APPLIED STATISTICS AND RESEARCH METHODS

Policy Manual for Comprehensive Exams

May 2024

Table of Contents

Introduction 3
Annual Schedule 3
M. S. / Ph.D. Comprehensive Exam Procedures 4
General Information 4
Timeline for Students 4
Continuous Registration Requirement 5
Examination Information 5
M.S. Examination (Master's Project) 6
Grading Procedures for Master's Project 6
Ph.D. Examinations 7
Ph.D. Examination Format 10
Ph.D. Grading Procedures 11
Procedures on the Day of the Ph.D. Exam 13

Introduction

The University of Northern Colorado (UNC) Graduate School requires all Ph.D. level students to successfully pass a written comprehensive examination that is designed, administered, and evaluated by the graduate faculty ofthe student's major department and by other qualified individuals as specified by the research advisor.

Similarly, the UNC Graduate School requires that each master's degree student must pass a written comprehensive examination or otherwise demonstrate competency in the discipline by successfully completing a specified equivalent that has been approved by the Graduate Council, e.g., a project in lieu of comprehensive examinations. Defense of a master's project in lieu of comprehensive examinations is equivalent to administering the comprehensive examination. This policy manual describes the master's and Ph.D. comprehensive exam requirements, policies, and procedures for the Department of Applied Statistics and Research Methods (ASRM).

Annual Schedule

Comprehensive exams are given two times per year for all Ph.D. students. Beginning in Fall, 2017, all M.S. students will conduct an applied master's project to fulfill the comprehensive exam requirement. The faculty and staff will administer the Ph.D. comprehensive exams according to the schedule in Table 1. Master's students may complete their master's project during any semester but must enroll in SRM 697 during the semester when they conduct most of the work for their master's project. In addition, master's students must complete the form to confirm they are "cleared" to do their master's project (same as the comprehensive exam application form).

Table 1. *Annual Comprehensive Exam Schedule for Ph.D. Students*

Activity	September Meet with or contact advisor	October 1	January The first week of the Spring semester	April 1	August One week prior to the Fall semester
Ph.D. written comprehensive exam dates			X		X
Meet with advisor to review expectations	X				
Deadline to sign up for comprehensive exam for next semester		X		X	

M. S. / Ph.D. Comprehensive Exam Procedures

The beginning of Semester One of a long, hard program of coursework may seem *not* to be the best time to be thinking about comprehensive examinations. However, we feel it is important for you to know and understand our procedures so that you can keep those procedures in mind as you complete individual courses and participate in other degree-relevant activities in your program. It is, for instance, important that you know at the very beginning of your program that at least part of the comprehensive examinations Ph.D. students will take at the end of the program may be *closed-book*, even if some of the examinations they take in their coursework are of the open-book or take-home variety.

The information provided below includes the timeline you need to follow as well as the general format and structure for the examinations themselves. If you have any questions regarding the comprehensive examinations, please address them to your academic advisor or to other faculty in the department.

General Information

A. Every ASRM graduate student must successfully pass the comprehensive examinations in order to graduate. For master's students, beginning Fall, 2017, the comprehensive examination requirement will be fulfilled by successful completion of an applied master's project.

B. Comprehensive examinations for Ph.D. students are offered two times a year (early January, one week prior to the beginning of spring semester, and in August, one week prior to the beginning of the fall semester). Master's students may complete the applied master's project during any semester. In addition, Summers-Only master's students will be expected to complete an applied master's project either during their last summer in the program or during another non-summer semester; whichever is more convenient for them.

C. Each Ph.D. student in the Statistics concentration must take written comprehensive examinations over two days, whereas students in the Research Methods concentration must take one sequestered, written comprehensive examination on one day and must complete a second examination administered as a take-home examination. Students in the Statistics concentration are required to take *both* written examinations during the specified comprehensive examination week. Students in the Research Methods concentration will complete the sequestered, written examination on the Tuesday of the specified comprehensive examination week and the take-home examination 17 days following the completion of the sequestered examination.

