

University of Nevada Reno  
Graduate Program in Mathematics  
Handbook



The Graduate Program in Mathematics at the University of Nevada Reno is offered by the Department of Mathematics & Statistics (DMS). The Department is the home of a dynamic group of 22 award-winning graduate faculty with diverse interest and expertise in Pure and Applied Mathematics, Probability and Statistics.

You can earn your Master of Science in Mathematics degree with concentrations in Pure Math, Applied Math, or Statistics doing research with internationally renowned faculty in the areas of:

**Applied Mathematics, C\*-Algebras, Discrete Mathematics, Dynamic Systems, Number Theory, Topology, Probability, Statistics**

The Graduate Program in Mathematics and Statistics at the University of Nevada, Reno offers the professional training that industry demands and the cutting-edge research opportunities of a Tier 1 national research university.

You will learn statistical and mathematical methods that drive an autonomous car, decode brain images and gene expression, quantify earthquake and climate hazards, and develop computational approaches for multi-physics problems; study low-dimensional topology and knot theory, infinite-dimensional spaces, non-commutative topology, dynamical systems theory, number theory, and much more.

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

Located where the Sierra Nevada meets the Great Basin, the University is 45 minutes from Lake Tahoe and four hours from San Francisco and Napa-Sonoma wine country.

Reno offers an excellent living environment, short commutes, a growing arts community, and an increasingly cosmopolitan flavor. Join us!

**Apply at [Admissions Website](https://www.unr.edu/admissions/)<sup>1</sup>**

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

**Phone: (775) 784-6773**

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<sup>1</sup> <https://www.unr.edu/admissions/>

**E-mail: [math@unr.edu](mailto:math@unr.edu)**

**Web: [unr.edu/math](http://unr.edu/math)**

## **1. Program Description**

- The DMS Graduate Program currently offers **Master of Science in Mathematics**. There are three programs of study for this degree: Pure Mathematics, Applied Mathematics, and Statistics. Within each program of study, there are two degree plans: Thesis and Non-Thesis.
- The Program teaches students the art and science of Mathematics and Statistics with focus on diverse applications in academic and non-academic areas. Students receive a competitive training in all stages of a research process, from formulating a question to using the concepts and methods of a chosen research field to presenting the finding to professional audience. Many courses involve using professional technology. The Program graduates are competitive on a job market, with a well-established track record of employment in academy, industry, and government.
- **Student learning outcomes (SLOs)**  
After completion of the program the students will be able to:
  - 1) Demonstrate knowledge of the Mathematics and Statistics discipline including its theory, concepts, and methods, as well as and diverse applications to academic and non-academic settings.
  - 2) Demonstrate competency in Mathematics and Statistics research methods including asking research questions, finding appropriate resources and/or designing independent data gathering, performing analysis, and being able to critically evaluate the limits of research methodologies.
  - 3) Demonstrate competency and confidence in oral and written message development and delivery including organizing appropriate information and effectively presenting research results to specific audiences and contexts.
  - 4) Demonstrate competency in selecting and using Mathematics/Statistics software necessary for efficient solution of a given research problem.

With questions about the program, please contact

**Dr. Ilya Zaliapin**

Chair of the Graduate Studies Committee

Department of Mathematics and Statistics

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**Note:** This handbook lists graduate program academic policies and procedures. It includes information on graduate school policies, degree requirements, timeline for degree completion, committee selection guidelines and comprehensive exam/thesis requirements. Every effort has been made to make this handbook accurate as of the date of publication; however, this handbook does not constitute a contractual commitment. Graduate programs may not offer all of the courses

as described, and policies are subject to yearly review and changes with program director and Graduate Council approval.

