# Table of Contents

1. **INTRODUCTION** ............................................................................................................................................................................ 3

2. **DEGREE REQUIREMENTS** ....................................................................................................................................................................... 4
   2.1 Degree Plans (Thesis vs. Non-Thesis) .............................................................................................................................................. 4
   2.2 Degree Requirements ........................................................................................................................................................................... 4
   2.3 Electives .......................................................................................................................................................................................................... 5
   2.4 The Master's Thesis .................................................................................................................................................................................. 5
   2.5 The Comprehensive Exam ........................................................................................................................................................................ 5
   2.6 Graduate School Academic Requirements ........................................................................................................................................ 7

3. **TRANSFER CREDITS** ............................................................................................................................................................................. 8

4. **GRADUATE COMMITTEE SELECTION** ............................................................................................................................................... 8

5. **PH.D. APPLICATION PROCESS** ............................................................................................................................................................ 9
   5.1 Required Application Materials .............................................................................................................................................................. 9
   5.2 Application Target Dates ......................................................................................................................................................................... 9

6. **TIMELINE FOR DEGREE COMPLETION** ............................................................................................................................................. 9
   6.1 Recommended timeline for Thesis Plan .................................................................................................................................................. 9
   6.2 Recommended timeline for Non-Thesis Plan ............................................................................................................................................. 10
   6.3 Forms required for graduation .............................................................................................................................................................. 10

7. **MASTER'S THESIS REQUIREMENTS** ............................................................................................................................................. 11

8. **GRADUATE ASSISTANTSHIPS** .............................................................................................................................................................. 11

9. **HEALTH INSURANCE** ............................................................................................................................................................................ 12

10. **LEAVE OF ABSENCE** ............................................................................................................................................................................. 12

11. **GRADUATE STUDENT ASSOCIATION** ................................................................................................................................................... 12
1 Introduction

The program of Master of Science in Statistics and Data Science at the University of Nevada, Reno (UNR) is offered by the Department of Mathematics & Statistics. The department is home of a dynamic group of over 25 award-winning graduate faculty with diverse interests and expertise in pure and applied mathematics and probability, statistics and data science.

Teaching assistantships, research assistantships, as well as department and university-wide scholarships are available for qualified students. All graduate students accepted to the program with teaching assistantship receive a stipend, tuition waiver, and a subsidized medical plan.

Faculty of the Department of Mathematics and Statistics are engaged in cutting edge research on topics spanning pure mathematics, applied mathematics, and statistics/probability. They collaborate with other researchers, both locally and at multiple institutions throughout the US and internationally. Their work is interdisciplinary, and includes joint projects with experimentalists. Graduate students have the opportunity to be part of these exciting activities. UNR and the Reno business community provide ample opportunities for internships and external research.

Located where the Sierra Nevada mountains meets the Great Basin, the university is 45 minutes from Lake Tahoe and four hours from San Francisco and the Napa-Sonoma wine country. Reno offers an excellent living environment, year-round outdoor activities, short commutes, a growing arts community, and an increasingly cosmopolitan flavor.

Contact Information

Address
Department of Mathematics and Statistics
University of Nevada Reno
1664 N. Virginia St., Reno, NV 89557

Webpage http://www.unr.edu/math
E-mail math@unr.edu
Phone: (775) 784-6773

For more information about the program, please contact

Prof. Anna K. Panorska
Statistics and Data Science Graduate Program Director
Department of Mathematics and Statistics
University of Nevada Reno
Reno, NV 89557
E-mail: ania@unr.edu
Phone: 1-775-784-6548
2 Degree requirements

2.1 Degree Plans (Thesis vs. Non-Thesis)
Students may complete the program of “Master of Science in Statistics and Data Science” by choosing one of two possible degree plans:

- The Master’s Thesis Degree Plan (Thesis Plan), or
- The Comprehensive Exam Plan (Non-Thesis Plan).

