REQUEST TO COLLEGE CURRICULUM COMMITTEE FOR CURRICULAR IMPROVEMENTS

DEPARTMENT: Statistics PROPOSED EFFECTIVE SEMESTER: Fall 2019 COLLEGE: Arts and Sciences

PROPOSED IMPROVEMENTS

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<td>☐ Other (explain**)</td>
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** Other: Revised PhD program

Title of degree, curriculum, major, minor, concentration, or certificate: Doctor of Philosophy in Statistics

Existing course prefix and #: NA Proposed course prefix and #: NA Proposed Credit hours: 65

Existing course title: NA

Proposed course title: NA

Existing course prerequisite & co-requisite(s): NA

Proposed course prerequisite(s) NA

- If there are multiple prerequisites, connect with "and" or "or". To remove prerequisites, enter "none."

Proposed course co-requisite(s) NA

- If there are multiple corequisites, they are always joined by "and."

Proposed course prerequisite(s) that can also be taken concurrently:

Is there a minimum grade for the prerequisites or corequisites?

The default grades are D for undergraduates and C for graduates.

Major/minor or classification restrictions:

- List the Banner 4 character codes and whether they should be included or excluded.

Specifications for University Schedule of Classes:

a. Course title (maximum of 30 spaces): NA
b. Multi-topic course: ☐ No ☐ Yes
c. Repeatable for credit: ☐ No ☐ Yes
d. Mandatory credit/no credit: ☐ No ☐ Yes
e. Type of class and contact hours per week (check type and indicate hours as appropriate)
   1. ☐ Lecture 3. ☐ Lecture/lab/discussion 5. ☐ Independent study
   2. ☐ Lab or discussion 4. ☐ Seminar or ☐ studio 6. ☐ Supervision or practicum

CIP Code (Registrar’s use only):

<table>
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<th>Chair/Director</th>
<th>Date</th>
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Chair, College Curriculum Committee

Dean Date: Graduate Dean: Date

Curriculum Manager: Return to dean Date Forward to: Date

Chair, COGE/ PEB / FS President

FOR PROPOSALS REQUIRING GSC/USC REVIEW:

☐ Approve ☐ Disapprove Chair, GSC/USC Date

☐ Approve ☐ Disapprove Provost Date

Revised May 2007. All previous forms are obsolete and should not be used.
1. Explain briefly and clearly the proposed improvement.

This proposal reduces the total number of credits required for the Doctor of Philosophy in Statistics from 75 credits to 65 credits (50 hours of coursework plus 15 hours of dissertation work). In addition, a number of revisions to the Graduate Catalog program description are proposed. The majority of these edits pertain to such things as core requirements, preliminary exams and process, and the chronological progression of the program.

2. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.)

With few exceptions, PhD Statistics programs in the country require less than 75 credits. This program change will keep the Department of Statistic's (DOS) program competitive and will reduce the time it takes students to obtain the degree. As a byproduct, the DOS also anticipates increased enrollments due to the change. The revisions to the Graduate Catalog program description provide more detail regarding program requirements, rules, and expectations.

3. Effect on other colleges, departments or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.

The Doctor of Philosophy in Statistics is the only such program here at Western Michigan University. Therefore, there are no effects on other colleges, departments, and/or programs.

4. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.

The Department of Statistics anticipates increased applications and possibly enrollments due to the proposed change. With the unchanged PhD-level courses in the curriculum even if the number of students in the PhD program increases there should be no effect on departmental offerings.

5. Effects on enrolled students: Are program conflicts avoided? Will your proposal make it easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students' time. If a required course will be offered during summer only, provide a rationale.

The proposed change will have no effect on students and there are no program conflicts. In fact, the demands on students' time will actually be less due to ten less credits in the program.

6. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?

External demand for PhD statistics graduates is excellent. The need for statisticians is growing and the trend is expected to continue. The employment rate is basically 100%. In fact, students are often hired or even recruited before defending their dissertation. It is the expectation of the Department of Statistics that fewer required credits will encourage students to complete their degree before accepting job offers.

7. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. If proposing a new program, include a letter and/or email of support from the university library affirming that the library resource issues have been reviewed. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? How often will course(s) be offered? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

As previously mentioned (e.g. in 4), the Department of Statistics anticipates increased applications and possibly enrollments due to the change. The Department does not expect a significant increase in enrollment unless there is an adequate number of graduate faculty in the Department that could serve as dissertation advisors for these students.