## 2. Application process

The application package includes:

1. Official transcripts
2. GRE (general test)
3. TOEFL (minimal scores: 550 for paper test, 79 for Internet test) or IELTS (6.5)
4. Statement of Purpose
5. Letters of Recommendation (at least one letter is required)

The deadline for Fall admission is March 1, and for Spring admission – November 1st, annually. You should apply at UNR Graduate School web site:

[Grad Admissions Website](https://www.unr.edu/grad/admissions)<sup>2</sup>

All applicants must meet the University requirements:

[Admissions Website](https://www.unr.edu/admissions/)<sup>3</sup>

The admissions as well as funding decision are made by the Department Chair in consultation with the Graduate Studies Committee after the application deadline. We do not require a Bachelor's degree in Mathematics, but expect a BS-level preparation in mathematics, which includes classes in Calculus, Linear Algebra, Differential Equations, Analysis, Statistics and Probability. Please be advised that we cannot evaluate or comment on an application package before a formal application has been submitted and considered by the Graduate Studies Committee.

## 3. Degree requirements

### 3.1 Thesis plan

This plan requires students to write and successfully defend a thesis. Requirements for graduation:

- Students must complete at least 30 credits of acceptable graduate courses.
- Students must complete 6 thesis credits (Math 797).
- Student must complete 12 non-thesis credits at the 700 level.
- Student must complete at least 21 credits through on-campus courses at the university. For transfer credits, please consult the Graduate Director.

### 3.2 Non-thesis plan

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<sup>2</sup> <https://www.unr.edu/grad/admissions>

<sup>3</sup> <https://www.unr.edu/admissions/>

This plan requires students to pass a comprehensive examination given by the department.  
Requirements for graduation:

- Students must complete at least 32 credits of acceptable graduate courses.
- Students must complete at least 18 credits of 700 level courses.
- Students must complete at least 23 credits through on-campus courses at the university. For transfer credits, please consult the Graduate Director.
- Students must complete 1 credit of the "Comprehensive Exam" course (Math 795)

### 3.3 Course work

#### **Pure Mathematics Option**

This option provides a solid foundation in the theoretical aspects of mathematics. To graduate, students must successfully complete:

- Math 713 (Abstract and Real Analysis I),
- Math 731 (Modern Algebra I), and
- At least one of the following three courses:
  - Math 714 (Abstract and Real Analysis II),
  - Math 732 (Modern Algebra II) or
  - Math 742 (Algebraic Topology).

#### **Applied Mathematics Option**

This option provides a broad technical background for solving real-world problems. Students are required to complete

- Math 713 (Abstract and Real Analysis I) as well as
- One of the following sequences:
  - Math 701-702 (Numerical Analysis and Approximation I and II)
  - Math 721-722 (Nonlinear Dynamics and Chaos I and II),
  - Math 751-752 (Operations Research I and II),
  - Math/Stat 753 - Stat 754 (Stochastic Models and Simulation and Mathematical Statistics) or
  - Math 761-762 (Methods in Applied Math I and II).

An internship may be included in the plan of study, subject to availability and approval of the graduate adviser.

#### **Statistics Option**

This option provides students with technical background in the theory, methods, and applications of statistics to prepare them for an industrial career or for doctoral studies in statistics. To graduate, students must successfully complete

- Math/Stat 661 (Probability Theory),
- Stat 652 (Statistics I),
- Math 713 (Real Analysis I),
- Stat 754 (Mathematical Statistics),
- Stat 755 (Multivariate Data Analysis), and
- At least one of the following courses:
  - Math/Stat 753 (Stochastic Models and Simulation),
  - Stat 756 (Survival Analysis) and
  - Stat 758 (Time Series).

### 3.4 Graduate School Academic Requirements:

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:** students whose cumulative graduate GPA is .1 to .6 points below that needed for a 3.0 GPA are put on probation. Students are placed on academic probation for one semester. If they fail to raise their cumulative GPA to 3.0 by the end of one semester, they are dismissed from their graduate program. Thesis, dissertation, S/U graded credits, and transfer credits have **no** impact on a student's GPA.

**Dismissal:** students whose cumulative graduate GPA is .7 or more grade points below that needed for a 3.0 GPA are dismissed. 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 (9 credits for master's degrees).

## 4. Transfer credits

These are credits transferred from another institution. Credits completed at UNR in another program or as a graduate special do not need to be transferred. Transfer credit can be requested on the [Graduate Credit Transfer Evaluation Request form](#)<sup>4</sup> available on Graduate School website, and must be signed by the student, major advisor, 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. Credits from a completed master's degree will be exempt from the 8-year time limitation for those students pursuing a doctoral degree.