To complete their master’s degree via the Thesis Plan, students must complete at least 30 credits of acceptable graduate courses, which must include:

- at least 6 thesis credits (by enrolling in the thesis course STAT 797), and
- at least 12 non-thesis credits of 700-level courses, and
- at least 21 credits through on-campus courses at the university. For transfer credits, please consult the Graduate Director.

To complete their master’s degree via the Non-Thesis Plan, students must pass the comprehensive exam and complete at least 32 credits of acceptable graduate courses, which must include:

- at least 18 non-thesis credits of 700-level courses.
- at least 23 credits through on-campus courses at the university. For transfer credits, please consult the Graduate Director.
- 1 credit of the Comprehensive Exam course Math 795 (Stat 795 coming in Fall 2020).

2.2 Degree requirements

To graduate, students must successfully complete the following six courses:

STAT 645 - Introduction to Statistical Computing (3 units, offered every fall semester)
STAT 661 - A First Course in Probability (3 units, offered every semester)
STAT 667 - Statistical Theory (3 units, offered every semester)
STAT 755 - Multivariate Data Analysis (3 units, offered every spring semester)
STAT 757 - Applied Regression Analysis (3 units, offered every fall semester)
STAT 760 - Statistical Learning (3 units, offered every spring semester)

In addition to the required courses, students following the

- Thesis Plan, must complete 6 elective and 6 thesis credits;
- Non-thesis Plan, must complete 12 elective and 1 comprehensive exam credits;

An internship may be included in the plan of study, subject to availability and approval of the Graduate Director.
2.3 Electives

In order for elective credits to count towards degree requirements, all elective credits must be approved by

- the student’s Graduate Committee (Section 4) if the student formed the Graduate Committee, or
- by the Graduate Director, if the student did not form the Graduate Committee yet;

Appropriate courses outside the Department of Mathematics and Statistics may be approved, depending on the student’s research interests.

2.4 The Master’s Thesis

Students who choose the Thesis Plan (Section 2.1) must write a Master’s Thesis to complete the program. This process starts with the student choosing a Thesis Advisor (Advisor), a choice typically made during the student’s first year in the program. The Advisor is a graduate faculty member of the Department of Mathematics and Statistics who works in a research area of interest to the student. To initiate the Student-Advisor collaboration, the student should approach the faculty member and ask her/him if she/he is willing to serve as the student’s Advisor. The student and Advisor jointly choose members of the student’s Graduate Committee (Section 4).

Once an Advisor has been identified, she/he will guide the student through the thesis writing process. This may involve preparatory work such as reading of books and/or research papers, computer programming, intense calculations, etc. While working on the thesis, the student needs to be enrolled in the thesis course STAT 797, completing a total of 6 credits. These are typically broken up as 3 credits during the student’s 3rd semester and 3 during the student’s 4th semester (though the student could choose to take all 6 credits in the 4th semester, for example).

The Advisor will instruct the student about the content and format of the thesis. A Master’s Thesis, unlike a Ph.D. Thesis, is not expected to contain original content, but should demonstrate the student’s mastery of a particular area of statistics and data science. Upon completion, the student will defend her/his thesis by giving a public presentation, followed by a period of questions by the student’s Graduate Committee members.

**Scheduling of the defense**: MS thesis defense is a public event. It is the student’s responsibility to contact her/his Graduate Committee and the Graduate Director (all that sign the Notice of Completion) regarding their availability. It is strongly advised that the student schedules defense no later than 1 month before the planned defense date. It is also the student’s responsibility to reserve an appropriate room for her/his defense. Defense announcements should be sent to the Mathematics and Statistics office for further dissemination.

2.5 The Comprehensive Exam

Students who choose the Non-Thesis Plan (Section 2.1) must complete the Comprehensive Exam. This exam is offered once every semester, close to the end of semester. The exact date for the exam is announced by the Graduate Director in a timely fashion.
General information. The exam is to evaluate students' fundamental knowledge of probability and statistics. The topics for the exam are a union of the major topics from the Probability (STAT 661) and Mathematical Statistics (STAT 667) courses.