8. General education criteria. For a general education course, indicate how this course will meet the criteria for the area or proficiency. (See the General Education Policy for descriptions of each area and proficiency and the criteria. Attach additional pages as necessary. Attach a syllabus if (a) proposing a new course, (b) requesting certification for baccalaureate-level writing, or (c) requesting reapproval of an existing course.)
12. Please offer both "Current Catalog Language" and "Proposed Catalog Language." If there is no change in the language, please state "as currently stated." Otherwise, please list the changes here.

 NA

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The proposed curriculum changes are not in response to any assessment outcomes.

10. Describe how this curriculum change is a response to assessment outcomes that are part of a departmental or college.

The proposed changes in the proposed catalog language from the most current catalog and for the "as currently stated" please share the exact proposed new language. Provide a given course and program. For the "as currently stated," please copy and paste relevant language description for a given course and program. For the "Proposed Catalog Language," please offer both "Current Catalog Language" and "Proposed Catalog Language." If there is no change in the language, please state "as currently stated." Otherwise, please list the changes here.

 NA

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The proposed curriculum changes are not in response to any assessment outcomes.

9. List the learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.

 NA
Statistics

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Joseph McKean
Joshua Naranjo
Georgiana Onicescu
Rajib Paul
Jeffrey Terpstra

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Financial Assistance
The Department of Statistics offers opportunities for financial support of graduate students through Graduate Assistantships and Fellowships. Individuals desiring further information about such opportunities, or about the graduate program as a whole, should contact the Statistics Department Office, 3304 Everett Tower.

Dr. Joshua Naranjo, Graduate Committee Chair, 5507 Everett Tower, 387-4548. E-mail: joshua.naranjo@wmich.edu

Doctor of Philosophy in Statistics

Advisors:
Dr. Rajib Paul
Dr. Jeff Terpstra

The Doctor of Philosophy in Statistics is designed to prepare students for careers in teaching and research universities, in industry, or in government. It is expected that students, through courses and other experiences, will develop facility in theoretical statistics and in several applied statistics areas. Choices available in the electives area allow the program to be designed to suit a variety of career interests. The program consists of 65 credits; 50 credits of coursework and 15 credits of dissertation work.

Admission Requirements
A student must possess a bachelors or master's degree in Statistics or a directly comparable degree with a substantial number of statistics and/or probability credits in order to be admitted to the program. In addition, to satisfying the general admission requirements of the Graduate
College. the student must have acquired a sufficient level of mathematical training with satisfactory grades as determined by the Statistics Doctoral Committee. Mathematics coursework includes, but is not necessarily limited to, a complete calculus sequence and a linear algebra course. Upon entrance to the program the students are expected to meet with an advisor, the program director who will assist him/her in planning his/her program until he/she reaches the stage of candidate.

Program Requirements

1. Departmental Graduate Examination in Statistics
Prior to admission or during the first year, students must pass the Departmental Graduate Examination (DGE) in Statistics at the doctoral level. This consists of two, three-hour exams in the areas of theoretical statistics (calculus-based mathematical statistics and probability) and applied statistics (regression, and design of experiments and mixed models). At WMU, this exam material corresponds to the following courses: STAT-56206500, 6600, 6620, and 6640. The DGE is given once a year, usually in May during the first week of the Summer I session. Should a student fail to pass either part of the DGE at the doctoral level, he/she may request a second attempt (usually given in August of the same summer) on the failed part(s) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam at the doctoral level, the student will be dismissed from the program. However, a student who is dismissed from the program for this reason may be allowed to continue in a different graduate program offered by the Department.

2. Acquire at Least 650 Hours of Course Work

Note: Students admitted to the program with a Masters Degree who have obtained graduate work in Statistics or a closely related field may possibly receive credit for as many as 320 of the 650 hours required.

Note: Up to six credit hours in approved areas related to statistical applications (e.g., computer science, computational or applied mathematics, engineering, biological science, management, or economics) may be substituted as electives upon approval of the Statistics Doctoral Committee.

