

**From:** [noreply@wsu.edu](mailto:noreply@wsu.edu)  
**To:** [curriculum.submit](#)  
**Subject:** 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan  
**Date:** Friday, November 5, 2021 4:21:52 PM  
**Attachments:** [2021.11.05.16.19.13.54.FormData.html](#)  
[2021.11.05.16.19.12.15.currentCatalogFile\\_MS\\_Stats\\_Rationale\\_2021.docx](#)  
[2021.11.05.16.19.12.15.currentCatalogFile1\\_MS\\_Stats\\_Updated\\_GS\\_Requirements.docx](#)  
[2021.11.05.16.19.12.15.currentCatalogFile2\\_MS\\_Stat\\_Proposed\\_Handbook\\_Oct2021.pdf](#)  
[2021.11.05.16.19.12.15.currentCatalogFile3\\_MS\\_Stat\\_Current\\_Handbook.pdf](#)

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Emily Lewis has submitted a request for a major curricular change. His/her email address is: [emily.m.lewis@wsu.edu](mailto:emily.m.lewis@wsu.edu).

**Requested change:** Revise or Drop Graduate Plan

**Degree:** MS Statistics

**Title:** Non thesis

**Requested Effective Date:** Fall 2022

Revise plan requirement: Yes

**Dean:** Swindell, Samantha - Assoc Dean - CAS,

**Chair:** Moore, Charles – Chair – Mathematics and Statistics,

\_\_\_\_\_  
Catalog Subcommittee  
Approval Date

\_\_\_\_\_  
AAC, PHSC, or GSC  
Approval Date

\_\_\_\_\_  
Faculty Senate  
Approval Date

**From:** [Moore, Charles](#)  
**To:** [curriculum.submit](#)  
**Subject:** Re: 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan  
**Date:** Friday, November 12, 2021 12:02:22 PM

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I never saw this, but I approve.

Charles Moore  
Professor and Chair  
Department of Mathematics and Statistics  
Washington State University  
Pullman, WA 99164

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**From:** curriculum.submit <curriculum.submit@wsu.edu>  
**Sent:** Friday, November 12, 2021 11:55 AM  
**To:** Moore, Charles <cnmoore@wsu.edu>  
**Subject:** FW: 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan

Greetings Professor Moore,

I do not see that we received your approval email for the below and attached proposal. Can I proceed with the Senate approval process?

Thank you,  
Blaine

Blaine Golden, Assistant Registrar  
Curriculum, Graduations, Athletic Eligibility

**From:** noreply@wsu.edu <noreply@wsu.edu>  
**Sent:** Friday, November 5, 2021 4:19 PM  
**To:** curriculum.submit <curriculum.submit@wsu.edu>  
**Subject:** 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan

Emily Lewis has submitted a request for a major curricular change. His/her email address is: [emily.m.lewis@wsu.edu](mailto:emily.m.lewis@wsu.edu).

**Requested change:** Revise or Drop Graduate Plan  
**Degree:** MS Statistics  
**Title:** Non thesis  
**Requested Effective Date:** Fall 2022  
**Revise plan requirement:** Yes  
**Dean:** Swindell, Samantha - Assoc Dean - CAS,

**From:** [Swindell, Samantha](#)  
**To:** [curriculum.submit](#); [Moore, Charles](#)  
**Subject:** RE: 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan  
**Date:** Wednesday, November 10, 2021 9:16:30 AM

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1. I approve this proposal in its current form.

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**From:** curriculum.submit@wsu.edu <curriculum.submit@wsu.edu>  
**Sent:** Friday, November 5, 2021 4:19 PM  
**To:** Moore, Charles <cnmoore@wsu.edu>  
**Cc:** Swindell, Samantha <sswindell@wsu.edu>  
**Subject:** 672875 Mathematics and Statistics Requirements Revise - Revise or Drop Graduate Plan

Moore, Charles – Chair – Mathematics and Statistics,

Swindell, Samantha - Assoc Dean - CAS,

Emily Lewis has submitted a request for a major curricular change.

