Multivariate Analytical Methods-- RSCH 7140/8140

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Office Hours:	By appointment (Please email/call ahead)

Course Information

<u>Course Description</u>:
RSCH 8140, *Multivariate Analytical Methods*. (3) This course examines statistical procedures that have multiple independent and/or dependent variables, all correlated with one another to some degree. Emphases are placed on practical issues such as selecting the appropriate statistical analyses, using SPSS and R to screen and analyze data, interpreting output, presenting results, and applying these analyses in research areas. Students are trained to be critical consumers and novice producers of multivariate research.

<u>Course Prerequisites</u>:
RSCH 8110 or equivalent (Introductory Statistics)
RSCH 8120 or equivalent (Advanced Statistics)

<u>Course Rationale</u>:
Multivariate analytical methods allow researcher to test models of complex human behaviors from a multidimensional perspective and provides an intriguing view of the world. Because of the difficulty of addressing complicated research questions with univariate analyses and the availability of software, multivariate statistics are widely used in educational and counseling research. The growing popularity of multivariate statistics parallels the greater complexity of research. Understanding multivariate statistics prepares students to read research literature and apply multivariate techniques in their field.
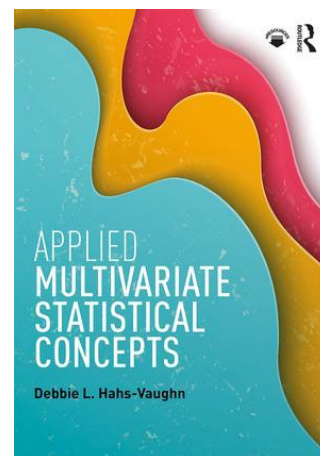
<u>Course Textbook</u>:
Hahs-Vaughn, Debbie L. (2017).
Applied Multivariate Statistical Concepts.
ISBN: 978-0-415-84236-5

Optional (classic textbook for multivariate statistics):
Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics.* Sixth Edition.

Other resources will be available on Canvas & course website.

Course Objectives:

This course is designed to introduce students to multivariate statistical analyses. At the end of the course, you will be able to:

- explain and apply the assumptions made in performing each analysis (see figure below);
- determine if the data meet those assumptions and what to do if they do not;
- determine what method to use with datasets;
- analyzed the data and report results; and
- interpret the results and explain the findings to others.

Decision Rule for Selecting Data Analysis Method
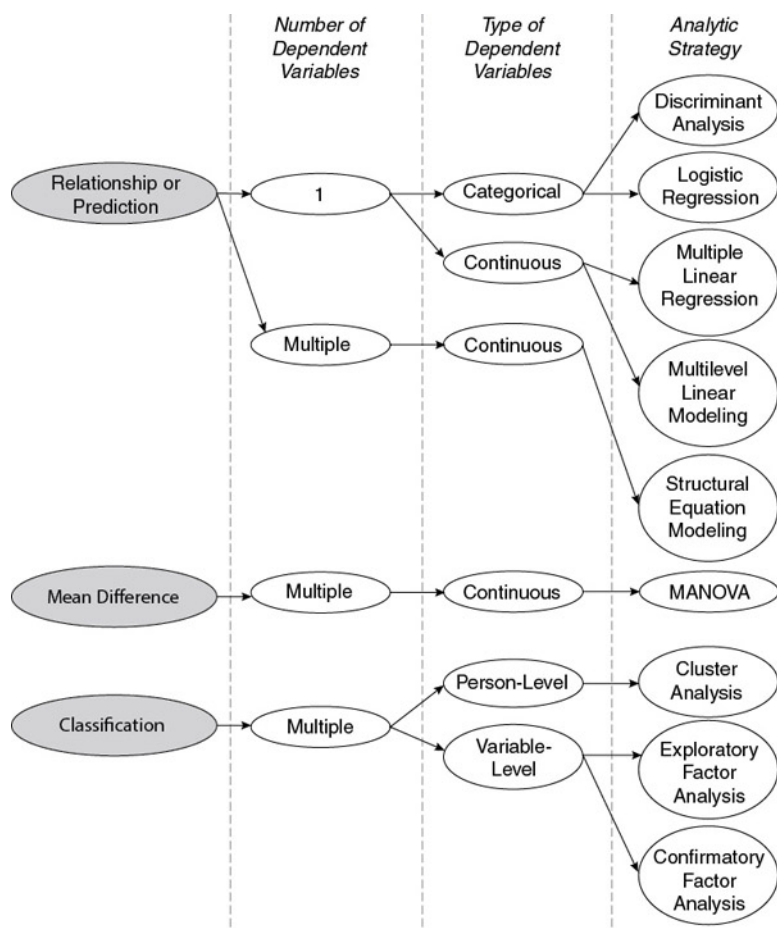
Hahs-Vaughn, Debbie L. (2017). Applied Multivariate Statistical Concepts. (p 3)