Timeline for Students

A. Each fall semester, students in ASRM will receive this Policy Manual for Comprehensive Exams.

B. Ph.D. students who plan to take the Comprehensive Examinations in January/August need to do the following on or before October 1/April 1:

1) Be aware that you must meet all Graduate School requirements for comprehensive examinations before you are allowed to apply to take the ASRM Comprehensive Examinations. (Information about requirements and deadlines is available from the graduate student staff specialist in the McKee CEBS Dean's Office and from the Graduate School's list of deadlines. For doctoral students, you must have an approved Plan of Study filed with the Graduate School. Please note that at least three months before a student takes the examinations, the graduate student staff specialist must verify with the Graduate School that the student has met all criteria. Doctoral students are also required to have an approved doctoral committee filed with the Graduate School prior to taking the written exams.
2) Obtain the Permission Form To Take Written Comprehensive Exams from the ASRM website or graduate student staff specialist in the McKee CEBS Dean's Office.
3) Notify the graduate student staff specialist of your intent to take the January exam by submitting the comprehensive examination permission form no later than October 1 for the January comprehensive exam, and no later than April 1 for the August exam.
4) Notify the comprehensive exam coordinator, your advisor, and graduate student staff specialist of your **intent to drop** your name from the group of students intending to take Comprehensive Examinations via email by 5:00 pm no later than two weeks prior to the exam. Students will need to complete a new permission form to take the written comprehensive exam in a subsequent semester.
5) Students who are **retaking** their Ph.D. comprehensive exams will **not** be granted an assistantship during the semester they are taking comprehensive exams.

Continuous Registration Requirement

All Ph.D. students are required to be enrolled for at least one credit during the semester they plan to take comprehensive exams or pay the $150 continuous registration fee if all degree credits have already been completed. Students who are taking exams the week prior to the fall semester, need to be enrolled for the fall semester (or pay the continuous registration fee for fall), and students taking the exams during the week prior to the spring semester need to be enrolled during the spring semester (or pay the continuous registration fee). Master's students need to be enrolled in SRM 697 during the semester when they are completing their applied master's project.

Students are encouraged to check enrollment requirements for financial aid and for student visas for international students to ensure they are in compliance with minimum credit hour requirements.

Examination Information

In order to prepare for the comprehensive exams, please work with your advisor to develop a study strategy for reviewing the overarching themes and content areas on which you need to focus your preparation. Each fall and spring semester, ASRM faculty will offer pre-comprehensive exam information sessions to explain the policies and procedures for comprehensive exams as well as to discuss expectations for the exams and study strategies to help prepare for the exams.

M.S. Examination (Master's Project)

Students in the M.S. program, in both the *Research Methods* and *Applied Statistics* concentrations, will be required to complete an applied master's project in lieu of the standard two-day closed-book written examinations that were previously required. During the semester, when students are completing either all or most of the work for the master's project, they should enroll in 3 credits of SRM 697: Master's Project. Students must select a faculty member as their MS project advisor and then select a topic and submit an outline of their Master's project the semester before enrolling in the SRM697. Students in the M.S. programs are *not* required to take oral comprehensive examinations.

Grading Procedures for Master's Projects

For master's students planning to graduate the semester when they are enrolled in SRM 697, they will need to submit a draft of the project "product" (e.g., evaluation report, consulting report, etc.) at least one month prior to the Graduate School's deadline for submitting comprehensive exam results. This will allow faculty time to review the project draft in order to render a "pass" or "fail" decision on the comprehensive exam. Note that the Graduate School's deadline for submitting comprehensive exam results is approximately one month prior to graduation. Although specific requirements regarding what the student needs to submit for evidence of satisfactory completion of the comprehensive exam will differ depending on the advisor and the nature of the student's project, in general, students need to submit a fairly complete product based on what they have completed thus far along with an outline describing what else they need to do to finish the project.

If the faculty determines that the student's project warrants a "pass" on the comprehensive exam, the advisor will send the comprehensive exam result to the Graduate School showing a "pass." If the student subsequently completes the remaining parts of the project the advisor (or SRM 697 instructor during spring semesters) will submit a grade of "S" for SRM 697. The student may then graduate at the end of that semester, assuming they have fulfilled all other degree requirements.