**Requested change:** Revise or Drop Graduate Plan

**Degree:** MS Statistics

**Title:** Non thesis

**Requested Effective Date:** Fall 2022

Revise plan requirement: Yes

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Both Chair and Dean approval is required to complete the submission process. Please indicate that you have reviewed the proposal by highlighting one of the statements below and **reply all** to this email. ([curriculum.submit@wsu.edu](mailto:curriculum.submit@wsu.edu).) [Details of major change requested can be found in the attached supplemental documentation]

1. I approve this proposal in its current form.
2. I approve this proposal with revisions. Revisions are attached.
3. I do not approve this proposal. Please return to submitter.

If you do not respond within one week, you will be sent a reminder email. If no response is received within three weeks of the submission date, the proposal will be returned to the submitter.

November 5, 2021

### MS Statistics Updates Rationale

The Department of Mathematics and Statistics would like to update the MS Stats curriculum. This degree has a few important additions to the elective choices to keep abreast of current course offerings and the job market. The following courses will be added as acceptable electives for the program, in addition to those already approved: Crop Sci 545, Stat 435, Stat 437, CPTS 540, CPTS 570, CPTS 575, Math 566, CPTS 591. All of these courses have been requested as elective substitutions by students in the past, and all of these courses are believed to benefit the Statistics students wishing to pursue them. In addition, due to faculty shortages, offering more elective choices is in the program's best interests since the department is not able to offer as many courses each semester as they have in the past. We do not believe there will be an impact to other departments, as our students already take the listed classes to improve their competitiveness in the job market.

All curriculum changes were first approved by the departmental Graduate Studies Committee and then by a quorum of the graduate faculty in Mathematics & Statistics, including faculty at the Vancouver campus, on October 7, 2021.

**Statistics MS (Non-Thesis):**

- Core: 6 courses minimum (18 credits):
  - STAT 512
  - STAT 530 or STAT 535
  - STAT 533 or STAT 575
  - STAT 536
  - STAT 556 and STAT 443 or STAT 548 and STAT 549
- Statistical Consulting: 2 credits minimum:
  - STAT 590
- Complete 3 courses from at least two field areas (9 credits):
  - Statistical Theory:
    - MATH 568, MATH 569, STAT 544, STAT 548, STAT 549, STAT 577
  - Applied Statistical Methods:
    - STAT 519, STAT 572, STAT 573, STAT 574, STAT 576
  - Bioinformatics and Biostatistics:
    - CROP\_SCI 545, MATH 563, STAT 520, STAT 522, STAT 565
  - Econometrics and Time Series:
    - ECONS 511, ECONS 512, ECONS 513, STAT 516, STAT 508
  - Data Analytics
    - CPT\_S 540, CPT\_S 570, CPT\_S 575, CPT\_S 591, MATH 566, STAT 435, STAT 437
- Research Credits: 4 credits minimum:
  - STAT 702
- Total Graded Credits: 26 credits minimum
- Total Credits: 33 credits minimum

**Applicable Graduate School Requirements:**

- Graded Credits: 26 credits minimum:
  - Students may use a maximum of 9 credits of undergraduate coursework (300-400)
- Research Credits: 4 credits minimum
  - STAT 702
- Total Credits: 30 credits minimum

## 8 THE M.S. IN STATISTICS

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**Description and Learning Outcomes** – This is a two-year degree designed to prepare students to work in industry or to apply to a PhD program by providing them with a broad statistical skill set. Students may enroll in the M.S. in Statistics program directly or while seeking a PhD in another field. Students can choose courses from four field areas: Statistical Theory, Applied Statistical Methods, Bioinformatics and Biostatistics, and Econometrics and Time Series.

This M.S. program is designed to lead the student to the following learning outcomes:

- **Problem solving skills:** Students are expected to learn the fundamental tools of statistical modeling and implementation. Skills for identifying and solving statistical problems arising in various interdisciplinary areas is an important expected learning outcome associated with this degree.
- **Ability to work individually or in groups:** Statistical modeling can be pursued at an individual level or as part of a group effort with the group comprised of experts in various allied fields. Students are expected to develop such statistical skills so that modeling and analysis can be done in a timely and efficient manner.
- **Communication skills:** Students should develop good communication skills so that the interpretation and implications of the results obtained from analysis of a statistical model can be presented in an effective manner.