Study guidelines. To study for the exam, we recommend taking both Probability (STAT 661) and the Statistics Theory (STAT 667) classes; practicing by doing problems assigned as homework and more problems from the course textbooks; doing relevant problems from the actuarial exams; studying proofs of theorems in the texts. Students are expected to know all definitions and theorems with proofs.

We stress that the exam is not based on any particular book. It is an exam based on knowledge of fundamental topics in probability and mathematical statistics. Some texts you may find helpful include:


Additional references:

Exam Syllabus
1. The formal language of probability: Random experiment, set theory, sample space, counting and combinatorial methods, probability of union of events, conditional probability, multiplication rule, independent events, the law of total probability and Bayes' theorem.

2. Univariate and multivariate random variables and probability distributions: Discrete, continuous, and mixed distributions; cumulative distribution function; probability density function; probability mass function; quantile function and percentile; marginal and conditional distributions; independence; functions of random variables and random vectors; linear transformations; sums, products, and quotients of random variables; minima and maxima of random variables; order statistics; mixtures and compound distributions and their applications; probability integral transform theorem and random variate generation; Monte-Carlo methods.

3. Measures of expectation, variation and risk, expected value, geometric mean, median, mean squared and mean absolute error, variance and standard deviation, moments and moment generating function, survival and hazard functions, covariance and correlation, conditional expectation and variance.

4. Special discrete and continuous distributions and their applications: Bernoulli, binomial, Poisson, hypergeometric, multinomial, negative binomial, geometric, exponential, gamma, Weibull, beta, uniform, Pareto, univariate and multivariate normal, lognormal distributions.

5. Convergence of probability distributions: Convergence in distribution, convergence in probability, and almost sure convergence; Markov and Chebyshev inequalities; the law of large numbers and the central limit theorem; normal approximation to binomial; delta method.
6. **Sampling distributions related to the normal distribution:** The sample mean and its properties; chi-square, student-t, and F distributions; joint distribution of the sample mean and variance.

7. **Estimation:** The method of moments; maximum likelihood estimation and its properties; efficiency, consistency, sufficiency, and unbiasedness; small and large sample confidence intervals; information inequality; loss and risk functions; uniformly minimum variance unbiased (UMVU) estimation; Bayesian estimation.

8. **Testing hypotheses:** Mathematical setup and terminology; power and sample size calculations; p-values; likelihood ratio tests, one and two sample z-test and t-test; F-test; Kolmogorov-Smirnov test; chi-square tests of goodness-of-fit; contingency tables and tests for homogeneity.

9. **Linear models:** The method of least squares, linear regression, statistical inference under linear regression model.

The Comprehensive Exam is 6 hours long and is broken up into a 3-hour morning session (typically 9 am - 12 noon) and a 3-hour afternoon session (1pm-4pm).

Students will be allowed a maximum of two attempts at passing the Comprehensive Exam. If the first written attempt is not successful, the student may ask for an opportunity of an oral exam to be scheduled as soon as practical (usually within 2 weeks) the same semester. If the student does not pass the oral exam, s/he will have a second chance to take the written test the following semester, as scheduled. There is no opportunity for an oral exam after the second written Comprehensive Exam. **During the semester the student takes the exam, s/he must be enrolled in MATH 795 (from Fall 2020 STAT 795) – the Comprehensive Exam course.**

2.6 **Graduate School Academic Requirements**

**Good Standing** Each graduate course must be completed with a grade of "C" or better for the credit to be acceptable toward an advanced degree.

In addition, students must maintain good standing with an overall cumulative graduate credit GPA of at least 3.0 on a scale of 4.0. Students must have a minimum GPA of 3.0 in order to meet graduation eligibility. All graduate students must maintain a cumulative graduate GPA of 3.0. If their GPA drops below 3.0 they are either placed on probation or dismissed. Undergraduate courses will not count towards graduate GPA.