Core Courses

STAT 6500 - Statistical Theory I Credits: 4 hours
STAT 6600 - Statistical Theory II Credits: 4 hours
STAT 6620 - Applied Linear Models Credits: 3 hours
STAT 6640 - Applied Mixed Models Design of Experiments I Credits: 3 hours
STAT 6800 - SAS Programming Credits: 3 hours

Doctoral Preliminary Examination Courses

STAT 6460 - Large Sample Theory Credits: 3 hours
STAT 6610 - Multivariate Statistical Analysis Credits: 3 hours
STAT 6630 - Linear Models Credits: 3 hours
STAT 6650 - Advanced Statistical Inference Credits: 3 hours
STAT 6660 - Advanced Nonparametric Statistical Methods Credits: 3 hours

Course Electives at the 6000 Level
At least seven-five 6000 level electives are required.
STAT 6040 - Statistics for Epidemiology Credits: 3 hours
STAT 6050 - Fundamentals of Clinical Trials Credits: 3 hours
STAT 6350 - Spatial Statistics Credits: 3 hours
STAT 6450 - Applied Bayesian Statistics Credits: 3 hours
STAT 6650 - Advanced Statistical Inference Credits: 3 hours
STAT 6670 - Introduction to Random Processes Credits: 3 hours
STAT 6680 - Categorical Data Analysis Credits: 3 hours
STAT 6690 - Studies in Probability and Statistics Credits: 3 hours
STAT 6810 - Survival Data Analysis Credits: 3 hours
STAT 6830 - Robust Statistical Analysis Credits: 3 hours
STAT 6880 - Statistical Research Tools Credits: 3 hours

Course Electives at the 5000 Level
No more than three-two 5000 level electives can be applied to the program of study.
STAT 5610 - Applied Multivariate Statistical Methods Credits: 3 hours
STAT 5630 - Sample Survey Methods Credits: 3 hours
STAT 5650 - Design of Experiments for Quality Improvement Credits: 3 hours
STAT 5660 - Nonparametric Statistical Methods Credits: 3 hours
STAT 5820 - Time Series Analysis Credits: 3 hours
STAT 5850 - Applied Data Mining Credits: 3 hours
STAT 5860 - Computer Based Data Analysis Credits: 3 hours

Note:
Note: The following courses may be substituted as electives upon approval of the Statistics Doctoral Committee.
STAT 6700 - Statistical Consulting Practicum Credits: 3 hours
STAT 6910 - Practicum in Statistical Consulting Credits: 1 hour
STAT 6990 - Reading and Research Credits: 3 hours

3. Three Two Preliminary Examinations

Students are expected to take preliminary exams at the first opportunity after the necessary course work is completed. Failure to do so will result in a failed attempt.

A student must pass preliminary examinations in Multivariate/Linear Models (STAT 6610 and 6630) and in Statistical Asymptotic Inference (STAT 6460650 and 6660). The third exam is satisfied by completion of project reports in an area to be chosen, with the approval of the Statistics Doctoral Committee, from two 6000 level statistics courses. Should a student fail to pass either exam, he/she may request a second attempt (usually given in August of the same summer) on the failed part(s) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam, the student will be dismissed from the program. However, a student who is dismissed
from the program for this reason may be allowed to continue in a different graduate program offered by the Department.

Two failures on the same examination will result in dismissal from the program. Students are expected to take the preliminary examinations as soon as they become eligible. Failure to do so will result in a failed attempt.

4. Demonstrate Competency in Two Research Tools.
In accordance with the requirements of the Graduate College, each student is required to attain competence in two research tools. Normally for students in Statistics these will consist of demonstrated competence in computer usage and/or a foreign language. Competence in computer usage can be demonstrated by obtaining a satisfactory grade in STAT 6800, STAT 6880 and/or equivalent statistics courses. Competence in a foreign language can be demonstrated by passing a reading course at the 4000-level in that language or by translating from a language other than English a statistical paper to the satisfaction of the Statistics Doctoral Committee. A third option for a research tool is a cross-disciplinary research experience involving concepts and language of a discipline other than Statistics (e.g., Biology, Chemistry, or Engineering) and resulting in documentation of the student’s competence in the other discipline in a form of written reports and/or published papers. The Statistics Doctoral Committee shall determine the acceptability of the cross-disciplinary research experience.

5. Dissertation
Complete and defend the dissertation before the student's dissertation committee. This requires at least 125 hours of the following course:
STAT 7300 - Doctoral Dissertation Credits: 1 to 15 hours

Administration and Procedures
This program will be administered by the Statistics Department Doctoral Committee. This committee will be responsible for the scheduling, preparation, and grading of preliminary examinations in statistics and for arranging a Thesis Proposal. Furthermore, each year the Statistics Doctoral Committee will review the progress of all doctoral students in the Statistics program. Any student not making satisfactory progress may be dropped dismissed from the program. Grades, performance on preliminary exams, the schedule of completed classes and exams, general progress towards completion of degree, as well as possible other criteria will be considered in this decision. As an example, course grades below a "B" are undesirable and could be grounds for dismissal.