**For PhD Students in Other Departments** – There are many disciplines and sub disciplines that require extensive advanced training in statistics to perform graduate research work. One natural avenue for students at WSU to obtain this advanced training is to pursue an M.S. in Statistics. It provides the skillset they need to perform research in their primary field of study and such a degree enhances their marketability. All students enrolled in a PhD program in Pullman are able to receive advanced statistical training at the Master of Science level. By pursuing this option, a student can simultaneously be enrolled in the M.S. in Statistics option and the program of their primary PhD degree-granting unit.

Normally, students will have taken several graduate level Statistics courses before adding the M.S. program to their PhD program. Once they have found an advisor and formed a committee, students will fill out an Add an Academic Program Degree Level form, to be submitted by the graduate coordinator in the Department of Mathematics & Statistics. There is no additional application fee. Students must obtain consent from their primary department and the Department of Mathematics & Statistics to submit this form. At the same time, the student should submit a completed Program of Study for the M.S. Statistics. Note that the Department of Mathematics & Statistics does not usually provide assistantships to students who are getting a PhD in another department. The degree must be added at least one semester before the semester the student intends to complete the degree.

**Courses** – The M.S. in Statistics requires a total of 33 credit hours, including four credits of Stat 702, a written project, and passage of a comprehensive oral examination. Any changes to the requirements for a particular student can be made only with prior approval of the student’s committee and the chair of the Graduate Studies Committee. Special topics covered in Stat 510 may be used to satisfy an elective with approval of the student’s committee. Students who do not have a background in a field outside of statistics, mathematics, or computer science are encouraged to take at least two upper division courses in another substantive area.

Core requirements account for 24 of the required credit hours; the remaining 9 hours must include three or more courses representing at least two field areas chosen from the table below.

Required Courses: Stat 702 Master’s Special Problems/Directed Study  
(4+ hours)

Core Courses: Stat 443 AND Stat 556 Probability and Statistical Theory (6 hours)  
(20 hours) OR Stat 548 AND Stat 549  
Stat 512 Analysis of Variance of Designed Experiments (3 hours)  
Stat 536 Statistical Computing (3 hours)  
Stat 530 OR Stat 535 Regression (3 hours)  
Stat 575 The Theory of Multivariate Analysis (3 hours)  
Stat 590 Statistical Consulting Practicum (2 hours)

Electives: Three courses from at least two field areas in the table below  
(9 hours)

Statistical Theory*	Stat 544 Applied Stochastic Processes Stat 548 Statistical Theory I Stat 549 Statistical Theory II Stat 577 Statistical Learning Theory
Applied Statistical Methods	Stat 519 Applied Multivariate Analysis Stat 572 Quality Control Stat 573 Reliability Stat 574 Linear and Nonlinear Mixed Models Stat 576 Bayesian Analysis
Bioinformatics and Biostatistics	Stat 520 Statistical Analysis of Qualitative Data Stat 522 Biostatistics and Statistical Epidemiology Stat 565 Analyzing Microarray and Genomic Data Math 563 Mathematical Genetics
Econometrics and Time Series	Stat 508 Environmental Spatial Statistics Stat 516 Time Series Econ 511 Econometrics I Econ 512 Econometrics II Econ 513 Econometrics III

\*Stat 548 and 549 cannot be used in the field area if counted for the core requirements.

**Stat 702 and M.S. Examination** – There is no thesis requirement; however, an M.S. in Statistics student is required to do a written Masters project equivalent to 2-4 hours of Stat 702. Therefore, early in the students graduate program (by the second semester as recommended by the Graduate School), the student should obtain a project supervisor and form an M.S. committee. The student's project supervisor will normally serve as the chair of the M.S. committee, which will usually include two additional faculty with interest in Statistics. The student is required to make the final draft of the project report available to the M.S. committee at least two weeks prior to the final Masters oral exam. It is the committee's responsibility to give final approval to the project.

The student must select one of three M.S. project options in order to satisfy the project requirement. Selection of the project option must be made in consultation with the student's M.S. committee chair. The three project options are as follows:

1. The student can do an independent research project (advised by the supervisor). Acceptable topics for a project include an original data analysis or original research on a statistical problem. The student is required to write the final draft of the project report.
2. The student can thoroughly study a statistical modeling and methodology paper (suggested by the supervisor). The student then reads the selected paper, together with at least three other relevant papers and then prepares a comprehensive written report which includes, but is not limited to, the central objectives of the problem, modeling, methodology, implementation, results, and conclusions. The student is required to write a summary report on the topic and to include in the report the computer code for implementation of the methodology.
3. The student can complete an internship that is compatible with the student's chosen career specialization within statistics (approved by the supervisor). The internship should be a full-time affiliation for a period of not less than eight weeks duration and not less than 400 hours. A monthly report is required during the internship and a written report is to be turned in at the end of the internship.