**Probation** If the student’s cumulative grade-point total is between 2.31 and 2.99, the student is placed on probation. The student must then raise her/his cumulative graduate GPA to 3.0 by the end of the following semester or the student will be dismissed from graduate standing. Thesis, dissertation, S/U graded credits, and transfer credits have no impact on a student’s GPA.

**Dismissal** If the graduate grade-point total is 2.30 or lower, the student is dismissed from graduate standing, or if the graduate GPA remains below 3.0 for two (2) consecutive semesters, the student is dismissed from graduate standing.
Dismissed students are no longer in a graduate program but may take graduate-level courses as a Grad Special. Students wishing to complete their degree must obtain approval to take graduate-level courses, raise their graduate GPA to at least 3.0 and then re-apply to a graduate program. Any courses taken to raise their GPA will be included in the graduate special/transfer credit limitation (12 credits for master’s degrees).

3 Transfer credits

Transfer credits are credits transferred from another institution. Transfer credit is requested on the Graduate Credit Transfer Evaluation Request form available on Graduate School website.

Credits completed at UNR in another program or as a graduate special do not need to be transferred. However, the maximum number of credits that are allowed to be transferred or shared between graduate special and degree programs (master’s and doctoral) is 12.

The form must be signed by the student, and Graduate Director. Transfer credits applied to a master’s program must comply with the time limitation on master’s work (6 years). Thus, if a student took a course five years prior to admission, they would have to complete the degree within one year for the course to apply to the degree.

Please note the following Graduate School Policy: Students may request to apply graduate units earned at another accredited institution toward an advanced degree at the University of Nevada, Reno by filing a Credit Transfer Evaluation Request Form, available online. The request must be approved by the student’s director of graduate studies and the Graduate Dean. Program approval to transfer credits does not guarantee that all courses requested will be transferred, or applicable toward satisfying program course degree requirements. The student will receive the evaluation results by mail. The evaluation results are distributed to the student, advisor, and graduate school for reference in graduate program planning. Only courses with a grade of “C” or better may be transferred to a master’s program; only courses with a grade of “B” or better may be transferred to a doctoral program.

For master’s degree programs, transferred units must be post-baccalaureate and conform to the time limitation on master’s work requiring completion within six (6) calendar years immediately preceding the granting of the degree. Additionally, no more than twelve (12) units completed either prior to admission to a graduate program or transferred from another institution may be applied to a master’s degree.

4 Graduate Committee Selection

Each master’s student on the Thesis Plan (Section 2.1) must secure a Thesis Advisor (Advisor), and a Graduate Committee. The Graduate Committee (Advisory-Examining Committee), chosen in communication between the student and her/his Advisor, serves as an advisory board to the student, on issues such as class selection, research work, thesis preparation and defense. The student is encouraged to form their committee as early as possible, but not later than the beginning of their 3rd semester.

The Graduate Committee must consist of a minimum of 3 graduate faculty members, including the Advisor, who functions as the committee’s Chair. At least 2 faculty members must be from the student’s
major department/program, and 1 faculty, from another department in a field related to the student’s major member, serves as the Graduate School’s representative. Formal approval of committee is made by the Graduate Dean.

5 Ph.D. Application process
This section contains information for students who wish to join the Ph.D. program in Statistics and Data Science, upon completing their Master’s Degree.

5.1 Required Application Materials
1. Official undergraduate/graduate transcripts from all previous institutions.
2. Official general Graduate Record Exam (GRE) score from within the past 5 years.
3. Official TOEFL/IELTS scores (only required for International students).
4. Three letters of recommendation.
5. Statement of purpose.
6. Resume.

Please note that only Graduate School may waive any of the requirements 1 – 3 above, and that we do not evaluate any materials sent by email. The only materials we evaluate are from the official application via graduate School’s web site.

