are here to assist you. SSAC is located in the Student Union Building I (SUB I), Suite 3200. Email: ssac@gmu.edu | Phone: (703) 993-3686. [See https://ssac.gmu.edu/].

<u>Student Health Services (SHS)</u>
SHS provides confidential health care to enrolled students in emergency and non-emergency circumstances on the Fairfax, Arlington and Prince William campuses. If there is a medical emergency and Student Health Services (SHS) is closed, please contact the free after-hours nurse (703 993-2831), a hospital emergency room, an urgent care facility, or call 911. [See https://shs.gmu.edu/].

<u>University Police</u>
Emergency: 911   Non-Emergency: (703) 993-2810
Reporting a Crime (Crime Solvers Anonymous Tip Hot-Line): (703) 993-4111
Mason Police Website: *http://police.gmu.edu/*