A chronological progression of the program is as follows:

1. Upon entrance to the doctoral program in Statistics, students are expected to meet with a Ph.D. advisor, the program director for help in planning the student's program until he/she reaches the status of candidate (i.e. when all three preliminary examinations are passed).
2. During the first semester of study, the student must complete a plan of study and have it approved by the Statistics Doctoral Committee. The selection determination of preliminary exams and research tools shall also be included. Students are responsible for updating the
Statistics

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The Department of Statistics offers graduate programs leading to the Master of Science in Statistics and the Doctor of Philosophy in Statistics. It also offers a graduate certificate in Applied Statistics and a graduate certificate in Biostatistics.

Financial Assistance
The Department of Statistics offers opportunities for financial support of graduate students through Graduate Assistantships and Fellowships. Individuals desiring further information about such opportunities, or about the graduate program as a whole, should contact the Statistics Department Office, 3304 Everett Tower.

Dr. Joshua Naranjo, Graduate Committee Chair, 5507 Everett Tower, 387-4548. E-mail: joshua.naranjo@wmich.edu

Doctor of Philosophy in Statistics

Advisor:

Dr. Jeff Terpstra

The Doctor of Philosophy in Statistics is designed to prepare students for careers in teaching and research universities, in industry, or in government. It is expected that students, through courses and other experiences, will develop facility in theoretical statistics and in several applied statistics areas. Choices available in the electives area allow the program to be designed to suit a variety of career interests. The program consists of 65 credits; 50 credits of coursework and 15 credits of dissertation work.

Admission Requirements
A student must possess a bachelors or master's degree with a substantial number of statistics and/or probability credits in order to be admitted to the program. In addition, the student must have acquired a sufficient level of mathematical training with satisfactory grades as determined by the Statistics Doctoral Committee. Mathematics coursework includes, but is not necessarily limited to, a complete calculus sequence and a linear algebra course. Upon entrance to the
program students are expected to meet with the program director who will assist him/her in planning his/her program until he/she reaches the stage of candidate.

Program Requirements
1. Departmental Graduate Examination in Statistics
Prior to admission or during the first year, students must pass the Departmental Graduate Examination (DGE) in Statistics at the doctoral level. This consists of two, three-hour exams in the areas of theoretical statistics (calculus-based mathematical statistics and probability) and applied statistics (regression, design of experiments and mixed models). At WMU, this exam material corresponds to the following courses: STAT6500, 6600, 6620, and 6640. The DGE is given once a year, usually in May during the first week of the Summer I session. Should a student fail to pass either part of the DGE at the doctoral level, he/she may request a second attempt (usually given in August of the same summer) on the failed part(s) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam at the doctoral level, the student will be dismissed from the program. However, a student who is dismissed from the program for this reason may be allowed to continue in a different graduate program offered by the Department.

2. Acquire at Least 50 Hours of Course Work

Note: Students who have obtained graduate work in Statistics or a closely related field may possibly receive credit for as many as 20 of the 50 hours required.

Core Courses
STAT 6500 - Statistical Theory I Credits: 4 hours
STAT 6600 - Statistical Theory II Credits: 4 hours
STAT 6620 - Applied Linear Models Credits: 3 hours
STAT 6640 - Applied Mixed Models Credits: 3 hours
STAT 6800 - SAS Programming Credits: 3 hours

Doctoral Preliminary Examination Courses
STAT 6460 - Large Sample Theory Credits: 3 hours
STAT 6610 - Multivariate Statistical Analysis Credits: 3 hours
STAT 6630 - Linear Models Credits: 3 hours

STAT 6660 - Advanced Nonparametric Statistical Methods Credits: 3 hours

Course Electives at the 6000 Level
At least five 6000 level electives are required.
STAT 6040 - Statistics for Epidemiology Credits: 3 hours
STAT 6050 - Fundamentals of Clinical Trials Credits: 3 hours
STAT 6350 - Spatial Statistics Credits: 3 hours
STAT 6450 - Applied Bayesian Statistics Credits: 3 hours
STAT 6650 - Advanced Statistical Inference Credits: 3 hours
STAT 6670 - Introduction to Random Processes Credits: 3 hours
STAT 6680 - Categorical Data Analysis Credits: 3 hours
STAT 6690 - Studies in Probability and Statistics Credits: 3 hours
STAT 6810 - Survival Data Analysis Credits: 3 hours
STAT 6830 - Robust Statistical Analysis Credits: 3 hours
STAT 6880 - Statistical Research Tools Credits: 3 hours

