

**GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT**

**EDRS 821
Advanced Application of Quantitative Methods
(3 credit hours)**

SPRING, 2012

Meeting Time/Days: W, 4:30pm-7:10pm

Location: Innovation Hall, room 203

PROFESSOR: Dimiter Dimitrov

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Office location: West Building, room 2007

Office hours: M (3:00pm-4:00pm), W(4:45pm-5:45pm)

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COURSE DESCRIPTION:

A. Prerequisites: EDRS 811

B. This course will provide advanced study of applications of quantitative methods in the practice of educational research and will reinforce and build upon concepts and skills acquired in EDRS 811. It will employ a modular approach and will contain advanced study of techniques appropriate to analysis of data from tests and surveys; group-experimental and quasi-experimental design; selected multivariate procedures and factor analysis. Students will learn through a combination of text reading assignments, critical analysis of professional journal articles, hands-on experience in using a computer program for data analysis, and application activities. Students will be expected to identify and report on quantitative methods used in published research (articles), to collect and analyze data using the Statistical Package for Social Sciences (SPSS), and to provide written reports of methodology and results.

NATURE OF COURSE DELIVERY:

Lectures, large group discussion, in class activities, and individual/group assignments

LEARNER OUTCOMES:

This course is designed to enable students to:

1. Analyze test and survey data using appropriate procedures and indexes such as item difficulty, item discrimination, score reliability, and criterion-related validity.
2. Develop univariate factorial designs with between-subjects and within-subjects (repeated measures) factors, conduct the data analysis, and interpret results associated with main and interaction effects.
3. Develop multiple regression models, conduct the analysis, and interpret the results.
4. Develop logistic regression models, conduct the analysis, and interpret the results.
5. Develop multivariate factorial design, conduct the analysis, and interpret the results.

PROFESSIONAL STANDARDS:

The student outcomes are informed by the Standards for Reporting non Empirical Social Science Research in Publications of the American Educational Research Association (AERA; *Educational Researcher*, Vol. 35, No. 6, pp. 33–40). Those standards deemed most relevant to addressing the learning targets for the course are those that state that *educators will have the knowledge, skill and disposition to:*

1. Apply basic principles of research practices for addressing specific educational needs.
2. Develop design and select advanced quantitative methods for addressing targeted research question in education research and related fields.
3. Conduct procedures of advanced quantitative methods using the SPSS statistical software and interpret the results.
4. Use research results to disseminate and advance understanding and knowledge related to theory and practice of education and related fields.
5. Recognize and appropriately act against the unethical, illegal, and otherwise, inappropriate research methods and uses of respective quantitative results.
6. Recognize the implications of educational research for social justice in schools and other professional organizations.
7. Discern critical issues related to the role of the research design in the framework of advanced quantitative modeling for data-driven decision making in education and related fields.

REQUIRED TEXTS:

Dimitrov, D. M. (2009). *Quantitative Research in Education: Intermediate & Advanced Methods*. Oceanside, NY: Whittier Publication. ISBN: 978-1-57604-301-1

COURSE REQUIREMENTS, PERFORMANCE-BASED ASSESSMENT, AND EVALUATION CRITERIA:

A. Requirements

1. **In class/Homework Assignments (10%):** Students will be asked to work individually on homework assignments throughout the semester.
2. **Class Attendance and Participation (5%):** Students are required to attend all classes, to be on time, prepared, follow outlined procedures in case of absence, actively participate and support the members of the learning group and the members of the class. The scoring rubric for class attendance and participation is provided in Appendix 1.
3. **Midterm Examination (15%):** Students will take a midterm examination (closed books and notes) to demonstrate understanding and knowledge of course content covered to date of examination.
4. **Pilot Research Study (50%):** This course requires students to develop and conduct a pilot-research study related to using advanced quantitative methods and interpretation of

results in the context of education research. This study is intended to reflect what you have learned from this course. It should be written in a way that one would submit for a national professional conference paper presentation. Other requirements for this course are designed to build up bases for the final pilot research proposal. Research papers must be handed in on time and must adhere to the APA Publication Manual Guidelines.

- 5. Final Examination (20%):** Students will take a final examination (closed books and notes) to demonstrate understanding and knowledge of course content covered throughout the coursework.

This pilot research study will be divided into 4 sequential parts.

1. Identify broad topic of interest; conduct a literature review; discuss significance of the proposed study; state purpose and hypotheses.
2. Methods- describe sample; identify measures to test hypotheses; discuss procedures and design of the study.
3. Data collection.
4. Data analysis.
5. Write the results section.
6. Discussion and Conclusion.