For all three options, the student is required to write a final summary report on the subject and make it available to the M.S. committee at least two weeks prior to the final Master's Examination. It is the committee's responsibility to give final approval.

The final Masters oral exam is a two-hour oral exam conducted by the student's M.S. committee. The oral exam will consist of a (i) 30-minute presentation of the student's project/paper/internship, (ii) 15-minute period following the Master's project presentation for questions by the committee related to the results contained in the Masters project, and (iii) 75-minute period devoted to a comprehensive oral exam covering the material in Stat 443, Stat 512, Stat 530, and Stat 556, as well as material covered in additional course work. The student is expected to be thoroughly familiar with a wide array of statistical concepts contained in the list of topics and concepts obtained from the graduate coordinator.



# PROPOSED REVISION FALL 2021

## 1 THE M.S. IN STATISTICS

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**Description and Learning Outcomes** – This is a two-year degree designed to prepare students to work in industry or to apply to a PhD program by providing them with a broad statistical skill set. Students may enroll in the M.S. in Statistics program directly or while seeking a PhD in another field. Students can choose courses from five field areas: Statistical Theory, Applied Statistical Methods, Bioinformatics and Biostatistics, Econometrics and Time Series, and Data Analytics.

This M.S. program is designed to lead the student to the following learning outcomes:

- **Problem solving skills:** Students are expected to learn the fundamental tools of statistical modeling and implementation. Skills for identifying and solving statistical problems arising in various interdisciplinary areas is an important expected learning outcome associated with this degree.
- **Ability to work individually or in groups:** Statistical modeling can be pursued at an individual level or as part of a group effort with the group comprised of experts in various allied fields. Students are expected to develop such statistical skills so that modeling and analysis can be done in a timely and efficient manner.
- **Communication skills:** Students should develop good communication skills so that the interpretation and implications of the results obtained from analysis of a statistical model can be presented in an effective manner.

**For PhD Students in Other Departments** – There are many disciplines and sub disciplines that require extensive advanced training in statistics to perform graduate research work. One natural avenue for students at WSU to obtain this advanced training is to pursue an M.S. in Statistics. It provides the skillset they need to perform research in their primary field of study and such a degree enhances their marketability. All students enrolled in a PhD program in Pullman are able to receive advanced statistical training at the Master of Science level. By pursuing this option, a student can simultaneously be enrolled in the M.S. in Statistics option and the program of their primary PhD degree-granting unit.

Normally, students will have taken several graduate level Statistics courses before adding the M.S. program to their PhD program. Once they have found an advisor and formed a committee, students will fill out an Add an Academic Program Degree Level form, to be submitted by the graduate coordinator in the Department of Mathematics & Statistics. There is no additional application fee. Students must obtain consent from their primary department and the Department of Mathematics & Statistics to submit this form. At the same time, the student should submit a completed Program of Study for the M.S. Statistics. Note that the Department of Mathematics & Statistics does not usually provide

assistantships to students who are getting a PhD in another department. The degree must be added at least one semester before the semester the student intends to complete the degree.

**Courses** – The M.S. in Statistics requires a total of 33 credit hours, including four credits of Stat 702, a written project, and passage of a comprehensive oral examination. Any changes to the requirements for a particular student can be made only with prior approval of the student’s committee and the chair of the Graduate Studies Committee. Special topics covered in Stat 510 may be used to satisfy an elective with approval of the student’s committee. Students who do not have a background in a field outside of statistics, mathematics, or computer science are encouraged to take at least two upper division courses in another substantive area. Those students who complete an undergraduate degree at Washington State University and receive a B or better in Stat 443 and Stat 456/556 may substitute other electives in place of that core requirement. Core requirements account for 24 of the required credit hours; the remaining 9 hours must include three or more courses representing at least two field areas chosen from the table below. At most, two courses may be outside of the “STAT” or “DATA” prefix.