If the faculty determines that the project is insufficiently complete or of unsatisfactory quality, the advisor will withhold the comprehensive exam result, which will result in the student's not being able to graduate that semester.

A. If the student subsequently completes the project by the end of the semester while enrolled in SRM 697 or satisfactorily addresses other deficiencies in the project by the end of that semester, the advisor will then submit the comprehensive exam result to the Graduate School showing a "pass" and will submit a grade of "S" for SRM 697; however, students will not be able to graduate until the following semester.

B. If the student fails to complete the project or address other deficiencies in the project by the end of the semester while enrolled in SRM 697, the student will be granted an *incomplete* in SRM 697 and will be required to address deficiencies in the project at least two weeks before the Graduate School's comprehensive exam deadline the following semester.

C. Students failing to complete the project or satisfactorily address other deficiencies in the project by the end of the first semester of the incomplete will receive a "fail" on the project. If this is the student's first failed comprehensive exam, the student will be granted one more semester to complete the project and address other deficiencies. Per UNC Graduate School policy, a second "fail" will result in the student's termination from UNC and from the degree program.

Ph.D. Examinations

Written exam

Students in *Applied Statistics* concentration will be required to take two six-hour closed-book examinations on two separate days during the examination week. The actual time allotted to complete the closed-book portion of the exam will be 7 hours (8:30am - 3:30pm) to allow students time to process and compose their answers. Ph.D. students in the

Students in the *Research Methods* concentration may choose one of the two following forms of examination:

A. A closed-book examination followed by a take-home examination.

1) A six-hour closed-book examination on one day during the examination week. The actual time allotted to complete the closed-book portion of the exam will be 7 hours (8:30am - 3:30pm) to allow students time to process and compose their answers.

2) A take-home examination. When students submit their completed closed-book exam responses, they will receive a set of instructions for the take-home part of the exam. Students will have **approximately** 17 days to complete the take-home exam, which will be due on the third Friday following completion of the closed book exam, i.e., two weeks plus three days. In most cases, students will submit their completed take-home "products" via email to the comprehensive exam coordinator and their advisor.

B. A complete take-home exam with dates to occur within the fall or spring semester.

1) Students will have **four weeks** to develop a "mini" research proposal of 20-30 pages in length. This will be of final draft quality. They are encouraged to consult with their advisor and others throughout the process. It is recommended the proposal reflect a possible future dissertation idea.

2) Students will have **three weeks** to complete the take-home exam, which will be due on the third Friday following completion of the closed book exam, i.e., two weeks plus three days. In most cases, students will submit their completed take-home "products" via email to the comprehensive exam coordination and their advisor. This should be the student's original work without consulting others. An editor and editing software may be utilized.

Examination Content and Organization

Applied Statistics Concentration

***Part One*:** Questions on this examination will emphasize material from SRM 502, SRM 614, and SRM 752.

***Part Two*:** For this exam, students will select **two** courses from the list below and will confirm their choices with their research advisor no later than when they sign up to take the comprehensive exam. Students may be permitted to change their choice of specialized courses at least one month prior to the exam, with their advisor's approval.

- SRM 606: Multiple Linear Regression Analysis
- SRM 607: Non-parametric Statistics
- SRM 608: Experimental Design
- SRM 609: Sampling Methods
- SRM 635: Categorical Data Analysis
- SRM 636: Applied Bayesian Analysis
- SRM 637: Applied Time Series
- SRM 645: Statistical Process Control
- SRM 731: Multivariate Analysis

The courses listed are subject to change due to course offerings.

Examination Content and Organization

Research Methods Concentration

Closed-Book: Questions on this examination will emphasize, but will not necessarily be limited to, material from SRM 627, SRM 660, SRM 673, and SRM 700.