Course Electives at the 5000 Level
No more than two 5000 level electives can be applied to the program of study.
STAT 5610 - Applied Multivariate Statistical Methods Credits: 3 hours
STAT 5630 - Sample Survey Methods Credits: 3 hours

STAT 5660 - Nonparametric Statistical Methods Credits: 3 hours
STAT 5820 - Time Series Analysis Credits: 3 hours
STAT 5850 - Applied Data Mining Credits: 3 hours
STAT 5860 - Computer Based Data Analysis Credits: 3 hours

Note: The following courses may be substituted as electives upon approval of the Statistics Doctoral Committee.

STAT 6910 - Practicum in Statistical Consulting Credits: 1 hour
STAT 6990 – Reading and Research Credits: 3 hours

3. Two Preliminary Examinations

Students are expected to take preliminary exams at the first opportunity after the necessary course work is completed. Failure to do so will result in a failed attempt.

A student must pass preliminary examinations in Multivariate/Linear Models (STAT 6610 and 6630) and in Asymptotic Inference (STAT 6460 and 6660). Should a student fail to pass either exam, he/she may request a second attempt (usually given in August of the same summer) on the failed part(s) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam the student will be dismissed from the program. However, a student who is dismissed from the program for this reason may be allowed to continue in a different graduate program offered by the Department

4. Demonstrate Competency in Two Research Tools
In accordance with the requirements of the Graduate College, each student is required to attain competence in two research tools. Normally for students in Statistics these will consist of demonstrated competence in computer usage and/or a foreign language. Competence in computer usage can be demonstrated by obtaining a satisfactory grade in STAT 6800, STAT 6880 and/or equivalent statistics courses. Competence in a foreign language can be demonstrated by passing a reading course at the 4000-level in that language or by translating from a language
other than English a statistical paper to the satisfaction of the Statistics Doctoral Committee. A third option for a research tool is a cross-disciplinary research experience involving concepts and language of a discipline other than Statistics (e.g., Biology, Chemistry, or Engineering) and resulting in documentation of the student’s competence in the other discipline in a form of written reports and/or published papers. The Statistics Doctoral Committee shall determine the acceptability of the cross-disciplinary research experience.

5. Dissertation
Complete and defend the dissertation before the student's dissertation committee. This requires at least 15 hours of the following course:
STAT 7300 - Doctoral Dissertation Credits: 1 to 15 hours

Administration and Procedures
This program will be administered by the Statistics Doctoral Committee. This committee will be responsible for the scheduling, preparation, and grading of preliminary examinations in statistics and for arranging a thesis proposal defense. Furthermore, each year the Statistics Doctoral Committee will review the progress of all doctoral students in the Statistics program. Any student not making satisfactory progress may be dismissed from the program. Grades, performance on preliminary exams, the schedule of completed classes and exams, general progress towards completion of degree, as well as possible other criteria will be considered in this decision. As an example, course grades below a "B" are undesirable and could be grounds for dismissal.

A chronological progression of the program is as follows:

1. Upon entrance to the doctoral program in Statistics, students are expected to meet with the program director for help in planning the student’s program until he/she reaches the status of candidate (i.e. when both preliminary examinations are passed).

2. During the first semester of study, the student must complete a plan of study and have it approved by the Statistics Doctoral Committee. The determination of preliminary exams and research tools shall also be included. Students are responsible for updating the plan of study each year and submitting it to the Statistics Doctoral Committee as part of their annual review.

3. Students are expected to take preliminary exams at the first opportunity after the necessary course work is completed. Failure to do so will result in a failed attempt. Normally, these exams will be given at most once a year (typically in late May). Two failures on the same examination will result in dismissal from the program.

4. During the prior semester in which the student attains the status of candidate he/she will select a dissertation advisor and corresponding committee. The candidate and the dissertation advisor will select, with the approval of the Dissertation Committee, a research topic for the candidate. In each of the above situations final appointment is subject to the approval of the Department Chairperson and the Graduate College.