Required Courses: Stat 702 Master’s Special Problems/Directed Study  
(4+ hours)

Core Courses: Stat 443 AND Stat 556 Probability and Statistical Theory  
(20 hours) OR Stat 548 AND Stat 549 Statistical Theory (6 hours)  
Stat 512 Analysis of Variance of Designed Experiments (3 hours)  
Stat 536 Statistical Computing (3 hours)  
Stat 530 OR Stat 535 Regression (3 hours)  
Stat 575 The Theory of Multivariate Analysis (3 hours)  
Stat 590 Statistical Consulting Practicum (2 hours)

Electives: Three courses from at least two field areas in the table below.  
(9 hours) Students may select three courses from the Data Analytics field.

Statistical Theory*	Stat 544 Applied Stochastic Processes Stat 548 Statistical Theory I Stat 549 Statistical Theory II Stat 577 Statistical Learning Theory
Applied Statistical Methods	Stat 519 Applied Multivariate Analysis Stat 572 Quality Control Stat 573 Reliability Stat 574 Linear and Nonlinear Mixed Models Stat 576 Bayesian Analysis
Bioinformatics and Biostatistics	Stat 520 Statistical Analysis of Qualitative Data Stat 522 Biostatistics and Statistical Epidemiology Stat 565 Analyzing Microarray and Genomic Data Math 563 Mathematical Genetics Crop_Sci 545 Statistical Genomics

Econometrics and Time Series	Stat 508 Environmental Spatial Statistics Stat 516 Time Series Econ 511 Econometrics I Econ 512 Econometrics II Econ 513 Econometrics III
Data Analytics	Stat 435 Statistical Modeling for Data Analytics Stat 437 High Dimensional Data Learning and Visualization MATH 566 Optimization in Networks CPTS 540 Artificial Intelligence CPTS 570 Machine Learning CPTS 575 Data Science CPTS 591 Elements of Network Science

\*Stat 548 and 549 cannot be used in the field area if counted for the core requirements.

**Stat 702 and M.S. Examination** – There is no thesis requirement; however, an M.S. in Statistics student is required to do a written Masters project equivalent to 2-4 hours of Stat 702. Therefore, early in the students graduate program (by the second semester as recommended by the Graduate School), the student should obtain a project supervisor and form an M.S. committee. The student’s project supervisor will normally serve as the chair of the M.S. committee, which will usually include two additional faculty with interest in Statistics. The student is required to make the final draft of the project report available to the M.S. committee at least two weeks prior to the final Masters oral exam. It is the committee’s responsibility to give final approval to the project.

The student must select one of three M.S. project options in order to satisfy the project requirement. Selection of the project option must be made in consultation with the student’s M.S. committee chair. The three project options are as follows:

1. The student can do an independent research project (advised by the supervisor). Acceptable topics for a project include an original data analysis or original research on a statistical problem. The student is required to write the final draft of the project report.
2. The student can thoroughly study a statistical modeling and methodology paper (suggested by the supervisor). The student then reads the selected paper, together with at least three other relevant papers and then prepares a comprehensive written report which includes, but is not limited to, the central objectives of the problem, modeling, methodology, implementation, results, and conclusions. The student is required to write a summary report on the topic and to include in the report the computer code for implementation of the methodology.
3. The student can complete an internship that is compatible with the student’s chosen career specialization within statistics (approved by the supervisor). The internship should be a full-time affiliation for a period of not less than eight weeks duration and not less than 400 hours. A monthly report is required during the internship and a written report is to be turned in at the end of the internship.

For all three options, the student is required to write a final summary report on the subject and make it available to the M.S. committee at least two weeks prior to the final Master's Examination. It is the committee's responsibility to give final approval.

The final Masters oral exam is a two-hour oral exam conducted by the student's M.S. committee. The oral exam will consist of a (i) 30-minute presentation of the student's project/paper/internship, (ii) 15-minute period following the Master's project presentation for questions by the committee related to the results contained in the Masters project, and (iii) 75-minute period devoted to a comprehensive oral exam covering the material in Stat 443, Stat 512, Stat 530, and Stat 556, as well as material covered in additional course work. The student is expected to be thoroughly familiar with a wide array of statistical concepts contained in the list of topics and concepts obtained from the graduate coordinator.