Course Evaluation:

(30%)   1. Attend class, participate in class discussions, quizzes, and complete homework assignments as indicated on the syllabus or as assigned in class

(60%)   2. Five research-based projects (12% each)

(10%)   3. Final project with presentation (10%)

<u>Grading Scale</u>:
A …… 90-100
B …… 80-89
C …… 70-79

Assignments that are late are reduced 10%. Assignments are reduced by 10% each day they are late.

<u>Responsibilities</u>:

Student Responsibilities:
1. Check the Web Site for updates (I'll update by Sunday before class)
2. Complete all reading, assignments, and projects on time
3. Don't wait until the last minute to complete assignments and projects
4. Form teams to help each other
5. Attend class. If you have to miss class, meet with a member of your team for update. If you still are having difficulty, call me.
6. Be respectful and mindful of others.

Instructor Responsibilities:
1. DO NOT waste students' time
2. Provide meaningful class activities and assignments
3. Provide opportunities for student success
4. Update homepage by Sunday before class
5. Provide immediate feedback (everything graded before the next class)
6. Be respectful and mindful of others

Student Resources

Canvas Tutorials	https://uncc.instructure.com/courses/342/pages/student-tutorials?module_item_id=10109
UNCC Help Services	http://itservices.uncc.edu/student-services/help-servicesLinks to an external site.
UNCC Library	http://library.uncc.edu/Links to an external site.
UNCC Academic Calendar	http://registrar.uncc.edu/calendar?tid_1=48&tid=42Links to an external site.
UNCC Office of Disability Services	http://ds.uncc.edu/Links to an external site.
UNCC Distance Education Student Services	http://distanceed.uncc.edu/student-servicesLinks to an external site.
UNCC Netiquette Guidelines	http://teaching.uncc.edu/academic-technologies/moodle-2/students/netiquette-guidelinesLinks to an external site.
Student Affairs Website	http://studentaffairs.uncc.edu (Links to an external site.)Links to an external site.

Final Project – Required Upload in Taskstream for Graduate Certificate Students

All students are expected to complete a research project using real data.

There are two products needed for the final project--(a) a paper [at most 8 pages unless otherwise discussed w/ Kailas] & (b) a presentation [~8 minutes PowerPoint using EZ Studio].

The following steps should be taken to complete the project:

1. After talking with your teacher/advisor, select research topic of interest.

2. Conduct a review of literature on the topic area.

3. Develop the research questions. This may be a little artificial for this class and not recommended for research. Always remember that the research question determines you research method, but I am forcing you into selecting a question(s) that requires a quantitative research method using at least one of the multivariate statistics we have covered in class (MANOVA, MANCOVA, Multiple Regression, Logistic Regression, Canonical Correlation, Discriminant Analysis, Factor Analysis, or another multivariate procedure).

4. Analyze result--IMPORTANT.

5. Complete manuscript. You are expected to use APA style.

Manuscript Outline (See your APA Manual concerning the content to include in each section)

Abstract
Introduction (Short)
Background
Statement of purpose
Hypotheses
Method (Short)
Participants
Material
Procedure
Results (Emphasis)
Discussion (Emphasis)
References

Format

Use APA format and include the parts of the manuscript described in the APA Publication Manual (pp. 10-29). The initial manuscript should be double-spaced, contain a single column, utilize 12 point New Times Roman font, and contain 1" margins on all sides. Tables and figures should be included in the text and should appear in the text right after the paragraph in which they were referenced. Manuscripts should be edited for spelling and grammar.