5. Upon selection of the dissertation advisor, committee, and topic, the candidate will prepare a written pre-proposal of the dissertation topic. It is expected that this pre-proposal will be completed and submitted to the dissertation advisor and committee no later than November of the ensuing Fall semester.
6. During the subsequent Spring semester, the candidate must also pass a Dissertation Proposal Defense, which is an oral presentation of a written thesis proposal to his/her Dissertation Committee. Both the pre-proposal and proposal defense typically take place during the first year after passing the preliminary examinations.

7. Following a successful dissertation proposal defense, the candidate is expected to finish his/her dissertation work and defend the dissertation some time during the following Fall semester. The ensuing Spring semester is typically devoted to final revisions and Graduate College approval of the dissertation. Once the Graduate College has approved the dissertation a student is allowed to graduate.
3. Students are expected to take preliminary exams at the first opportunity after the necessary
course work is completed. Failure to do so can result in a failed attempt. Normally, these
exams will be given at most once a year (typically in late May). Two failures on the same
examination will result in dismissal from the program.

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select a dissertation advisor and corresponding committee, with the approval of the Statistics
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Dissertation Committee. Both the pre-proposal and proposal defense typically takes place
during the end of the first year after passing all three preliminary examinations.

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his/her dissertation work and defend the dissertation some time during the following Fall
semester. The ensuing Spring semester is typically devoted to final revisions and Graduate
College approval of the dissertation. Once the Graduate College has approved the
dissertation a student is allowed to graduate.
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Doctor of Philosophy in Statistics

Advisors:
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Program Requirements
1. Departmental Graduate Examination in Statistics
Prior to admission or during the first year, students must pass the Departmental Graduate Examination (DGE) in Statistics at the doctoral level. This consists of two, three-hour exams in the areas of theoretical statistics (calculus-based mathematical statistics and probability) and applied statistics (regression, and design of experiments, and mixed models). At WMU, this exam material corresponds to the following courses: STAT 5620, 5650, 6600, 6620, and 6640. The DGE is given once a year, usually in May during the first week of the Summer I session. Should a student fail to pass either part of the DGE at the doctoral level, he/she may request a second attempt (usually given in August of the same summer) on the failed part(s) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam at the doctoral level, the student will be dismissed from the program. However, a student who is dismissed from the program for this reason may be allowed to continue in a different graduate program offered by the Department.

2. Acquire at Least 650 Hours of Course Work

Note: Students admitted to the program with a Masters Degree who have obtained graduate work in Statistics or a closely related field may possibly receive credit for as many as 320 of the 650 hours required.

Note: Up to six credit hours in approved areas related to statistical applications (e.g. computer science, computational or applied mathematics, engineering, biological science, management, or economics) may be substituted as electives upon approval of the Statistics Doctoral Committee.

Core Courses
- STAT 6500 - Statistical Theory I Credits: 4 hours
- STAT 6600 - Statistical Theory II Credits: 4 hours
- STAT 6620 - Applied Linear Models Credits: 3 hours
- STAT 6640 - Applied Mixed Models Design of Experiments I Credits: 3 hours
- STAT 6800 - SAS Programming Credits: 3 hours

Doctoral Preliminary Examination Courses
- STAT 6460 - Large Sample Theory Credits: 3 hours
- STAT 6610 - Multivariate Statistical Analysis Credits: 3 hours
- STAT 6630 - Linear Models Credits: 3 hours
- STAT 6650 - Advanced Statistical Inference Credits: 3 hours
STAT 6660 - Advanced Nonparametric Statistical Methods Credits: 3 hours

Course Electives at the 6000 Level
At least seven five 6000 level electives are required.
STAT 6040 - Statistics for Epidemiology Credits: 3 hours
STAT 6050 - Fundamentals of Clinical Trials Credits: 3 hours
STAT 6350 - Spatial Statistics Credits: 3 hours
STAT 6450 - Applied Bayesian Statistics Credits: 3 hours
STAT 6650 - Advanced Statistical Inference Credits: 3 hours
STAT 6670 - Introduction to Random Processes Credits: 3 hours
STAT 6680 - Categorical Data Analysis Credits: 3 hours
STAT 6690 - Studies in Probability and Statistics Credits: 3 hours
STAT 6810 - Survival Data Analysis Credits: 3 hours
STAT 6830 - Robust Statistical Analysis Credits: 3 hours
STAT 6880 - Statistical Research Tools Credits: 3 hours