## 5. Timeline for degree completion

### 5.1 Recommended timeline for thesis plan:

- Take 6-9 graduate credits per semester

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<sup>4</sup> <http://www.unr.edu/Documents/graduate-school/GraduateCreditTransferEvaluationRequest.pdf>

- Second semester: Secure thesis committee
- Second semester: Complete Program of Study form, confirm with adviser, and secure committee signatures
- Second semester: Formulate the topic of thesis, start working on the thesis with adviser
- Third semester: Complete thesis draft, discuss with committee
- Fourth semester: Finalize thesis, present to committee/public

## 5.2 Recommended timeline for non-thesis plan:

- Take 6-9 graduate credits per semester
- Second semester: Secure graduate committee
- Second semester: Complete Program of Study form, confirm with adviser, and secure committee signatures
- Third or fourth semester: Take comprehensive exam

## 5.3 Forms that are required to be submitted to the graduate school:

- [Declaration of Advisor/Major Advisor/Committee Chair form](#)<sup>5</sup>
  - For master's students, the completed form must be submitted to Graduate School by the end of the student's second semester
- [Program of Study form](#)<sup>6</sup>
  - For master's students, the completed form must be submitted to Graduate School by the end of the student's third semester
- [Graduation Application](#) deadlines<sup>7</sup>
  - Must be submitted to the graduate school several weeks in advance. Check website for exact dates
- Notice of completion – completed form should be submitted after all requirements have been met.
  - [Master's form](#)<sup>8</sup>
- [Exit Survey](#)<sup>9</sup>

You can find an updated list of forms and requirements here: [Forms Website](#)<sup>10</sup>

**Master's degrees:** All course work must be completed within six years preceding the awarding of the degree.

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<sup>5</sup> <https://www.unr.edu/Documents/graduate-school/Declaration-of-Advisor.pdf>

<sup>6</sup> <http://www.unr.edu/Documents/graduate-school/program-of-study.pdf>

<sup>7</sup> <https://www.unr.edu/grad/graduation-and-deadlines>

<sup>8</sup> <https://www.unr.edu/Documents/graduate-school/notice-of-completion-master-degree-updated.pdf>

<sup>9</sup> <https://www.unr.edu/grad/forms-and-deadlines/exit-survey>

<sup>10</sup> <http://www.unr.edu/grad/forms>

## 6. Committee selection guideline

### 6.1 Role of the thesis/graduate committee

Each student must secure a thesis/graduate committee. The role of the committee is to advise the student during his/her Master Program career on class selection and order, research work, thesis preparation and defense or comprehensive exam preparation. The students are encouraged to form their committee by the beginning of their second semester. The Graduate School requires each student to form the committee by the end of their third semester.

All master's programs (with a few exceptions for course-only degrees) require at least three advisory committee members. All must be graduate faculty members. At least one (the graduate school representative or "outside" member) must be from a department or program different from the department or program from which the student is graduating.

Formal approval of all student advisory committees is made by the Graduate Dean

## 7. Comprehensive exams

Each person taking a comprehensive exam must enroll in MATH 795 or STAT 795 class.

Students in Pure Mathematics and Applied Mathematics Options take a comprehensive exam based on four 700-level classes they took during their studies: MATH 713 and three classes of their choice. Students in Statistics Option take a syllabus-based exam (see below). The exam is scheduled by the Program Director at the end of semester (end of November in Fall, end of April in Spring). It is a 6-hours exam, with a lunch break (the lunch is provided by the Department). The exams are prepared and graded by the faculty selected by the Graduate Studies Committee; the possible exam results are Pass/Non-Pass.

If a student fails the comprehensive exam, (s)he is given an opportunity of an oral re-examination during the same semester. The oral re-examination is given by the faculty selected by the Graduate Studies Committee. The exam covers the same material as in the comprehensive exam for this student. The exam results are Pass/Non-Pass.

If a student fails the oral re-examination, (s)he can re-take the comprehensive exam during the next semester. If a student fails the second attempt, (s)he is dismissed from the program.