RSCH 8140: Multivariate Final Project Rubric

Elements	Not Met (1)	Proficient (2)	Accomplish (3)
(Written Paper) Data/statistics is presented and summarized to support the conclusions using the appropriate multivariate statistic(s)	Insufficient data to support stated conclusions	Some conclusions are not fully supported by the data; Most assumptions & limitations are addressed; Statistics are reported appropriately	Data fully support all conclusions; Assumptions and limitations are addressed; All statistics are reported appropriately
(Written Paper) Suitable tables/graphs summarize data in a clear and meaningful way even to those unfamiliar with the project	Data not presented in a suitable format or incorrect.	Data is accurately presented but in need of some revision or summary is difficult for audience to follow.	Data is accurately presented in a suitable format, correctly titled and labeled, easy to interpret, and relevant to the purpose; APA format is followed.
(Written Paper) Statistics are interpreted correctly and limitations/generalization are discussed (written section)	Results lack interpretation or our misinterpreted.	Results are interpreted with some minor misinterpretation of results.	Results are interpreted correctly and limitations are reported.
Oral presentation meet its intended objective	Objective is difficult to determine; additional content needed to support objective	Objective is not immediately clear; some additional content needed to support objective	Objective of the presentation is easily identified; content supports objective
Oral presentation organization reflect the purpose of the presentation and the needs of the audience	Direct or indirect structure used inappropriately; organization is confusing or unclear; weak introduction or conclusion	Structure either too direct or too indirect; organization is evident but may be undermined by weak transitions or occasional digressions; introduction or conclusion does not accomplish its intended function	Appropriate use of direct/indirect structure; presentation organized according to audience's needs; relationship between ideas clear; strong introduction and conclusion
Oral presentation evidence used to support the argument concrete, relevant, credible, accurate, and sufficient	Some evidence is provided, but data not fully explained, relevant to the argument, or credible; important pieces of evidence have not been included; some data inaccurate	Many details support argument, but some are not fully elaborated or sufficiently specific; some evidence not relevant	Argument is clearly supported by accurate evidence considered credible by the audience; sufficient detail to support the main points of the document

Course Policies

Missing/Late Work:
Course assignments and projects due dates and times are posted in Canvas. Points will be deducted for late assignments as follows: *Assignments that are late are reduced 10%. Assignments are reduced by 10% each day they are late.* If you have to be late due to an emergency, please let Kailas know ahead of time.

Attendance:
This is a blended class where we do not meet face-to-face every week. I am trying to modify this class to better meet your needs. Instead of all of us attending class the same time every week in the same classroom, I want to expand this class outside of that rigid schedule and make you more in control of your time without decreasing the quality of your education. There will be times that we have to meet together as a group. **You should make every effort to attend those classes**. If you cannot attend, you are responsible for all the notes, assignments, and activities. I strongly suggest that you team up with someone in the class to have a support system. I will accommodate student observances of the holy days of all religious denominations.

I will schedule some time for individual tutoring for those that feel they need more individual attention. This time should not be spent on trying to catch up on missing classes, but to clarify any difficulties that you might be having. About 40% of the class time will be spent working on project-based activities. I'll give you the project and you will budget your own time in completing the project. I plan to use the technologies that we have (conference calls, email, website, WebEx) to assist you in the project.

Code of Student Academic Integrity
Students have the responsibility to know and observe the requirements of the UNC Charlotte Code of Student Academic Integrity. This code forbids cheating, fabrication or falsification of information, multiple submission of work, plagiarism, abuse of academic materials, and complicity in academic dishonesty. The Code is available from the Dean of Students Office or online at:
http://legal.uncc.edu/policies/up-407
Faculty may ask students to produce identification at examinations and may require students to demonstrate that graded assignments completed outside of class are their own work.

College of Education Commitment to Diversity
The College of Education at UNC Charlotte is committed to social justice and respect for all individuals, and it seeks to create a culture of inclusion that actively supports all who live, work, and serve in a diverse nation and world. Attaining justice and respect involves all members of our community in recognizing that multi-dimensional diversity contributes to the College's learning environments, thereby enriching the community and improving opportunities for human understanding. While the term "diversity" is often used to refer to differences, the College's intention is for inclusiveness, an inclusiveness of individuals who are diverse in ability/disability, age, economic status, ethnicity, gender, language, national origin, race, religion, and sexual orientation. Therefore, the College aspires to become a more diverse community in order to extend its enriching benefits to all participants. An essential feature of our community is an environment that supports exploration, learning, and work free from bias and harassment, thereby improving the growth and development of each member of the community.