The presentation of the final paper will take place the last day of class in a research paper format (APA style, see also guidelines posted on the AERA website, www.aera.net.org.) After completing the research study, reflect on that experience. What did you learn from it? How do you think course material helped you carry out the study? [**Scoring rubric** for the research paper is provided in Appendix 2].

- 5. Final Examination (30%):** Semi-comprehensive (closed books and notes) examination.

B. Performance-based assessments

All of the student products specified under course requirements will require performance-based assessments guided by grading rubrics. The scoring rubrics associated with the assessment of (a) class attendance and participation and (b) pilot research project at proposal development assignment is provided in Appendices 1 and 2, respectively.

C. Criteria for evaluation

There are 100 total points for the course, distributed among the homework assignments (10%), class attendance and participation (5%), midterm examination (15%), pilot research project (50%), and final examination (20%).

D. Grading scale

Letter grades will be assigned as follows:

A+	97.5 - 100%,	A	92.5 - 97.49%,	A-	89.5 - 92.49%,
B+	87.5 - 89.49%,	B	82.5 - 87.49%,	B-	79.5 - 82.49%,
C	70-79.49%, and				
F	below 70%				

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT

Student Expectations

- Students must adhere to the guidelines of the George Mason University Honor Code [See <http://academicintegrity.gmu.edu/honorcode/>].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See <http://ods.gmu.edu/>].
- Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/1301gen.html>].
- 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. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

Campus Resources

- 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 [See <http://caps.gmu.edu/>].
- 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/>].
- For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See <http://gse.gmu.edu/>].

PROPOSED CLASS SCHEDULE

DATE	TOPIC	Text Chapter
January 23	Review of quantitative research design	4, 5
January 30	Correlation and simple regression. Partial and part correlations	8, 10, 11
February 6	Multiple regression	13
February 13	Analysis of variance (ANOVA)	14, 15
February 20	Analysis of Covariance (ANCOVA)	16
February 27	Multiple regression and ANOVA	17
March 5	ANOVA with random factors	18
March 12	Spring Break (No classes)	
March 19	MIDTERM EXAMINATION	
March 26	Repeated measures ANOVA	19
April 2	Logistic regression	20
April 9	Multivariate analysis of variance(MANOVA)	21
April 16	Exploratory factor analysis	22
April 23	Confirmatory factor analysis	23
April 30	Review and Project Discussion	
May 7	Reading Day	
May 14	FINAL EXAMINATION	

APPENDIX 1

RUBRIC FOR PARTICIPATION AND ATTENDANCE

	LEVEL OF PERFORMANCE			
ELEMENT	Distinguished (4-5 pts.)	Proficient (3 pts.)	Basic (2 pts.)	Unsatisfactory (1 or 0 pts.)
Attendance & Participation	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence. The student actively participates and supports the members of the learning group and the members of the class.	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence; the student makes active contributions to the learning group and class.	The student is on time, prepared for class, participates in group and class discussions. The student attends all classes and if an absence occurs, the procedure outlined in this section of the syllabus is followed.	The student is late for class. Absences are not documented by following the procedures outlined in this section of the syllabus. The student is not prepared for class and does not actively participate in discussions.

APPENDIX 2
EDRS 821
RUBRIC FOR RESEARCH PAPER

GENERAL EVALUATION CRITERIA:

- Clarity and organization
- Comprehensiveness of content
- APA style

TOTAL SCORE: **MAX = 50 pts.**

Performance Elements	Quality Points
Introduction Section	max = 9 points
Statement of the nature and importance of the problem and literature review related to the issues.	4-5 points: The study problem is (a) relevant to the area of educational research, (b) described in a parsimonious and complete manner, (c) channeled towards the purpose of the study, and (d) embedded in a literature review on related theory and research.
	2-3 points: The study problem is relevant to the area of educational research and overall well described, but not channeled towards the purpose of the study or the literature review is not quite on target.
	0-1 points: The study problem is not relevant to the area of educational research and/or not clearly described, poorly channeled towards the purpose of the study, and not supported well by literature review.
Justification of the need for this study	2 points: The justification of the study is well described and stems from a necessity to fill up an existing gap in previous research on the topic or to conduct a replication study.
	0-1 points: The justification of the study is not well described and/or does not stem from a necessity to fill up an existing gap in previous research on the topic or to conduct a replication study.
Statement of the purpose of the study and related research questions.	2 points: The purpose of the study is connected to the statement of the problem and the research questions are properly described.
	0-1 points: The purpose of the study is not well connected to the statement of the problem and/or the research questions are not properly described.