Further, please note that credits from a completed master’s degree will be exempt from the 8-year time limitation for those students earning a doctoral degree. Additionally, 30 credits earned in Master program may qualify to be transferred to PHD program, if approved by the Graduate Director.

5.2 Application Target Dates

<table>
<thead>
<tr>
<th>Spring Semester Applications</th>
<th>Fall Semester Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Deadline: October 1</td>
<td>First Deadline: February 1</td>
</tr>
<tr>
<td>Second Deadline: November 1</td>
<td>Second Deadline: March 1</td>
</tr>
</tbody>
</table>

Admissions and funding offers will be made shortly after the first deadline. Applications received between the first and second deadline will be given full consideration, but funding will be contingent upon availability. Applications will not be accepted after the second deadline.

Applications need to be submitted through the Graduate School’s website.

6 Timeline for degree completion

6.1 Recommended timeline for Thesis Plan
- Take 6-9 graduate credits per semester. For example, to reach the needed 30 credits for graduation, you may take 9 credits for two semesters and 6 credits for the other two semesters.
• Identify a Thesis Advisor and Graduate Committee by the end of your first year in the program.
• As early as possible, but no later than the beginning of your 3\textsuperscript{rd} semester in the program, complete the \textit{Program of Study} form.
• Start work on your Master’s Thesis by no later than the beginning of your 3\textsuperscript{rd} semester.
• Complete work on your Master’s Thesis during your 4\textsuperscript{th} semester. Circulate your complete thesis among members of your Graduate Committee, at least two weeks prior to the thesis defense. In case of a very long or very detailed thesis, committee members may need more time to review your work.
• Schedule a public defense of your thesis. Consult your Advisor, Graduate Committee members, and the Graduate Director about their time and availability.
• Upon a successfully defended thesis, file the \textit{Notice of Completion} with the Graduate School.

6.2 \textbf{Recommended timeline for Non-Thesis Plan}

• Take 6-9 graduate credits per semester. For example, to reach the needed 32 credits for graduation, you may take 9 credits for three semesters and 5 credits during the remaining semester.
• As early as possible, but no later than the beginning of your 3\textsuperscript{rd} semester in the program, complete the \textit{Program of Study} form.
• Schedule the Comprehensive Exam during your second year (3\textsuperscript{rd} or 4\textsuperscript{th} semester) of the program. Enroll in MATH 795 (STAT 795 from Fall 2020) – the Comprehensive Exam course.
• Upon a successfully completion of the Comprehensive Exam, file the \textit{Notice of Completion} with the Graduate School.

6.3 \textbf{Forms required for graduation}

Forms that are required to be submitted to the Graduate School during the progression to your terminal degree, can be found on their \textit{Forms} web page. They include these forms (listed with a timeline for their submissions):

• \textbf{Declaration of Advisor, Major Advisor, Committee Chair}
  o For master’s students on the Thesis Plan, the completed form must be submitted to Graduate School by the end of the student’s 2\textsuperscript{nd} semester.
• \textbf{Program of Study}
  o For master’s students, completed form must be submitted to Graduate School by the end of the student’s 3\textsuperscript{rd} semester.
• \textbf{Graduation Application}
  o Must be submitted to the Graduate School several weeks in advance. Check their website for exact dates.
• The Notice of Completion form should be submitted after all requirements for the degree have been met.
• Optional \textit{Exit Survey}, to be completed upon graduation. This survey is voluntary, confidential, and takes about 5 minutes.

\textbf{Master’s degrees:} All course work must be completed within six years preceding the awarding of the degree.
7 Master’s Thesis Requirements

Each master student on a Thesis Plan must prepare a Master’s Thesis guided by her/his Advisor. The Advisor must be selected from the graduate faculty members of the Department of Mathematics and Statistics. The details of thesis preparation and presentation should be discussed with the Advisor.

Graduate School forms and resources related to Master’s Theses:
- Master’s Thesis Filing Guidelines
- Final Review Approval – Obtain sign-off from advisory committee chair
- Notice of Completion – completed form should be submitted after all requirements have been met.