College of Education Professional Dispositions Statement for Education Programs
Dispositions include the values, commitments, and ethics expected of professional educators at UNC Charlotte. Students will be evaluated throughout their academic and professional preparation on these dispositions. (These may be found online at https://education.uncc.edu/resources/professional-dispositions-plan-and-information). Programs within the Cato College of Education lead to demanding professions that require students to act in a professional manner at all times, be collegial with peers and supervisors, and conscientiously attend to job-related details. Showing proper initiative and following through on tasks in a timely manner are also critical. Establishing habits supportive of these dispositions is an important part of each student's career preparation and as such will be emphasized throughout this course and the program. ***This includes the appropriate use of electronic devices, including cell phones, during class time and in clinical field settings.*** Students are expected to exercise good judgment in cell phone and electronic device use.

College of Education Technology Statement
Professional education programs at UNC Charlotte are committed to preparing candidates for success in the 21st century through an emphasis on knowledge, effectiveness and commitment to technology integration and application. Preparation in the integration and application of technology to enhance student learning is essential for all candidates. Programs across the professional education unit, including the College of Arts + Architecture, Cato College of Education, and College of Liberal Arts and Sciences, reflect this commitment in coursework, early field experiences, and clinical practice which includes student teaching and/or the capstone/internship phase of the respective programs.

Religious Accommodations
UNC Charlotte provides reasonable accommodations, including a minimum of two excused absences each academic year, for religious observances required by a student's religious practice or belief. Such reasonable accommodations must be requested in accordance with the procedures in this Policy, and include the opportunity for the student to make up any tests or other work missed due to an excused absence for a religious observance. Students wishing to request a religious accommodation may refer to the information found at http://legal.uncc.edu/policies/up-409. It is the obligation of students to provide faculty with reasonable notice of the dates of religious observances on which they will be absent by submitting a Request for Religious Accommodation Form to their instructor prior to the census date for enrollment for a given semester (typically the 10th day of enrollment).

Disability Accommodations

UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office at Fretwell 230. All information shared with the instructor concerning a disability will remain strictly confidential unless otherwise specified by the instructor. The Office of Disability Services website is http://ds.uncc.edu.

Online Student Course Evaluation Process and Confidentiality
Beginning spring 2012 all courses in the College of Education will be evaluated through an online evaluation survey process. Student course evaluations provide an important source of feedback for faculty regarding course design and instructional effectiveness. The online course evaluations will be administered at the end of the term, most likely in the final two weeks (prior to final exams). You will receive an email announcement alerting you when the survey period opens. Periodic reminders will be

sent during the time the survey is open. Please be advised that this process will be secure and confidential. The technology used will ensure anonymity of participants as well as confidentiality. The College of Education is committed to excellent instruction and student support. Please help us in continuing this commitment by participating in the course evaluation process.

Appropriate Use of Technology
It is expected that electronic devices will be turned off or silent and will not be used during class. If you wish to use a laptop during class, please ask the instructor in advance of the class session and only use the device for class-related activities. Checking e-mail and web browsing during class is prohibited and will result in the loss of privileges to use the device in class for the remainder of the semester.

Important Dates
Students are responsible for being aware of dates to withdraw from class without consequences. All the dates can be found at the following website (http://www.registrar.uncc.edu/calendar.htm).

Policy on Grade of Incomplete
The grade of "I" is assigned at the discretion of the instructor when a student who is otherwise passing has not, due to circumstances beyond his/her control, complete all the work in the course (UNCC Course Catalog).

Inclement Weather Policy
UNCC announces the University closing on public broadcast or you can call 704-687-2877 for an update. I often post closing information on the class homepage, and I will update my answering machine to inform you of cancellations of class. I realize that some of you travel a great distance to attend class and our class finishes late in the evening. Please use your best judgment on what are safe conditions for your travel.

Credit Hour Statement
This 3-hour credit course requires 45 hours of classroom or direct faculty instruction and 6 hours of out-of-class student work each week for approximately 15 weeks. Out-of-class work include but is not limited to: required reading, statistical analyses, literature searches, written assignments, and studying for quizzes and exams.