In addition, students in the Qualitative Research Methods specialization should select **one** course from the following list:

- SRM 685: Educational Ethnography
- SRM 686: Qualitative Case Study Research
- SRM 687: Narrative Inquiry

Students in the Quantitative Research Methods specialization should select **one** course from the following list:

- SRM 610: Statistical Method III
- SRM 625: Applied Multiple Regression Analysis
- SRM 626: Applied Multilevel Modeling
- SRM 629: Structural Equation Modeling

Students in the Mixed Methods specialization should select **one** course from the following list:

- SRM 660: Mixed Methods Research

The courses listed are subject to change due to course offerings.

Students should confirm their choice of specialized course with their research advisor no later than when they sign up to take the comprehensive exams. Under extenuating circumstances, students may be permitted to change their choice of specialized course at least one month prior to the exam with their advisor's approval.

Take-home Exam: The take-home exam may involve one or more of the following activities, including critiquing research, designing an evaluation plan, responding to a request for a grant proposal, or analyzing data and submitting a report.

Mini Research Proposal

Students will have four weeks to develop a "mini" research proposal of 20-30 pages in length. This will be of final draft quality. They are encouraged to consult with their advisor and others throughout the process. It is recommended the proposal reflects a possible future dissertation idea.

It is strongly recommended that, before taking the examinations, students in the *Quantitative Research Methods Specialization* complete the following core courses: SRM 610, SRM 625, SRM 626, SRM 627, SRM 629, SRM 660, SRM 673, SRM 700, and one course from SRM 685, SRM 686, or SRM 687 (in addition to all courses required for the M.S. research methods degree).

Students in the *Qualitative Research Methods Specialization* should have completed SRM 627, SRM 660, SRM 673, SRM 685, SRM 686, SRM 687, and SRM 700 prior to taking comprehensive exams.

Oral Comprehensive Exam

After the Ph.D. student is notified that they have passed both parts of the written examinations, the student will take a two-hour oral comprehensive examination. With the approval of the student's advisor and doctoral committee, the student must submit the Request to Schedule a Doctoral Examination form to the Graduate School at least two weeks prior to the scheduled oral examination.

Applied Statistics Concentration

The purpose of this examination is to further investigate the student's command of certain topics from the written examinations and to probe the student's understanding of statistical issues. Specifically, the Applied Statistics oral comprehensive exam will consist of:

A. Follow-up questions on the responses the student provided on the written examination, and

B. Questions on *two* topics related to the student's academic background and research focus area. These topics should be determined by the student in consultation with his/her doctoral committee.

Research Methods Concentration

The purpose of this examination is to further investigate the student's command of certain topics from the written examinations and to probe the student's understanding of applied research and statistics concepts as well as methodological issues in specific areas of interest to the student. Specifically, the Research Methods oral comprehensive exam will consist of:

A. Follow-up questions on the responses the student provided on the two portions of the written examination (i.e., sequestered and take-home), and

B. Questions on *two* topics related to the student's primary areas of interest in research methods, measurement, and/or statistics. These topics should be determined by the student in consultation with his/her doctoral committee.

Ph.D. Examination Format

Applied Statistics Concentration

A. The Applied Statistics faculty will submit a pool of questions (along with solutions) to the Applied Statistics (AS) Comprehensive Examination Coordinator.

B. Each question should be written such that a student could be reasonably expected to complete it in approximately 30 minutes.

C. The AS Comprehensive Exam Coordinator will construct the comprehensive exams based on the pool of questions submitted by the AS faculty. After final approval of the exam by the remaining AS faculty, the AS Exam Coordinator will submit the exam along with the grader information to the graduate student staff specialist in the McKee CEBS Dean's Office by 5:00pm on the Friday, two weeks prior to comprehensive exam week. The number of questions on each exam is shown below:

Ph.D. Examination (Applied Statistics Concentration)

1) Part One: 10 questions (5 points each)
2) Part Two: 10 questions (5 points each)

Research Methods Concentration

A. The Research Methods faculty will submit a pool of questions for the closed-book exam and will submit instructions and materials for the take-home exam to the Research Methods (RM) Comprehensive Examination Coordinator. The RM exam coordinator will compile the two parts of the exam and will then send them to the remaining RM faculty for final approval. Once approved, the exam along with grader information will be submitted to the graduate student staff specialist in the McKee CEBS Dean's Office by 5:00pm on the Friday, two weeks prior to comprehensive exam week.