Method Section		max = 13 points
Description of the study sample	4 points: Provided is clear, accurate, and complete description of the study sample — sampling method (random selection, volunteers, etc.), relevant demographic characteristics, sample size (total and by subgroups), and judgment about sample representativeness for the targeted population.	
	2-3 points: Provided is relatively complete description of the study sample, with drawbacks related to the description of sampling method, relevant demographic characteristics, sample size, or sample representativeness.	
	0-1 points: Provided is poor description of the study sample, with missing elements related to method of sampling, relevant demographic characteristics, and representativeness.	
Description of the data (instruments, scales, and score reliability)	2-3 points: Provided is clear, accurate, and complete description of the data sources (e.g., assessment instruments, existing records, etc.), scoring rubrics, scales, and reliability of scores obtained for the study sample.	
	0-1 points: Provided is incomplete (or lacking) description of data sources and there is no report on reliability estimates.	
Description of the data collection method	2 points: Provided is clear, accurate, and complete description of the data collection method — e.g., existing students records or online data base.	
	0-1 points: Provided is incomplete (or lacking) description of the data collection method.	
Description of data analysis methods and procedures used to address the research questions in the project	4 points: Provided is clear, accurate, and complete description of <i>appropriate</i> data analysis methods and procedures used to address the research questions.	
	2-3 points: Selected are <i>appropriate</i> methods and procedures of data analysis, with lack of sufficient clarity, accuracy, and/or completeness in description.	
	0-1 points: Some (or all) of the selected data methods and procedures are <i>not appropriate</i> for addressing the project research questions.	
Results Section		max = 14 points
	8 points: Provided is clear, accurate, and complete presentation of relevant results in APA style by	

Within-text presentation of results obtained with the statistical data analysis for each research question	project research questions.
	6-7 points: Provided is clear, accurate, and complete presentation of relevant results by project research questions, with some deviations from the APA style.
	5-6 points: Presented are relevant results by project research questions, with some deviations from clarity, completeness, and the APA style.
	4-5 points: Presented are relevant results by project research questions, with some deviations from clarity, accuracy, completeness, and the APA style.
	2-3 points: Some results are irrelevant and/or there are problems with clarity, accuracy, completeness, and APA style.
	0-1 points: Some (or all) results are irrelevant and there are serious problems with clarity, accuracy, completeness, and APA style.
Presentation of tables	2-3 points: The tables include all necessary information presented in APA style.
	0-1 points: The tables do not include all necessary information and /or there APA style problems.
Presentation of figures	2-3 points: The figures are clear and provide relevant information in APA style.
	0-1 points: There are some (or serious) problems with clarity of the figures, their relevance, and/or APA style.
Discussion Section max = 14 points	
Conclusions drawn from the results, findings and implications for theory and/or practice	8 points: Provided is clear, accurate, and complete presentation of conclusions drawn from the study results, comparisons with findings in previous studies on the topic of interest, plausible explanations of the study findings, and implications for theory and/or practice.
	6-7 points: Provided is clear, accurate, and complete presentation of conclusions drawn from the study results, with minor problems in accuracy and/or sufficiency related to comparisons with findings in previous studies, plausible explanations of the study findings, implications for theory and/or practice, and APA style.
	5-6 points: The conclusions are drawn from the study results, but there are relatively serious problems in accuracy and/or sufficiency related to comparisons

	with findings in previous studies, plausible explanations of the study findings, implications for theory and/or practice, and APA style.
	4-5 points: Some conclusions are not well connected to the study results and there are relatively serious problems in accuracy and/or sufficiency related to comparisons with findings in previous studies, plausible explanations of the study findings, implications for theory and/or practice, and APA style.
	2-3 points: Some conclusions do not stem from the study results and there are serious problems in accuracy and/or sufficiency related to comparisons with findings in previous studies, plausible explanations of the study findings, implications for theory and/or practice, and APA style.
	0-1 points: The conclusions do not stem from the study results and there are serious problems in accuracy and/or sufficiency related to comparisons with findings in previous studies, plausible explanations of the study findings, implications for theory and/or practice, and APA style.
Limitations of the study	2-3 points: Provides is clear, accurate, and complete presentation of the limitations of the study, with implications for the study findings and their generalization.
	0-1 points: There are serious problems in clarity, accuracy, and completeness of the study limitations and their implications for the findings and their generalization.
Recommendations for future research	2-3 points: The recommendations for future research are clearly presented and stem from logical necessity for meaningful replications (e.g., to validate and/or generalize the findings) and/or further extensions of the study design and analyses.
	0-1 points: The recommendations for future research are <i>not</i> clearly presented and do not address the necessity for replications and/or further extensions.