### 7.1 Comprehensive exam in Statistics and Probability

**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, STAT 754) courses.

**Study guidelines.** To study for the exam, we recommend taking both Probability and the Mathematical Statistics classes; practicing by doing problems assigned as homeworks and more problems from the course text books; 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:



**Main reference:** DeGroot, M.H. and Schervish, M.J. "*Probability and Statistics*", Addison Wesley, 3rd edition, 2002.

**Additional references:** Bean, M.A. "*Probability: The Science of Uncertainty with Applications to Investments, Insurance and Engineering*", American Mathematical Society, 2009.  
[Society of Actuaries \(SoA\) Website<sup>11</sup>](#)

### 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; Neyman-Pearson lemma; uniformly most powerful (UMP) tests; 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.

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<sup>11</sup> <https://www.soa.org/education/exam-req/syllabus-study-materials/edu-multiple-choice-exam.aspx>

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

## 8. Thesis requirements

Each student in thesis plan must prepare a master thesis guided by his/her adviser. The adviser must be selected from the graduate faculty members of the DMS. The details of thesis preparation and presentation should be discussed with adviser.

Graduate School forms and resources related to thesis and dissertations:

- [Master's Thesis Filing Guidelines](#)<sup>12</sup>

Once all requirements have been met, students need to submit a Final Review Approval and Notice of Completion form in order to graduate.

- Final Review Approval – Obtain sign-off from advisory committee chair
  - [Master's Final Review Approval](#)<sup>13</sup>
- Notice of completion – completed form should be submitted after all requirements have been met.
  - [Master's Notice of completion](#)<sup>14</sup>

## 9. Graduate Assistantships

Teaching Assistantships award a stipend of \$17,000 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 often available as well.

**Teaching Assistantships are also subject to the following guidelines:**

1. TA support is normally approved for 4 semesters. To get TA support beyond this period requires special semester-by-semester approval of the Graduate Committee.
2. Students being supported by a TA 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 (teaching GTA or GRA) 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) 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 assistantship in the graduate school website:

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<sup>12</sup> <http://www.unr.edu/grad/forms/thesis-filing-guidelines>

<sup>13</sup> <http://www.unr.edu/Documents/graduate-school/thesis-final-review-approval-form.pdf>

<sup>14</sup> <https://www.unr.edu/Documents/graduate-school/notice-of-completion-master-degree-updated.pdf>

[General information](#)<sup>15</sup>

[Graduate Assistantship handbook](#)<sup>16</sup>.

## 10. Health insurance

All domestic degree seeking graduate students, who are enrolled in six 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](#)<sup>17</sup> 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 \(OISS\)](#)<sup>18</sup> directly.

[Information on Graduate health insurance](#)<sup>19</sup>.

## 11. 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](#)<sup>20</sup> 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:** When a student has been absent for one semester or more without an approved leave of absence, he or she may request reinstatement via the [Reinstatement form](#)<sup>21</sup>. 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.

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<sup>15</sup> <http://www.unr.edu/grad/funding/graduate-assistantships>

<sup>16</sup> [http://www.unr.edu/Documents/administration-finance/hr/hr-graduate/GA\\_handbook.pdf](http://www.unr.edu/Documents/administration-finance/hr/hr-graduate/GA_handbook.pdf)

<sup>17</sup> <https://studentinsurance.usi.com/UNR/unr-grad>

<sup>18</sup> <https://www.unr.edu/oiss>

<sup>19</sup> <http://www.unr.edu/grad/health-insurance>

<sup>20</sup> [http://www.unr.edu/Documents/graduate-school/leaveofabsencer\\_9.23.pdf](http://www.unr.edu/Documents/graduate-school/leaveofabsencer_9.23.pdf)

<sup>21</sup> <https://www.unr.edu/Documents/graduate-school/Notice-of-Reinstatement-Graduate-Standing.pdf>

## **12. Graduate Student Association**

The [Graduate Student Association \(GSA\) Website<sup>22</sup>](#) 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.

## **13. Graduate School Forms**

Please refer to [Forms Website<sup>23</sup>](#) for all forms available at The Graduate School.

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<sup>22</sup> <https://www.unr.edu/gsa/>

<sup>23</sup> <https://www.unr.edu/grad/forms-and-deadlines>