B. There will be no fixed number of questions on the closed-book Ph.D. Research Methods exam. Instead, questions will be written so that students must demonstrate their knowledge and understanding of statistics, measurement, design, evaluation, and qualitative methods by integrating and applying concepts across courses. Students should focus on concepts rather than on courses. For example, on any given question, a student might need to apply concepts derived from a variety of courses in both research methods and statistics. Questions may range in length from approximately 30 minutes to two hours or longer. Students are expected to be able to cite relevant references in their responses.

Grading Procedures for Ph.D. Comprehensive Exams

A. A copy of a student's exam and solutions (where applicable) will be submitted to the ASRM faculty member who wrote the particular question. Students' exam responses will be identified by number only.

B. Closed-book exams will usually be scored by the faculty submitting the exam questions whereas on the take-home portion of the Research Methods exam, two raters will evaluate the student's outcome product (e.g., grant proposal, analysis report, etc.) each using the same rubric. Numeric ratings from both raters will be averaged to determine a pass or fail decision on the take-home exam. After the exam responses are graded and overall scores tallied, students will receive a letter notifying them of a pass or fail status. These letters will usually be sent out four weeks after the exam (two weeks after the take-home exam is submitted for Research Methods students). Once students receive their letter, they should schedule a meeting with their research advisor to review strengths and weaknesses of the exam performance. Students will not receive a numeric score for individual questions but will receive the faculty comments for their exam responses during their advisor meeting. For Ph.D. students, the advisor will discuss how students need to prepare for their oral exams and/or how they need to focus their studying to retake the exam. Students will be given general content areas to review and strategies for preparation.

C. On the Applied Statistics exams, the ASRM faculty will score each question on a Likert-type rating scale 0-5. Scoring may be rounded to the nearest 0.1. For example, a question can be scored 2.8, based on the following scale.

5	Superior	4	Good	3	Satisfactory
2	Unsatisfactory	1	Poor	0	Very poor

In the event that a faculty member scores a question lower than 3, the faculty member should provide a written comment addressing the student's academic weakness, although faculty members are encouraged to provide written feedback even when scores are at 3 or higher.

D. The overall possible score for the Ph.D. Applied Statistics examinations will be the total of the scores. Note that the scores below are the highest possible for a given day.

1) 50 total points for the Ph.D. Applied Statistics examinations.

The highest possible score for the Research Methods Ph.D. closed-book exam will be a mean of 5.0 across all exam items (on a scale ranging from 1 to 5 as described above). Note that because the number of items on the Research Methods Ph.D. exams is not fixed, it is not possible to establish a fixed number of points that will apply to all exams across every semester.

E. A student must obtain a score of at least 60% on each topic and 70% in total to pass the Applied Statistics Ph.D. written examination on a single day.

1) Statistics students who pass the overall exam on a given day (with a score of 70% or higher) but who fail one or more content areas on that day, will be given a "conditional" pass with the option to retake the failed content area(s) before an overall "pass" or "fail" decision is rendered for that day's exam.

F. On the closed-book portion of the Research Methods Ph.D. exam Research Methods sequestered exam, the ASRM faculty will score each question on a 1-5 point Likert-type rating scale. Questions left blank will receive a score of 0. Scoring may be rounded to the nearest 0.1. For example, a question can be scored 2.8, based on the following scale.

5	Superior	4	Good	3	Satisfactory
2	Unsatisfactory	1	Poor	0	Unanswered

In the event that a faculty member scores a question lower than 3, the faculty member should provide a written comment addressing the student's academic weakness, although faculty members are encouraged to provide written feedback even when scores are at 3 or higher.

G. On the closed-book portion of the Research Methods Ph.D. examination, students need to earn a mean of 3.0 or higher (based on the 1 to 5 scale above) to pass the exam.