Alignment of Course Objectives to Professional Standards

Professional Educators: Advancing Educational Equity through Excellence and Engagement, the Conceptual Framework for Professional Education Programs at UNC Charlotte, has a strong emphasis on the Cato College of Education's updated vision to be a national leader in educational equity, excellence, and engagement. During coursework, early field experiences, and clinical practice candidates have multiple opportunities to develop the knowledge, skills, and dispositions necessary to produce highly effective and engaged professionals. This course seeks to develop the proficiencies that are indicated below:

COURSE OBJECTIVES	CACREP	College Conceptual Framework (2017)
1. Explain the advantages of multivariate statistics versus a series of univariate analyses	6.B.4.b	P. Research Skills
2. Screen multivariate data for assumptions	6.B.4.b	P. Research Skills
3. Understand and apply multivariate hypothesis testing techniques, such as multivariate analysis of variance (MANOVA), multivariate analysis of covariance (MANCOVA), multiple regression, multilevel analysis, and profile analysis.	6.B.4.b	P. Research Skills
4. Understand and apply discrimination and classification techniques, such as cluster analysis, discriminant function analysis (DFA), and logistic regression.	6.B.4.b	P. Research Skills
5. Understand and apply data reduction techniques, such as principal component analysis (PCA), exploratory factor analysis (EFA), and confirmatory factor analysis (CFA).	6.B.4.b	P. Research Skills

Standards for Counseling Program

2016 CACREP Standard 6.B.4.b: univariate and multivariate research designs and data analysis methods

Professional Educators:

Advancing Educational Equity through Excellence and Engagement

Professional Responsibilities	Dispositions	Learners and Learning	Effective Pedagogy
A. Ethics – Candidates consistently demonstrate and practice high ethical standards	**F. Advocacy** – Candidates are prepared to advocate on behalf of others for services that support the social, emotional, physical, educational, behavioral, and basic needs of students, families, and colleagues	**J. Positive Impact & Accountability** – Candidates demonstrate a belief that all individuals can learn as well as an understanding that they have a positive impact on learning and development	**M. Specialty Area Knowledge** – Candidates complete rigorous specialty area training in their related fields and have a thorough knowledge base in their disciplines
B. Professional Identity & Continuous Growth – Candidates participate in continuous practice opportunities with reflection and in high-quality learning experiences that enable them to attain a professional identity	**G. Self-Awareness** – Candidates have deep knowledge of self in order to self-regulate their teaching, leadership, counseling and/or the learning processes. They understand oneself in relation to others	**K. Cultural Competence & Culturally Sustaining Practice: Responsiveness to Diverse Learners** – Candidates design and provide inclusive programs and services and establish respectful learning environments that respond to the needs of all learners, clients, and families	**N. Pedagogical Knowledge** – Candidates understand and demonstrate methods of effective teaching as well as research, counseling and leadership strategies
C. Leadership – Candidates embrace the inherent commitment to leadership implicit in their practice. They fulfill their responsibilities and leverage their leadership role in productive ways	**H. Reflective Practice** – Candidates critically and thoughtfully examine their practice for the purpose of continuous improvement	**L. 21st Century Literacies, Competencies & Character Qualities** – Candidates demonstrate skills in 21st Century literacies (literacy, numeracy, citizenship, digital, and media); competencies (critical thinking, creativity, collaboration); and character qualities (curiosity, initiative, persistence, resilience, adaptability, leadership)	**O. Research-Based Practice** – Candidates apply research-based strategies and processes while planning, implementing, and evaluating learners
D. Collaboration – Candidates are committed to consensus-building, coalition-forming, and agenda framing strategies and collaborate with professionals from other disciplines	**I. Social Justice** – Candidates actively engage in the continual process of personal vision-building, inquiry, and collaboration. Candidates use critical inquiry to establish meaningful and relevant changes in pedagogical practices		**P. Research Skills** – Candidates understand and effectively use methodologically sound and useful research practices and evaluation skills
E. Policies, Laws, Standards & Issues – Candidates are both competent and engaged in the understanding and development of educational policy and law, analyze and incorporate standards into practice and identify and consider societal issues that impact education and practice			