8 Graduate Assistantships

Teaching Assistantships award a stipend for the academic year plus a tuition and fee waiver and a subsidized medical plan. Teaching assistants will be expected to perform specific teaching and grading duties. Normally this will not exceed teaching 6 credit hours per semester or the academic equivalent. Awards are based on academic credentials submitted with the Graduate School application. Research Assistantships are sometimes available as well.

Teaching Assistantships (TA-ships) are also subject to the following guidelines

1. TA-ship support for MS students is normally approved for 4 semesters subject to satisfactory degree progress. To get TA-ship support beyond this period requires special semester-by-semester approval by the Graduate Committee and the Chair of the department.
2. Students being supported by a TA-ship are expected to enroll in at least 6 credits of approved graduate coursework. The courses Grad 701 and Math 899 do not count toward this 6-credit requirement.

All graduate students holding an assistantship are considered Nevada residents for tuition purposes. Non-resident tuition is only waived for the duration of the assistantship. To be eligible for an assistantship, students must be admitted to a degree-granting program and be in good academic standing. The student must have an overall GPA of at least 3.0 and must be continuously enrolled in at least 6 graduate level credits (600-700 level courses) throughout the duration of the assistantship.

State-funded assistantships (GTA/GRA) may be held for a maximum of three (3) years for master’s degree students, and five (5) years for doctoral degree students.

Information on graduate assistantships can be found on the Graduate School’s website at these links:
- General information
- Assistantship handbook
9 Health insurance

All domestic degree seeking graduate students, who are enrolled in 6 or more credits (regardless of the course level) in a semester, will be automatically enrolled and billed for the university sponsored health insurance for each term they are eligible (fall & spring/summer). If a student has other comparable coverage and would like to waive out of the student health insurance, it is the student’s responsibility to complete the University online waiver form prior to the deadline. If approved, a health insurance waiver is good for the current academic year only. A new waiver must be submitted each academic year. All international graduate students are required to carry student health insurance, and the cost will be automatically added to your student account. Any international graduate students with insurance questions must contact the Office of International Students and Scholars (OISS) directly.

10 Leave of Absence

Continuous Enrollment To maintain “good standing” all graduate students are required to enroll in a minimum of three (3) graduate credits each fall and spring semester until they graduate. International students may be required to enroll in nine graduate credits each fall and spring semester depending on the requirements of their visa. All students holding assistantships (whether teaching or research assistantships) are required to enroll in a minimum of six (6) graduate credits each semester they hold the assistantship.

Leave of Absence Students in good standing may request a leave of absence by completing a Leave of Absence Form available on the Graduate School’s website, during which time they are not required to maintain continuous registration. Usually, a leave of absence is approved for one or two semesters. The leave of absence request may be extended by the student filing an additional leave of absence form. Students applying for a leave of absence should not have any “incomplete” grades which could be changed to “F” and have a detrimental impact on their cumulative GPA. Requests for leave of absences must be received by the Graduate School no later than the last day of enrollment for the semester the leave is to begin.

Reinstatement to Graduate Standing When a student has been absent for one semester or more without an approved leave of absence, she or he may request reinstatement via the Notice of Reinstatement to Graduate Standing Form. This form allows the program the option to recommend the student be re-admitted to their graduate program based on their previous admission, or require the student to re-apply for admission which would require students to submit a new application for admission and pay the application fee. The Notice of Reinstatement to Graduate Standing must be received by the Graduate School no later than the last day of enrollment for the semester the reinstatement is to begin.

11 Graduate Student Association

The Graduate Student Association (GSA) represents all graduate students and promotes the welfare and interests of the graduate students at the University of Nevada, Reno. The GSA works closely with appropriate university administrative offices, including the Graduate School and Student Services and reports to the President of the University. The GSA government functions through the Council of Representatives, Executive Council and established committees.