H. On the Research Methods Ph.D. take-home exam, the Research Methods faculty will develop scoring rubrics specific to the type of exam activity. For example, the rubric for a research critique would likely include different components than one for conducting and reporting on data analysis; however, each component on any given rubric will be scored on a 1 to 5 point scale, as follows:

5	Superior	4	Good	3	Satisfactory
2	Unsatisfactory	1	Poor	0	Unanswered

In order to pass the take-home part of the written comprehensive exam, students must earn an overall mean score of at least 3 across all components and may not be Unsatisfactory in more than two areas.

I. In the event a student fails one or both closed-book exams, a second reader will be asked to grade the student's responses on the failed exam, on the failed items only for both the Applied Statistics exams and for the closed-book portion of the Research Methods exam. Numeric ratings from both readers will be averaged to determine a pass/fail decision.

J. In the event a Research Methods student fails the take-home examination, a third rater will be asked to grade the student's response on the take-home product. Numeric ratings from the three raters will be averaged to determine a pass/fail decision.

K. When the examinations have been graded, all students will receive an email from the Chair regarding their exam results. After receiving notification of the exam results, students should schedule a meeting with their respective advisors to review the results of the exam.

Possible results are as follows:

1) Ph.D. students who pass both written examinations pass the overall Written Comprehensive Examination.
2) Ph.D. students who fail one or both written examinations fail the overall Written Comprehensive Examination.

A Ph.D. student who fails only one of the two examinations needs to retake only the examination that was failed and, specifically, only the content area that was failed. The student must be aware that only ***one*** retake is allowed. For students failing the January exam, their first retake opportunity will be in August during the regularly-scheduled August exam. A student is not required to retake the exam during the next scheduled offering. A student may (and should) wait until they feel better prepared to retake the exam. Per Graduate School policy, a student failing a retake will be terminated from the university upon the Graduate School's receipt of the comprehensive exam result on the failed retake.

After passing both written examinations, Ph.D. students may schedule their oral examination. This oral examination is two hours and is also closed-book. You are responsible for scheduling this examination in accordance with Graduate School Policy. Students need to submit a Request to Schedule a Doctoral Examination form to the Graduate School *at least* two weeks prior to the date of the oral comprehensive exam. Policies regarding possible outcomes for oral exams are described in the Graduate School Catalogue under Comprehensive Exam Orals.

Procedures on the Day of the Written Ph.D. Exams

A. What to bring with you to the written exam:

1) Lunch or snacks – no lunch break will be provided during the exam, but you may bring food and/or beverages with you to eat/drink while taking the exam.
2) Calculator – students in Applied Statistics will be expected to perform calculations on some questions. Please note that no other technology will be allowed during the examinations, e.g., electronic dictionaries/translators, phones, iPods, etc.
3) Hard or Soft Cover Dictionary – students may bring a hard or softcover dictionary.
4) Leave all devices, including phones and any type of headphone earbuds, in your office or car.

B. What we will provide:

1) Blank paper for your answers as well as for you to make notes to yourself, if necessary.
2) A laptop computer. This would mainly apply to students taking the Research Methods exam, which requires them to respond to essay-type questions.
3) Statistical tables of critical values.

C. What will <u>not</u> be provided:

1) Formula sheets -- therefore as you prepare for the exam, keep in mind that essentially any calculation is "fair game."
2) No formal breaks will be given during comprehensive exams. Students are permitted to take brief breaks, e.g., to use the restroom, smoke, stretch your legs, etc. However, no additional exam time will be given to students to compensate for breaks.

D. University Closure

1) If the university **opens late** on a scheduled comps day, the exam schedule will shift back the same amount of time as the closure. If the university opens so late that the exam can not be completed by 5 pm, it will be moved to the next day scheduled. If no other days are scheduled, the exact same exam scheduled will occur the following week. We will email you as soon as we are aware of this occurrence.
2) If the university **is closed** on a scheduled comps day, the exams will shift to the next day scheduled or the following week as needed. We will email you as soon as we are aware of this occurrence.