Course Electives at the 5000 Level
No more than three 5000 level electives can be applied to the program of study.
STAT 5610 - Applied Multivariate Statistical Methods Credits: 3 hours
STAT 5630 - Sample Survey Methods Credits: 3 hours
STAT 5650 - Design of Experiments for Quality Improvement Credits: 3 hours
STAT 5660 - Nonparametric Statistical Methods Credits: 3 hours
STAT 5820 - Time Series Analysis Credits: 3 hours
STAT 5850 - Applied Data Mining Credits: 3 hours
STAT 5860 - Computer Based Data Analysis Credits: 3 hours

Notes:
The following courses may be substituted as electives upon approval of the Statistics Doctoral Committee.
STAT 6700 – Statistical Consulting Practicum Credits: 3 hours
STAT 6910 - Practicum in Statistical Consulting Credits: 1 hour
STAT 6990 – Reading and Research Credits: 3 hours

3. **Preliminary Examinations**

Students are expected to take preliminary exams at the first opportunity after the necessary course work is completed. A student must pass preliminary examinations in Multivariate/Linear Models (STAT 6610 and 6630) and in Statistical Asymptotic Inference (STAT 6460, 650 and 6660). The third exam is satisfied by completion of project reports in an area to be chosen, with the approval of the Statistics Doctoral Committee, from two 6000 level statistics courses. Should a student fail to pass either exam, he/she may request a second attempt (usually given in August of the same summer) upon petitioning the Statistics Doctoral Committee. The Statistics Doctoral Committee will then determine whether or not to grant the request. If the request is not granted or the request is granted, but the student fails on his/her second attempt to pass the exam at the doctoral level, the student will be dismissed from the program. However, a
student who is dismissed from the program for this reason may be allowed to continue in a different graduate program offered by the Department.

Two failures on the same examination will result in dismissal from the program. Students are expected to take the preliminary examinations as soon as they become eligible. Failure to do so will result in a failed attempt.

4. Demonstrate Competency in Two Research Tools.
In accordance with the requirements of the Graduate College, each student is required to attain competence in two research tools. Normally for students in Statistics these will consist of demonstrated competence in computer usage and/or a foreign language. Competence in computer usage can be demonstrated by obtaining a satisfactory grade in STAT 6800, STAT 6880 and/or equivalent statistics courses. Competence in a foreign language can be demonstrated by passing a reading course at the 4000-level in that language or by translating from a language other than English a statistical paper to the satisfaction of the Statistics Doctoral Committee. A third option for a research tool is a cross-disciplinary research experience involving concepts and language of a discipline other than Statistics (e.g., Biology, Chemistry, or Engineering) and resulting in documentation of the student's competence in the other discipline in a form of written reports and/or published papers. The Statistics Doctoral Committee shall determine the acceptability of the cross-disciplinary research experience.

5. Dissertation
Complete and defend the dissertation before the student's dissertation committee. This requires at least 125 hours of the following course:
STAT 7300 - Doctoral Dissertation Credits: 1 to 15 hours

Administration and Procedures
This program will be administered by the Statistics Department-Doctoral Committee. This committee will be responsible for the scheduling, preparation, and grading of preliminary examinations in statistics and for arranging a Thesis Proposal, Defense, and Defense. Furthermore, each year the Statistics Doctoral Committee will review the progress of all doctoral students in the Statistics program. Any student not making satisfactory progress may be dropped from the program. Grades, performance on preliminary exams, the schedule of completed classes and exams, general progress towards completion of degree, as well as possible other criteria will be considered in this decision. As an example, course grades below a "B" are undesirable and could be grounds for dismissal.

A chronological progression of the program is as follows:

1. Upon entrance to the doctoral program in Statistics, students are expected to meet with a Ph.D. advisor, the program director for help in planning the student's program until he/she reaches the status of candidate (i.e. when all three preliminary examinations are passed).
2. During the first semester of study, the student must complete a plan of study and have it approved by the Statistics Doctoral Committee. The selection determination of preliminary exams and research tools shall also be included. Students are responsible for updating the
plan of study each year and submitting it to the Statistics Doctoral Committee as part of their annual review.

3. Students are expected to take preliminary exams at the first opportunity after the necessary course work is completed. Failure to do so will result in a failed attempt. Normally, these exams will be given at most once a year (typically in late May). Two failures on the same examination will result in dismissal from the program.

4. During the prior semester in which the student attains the status of candidate he/she will select a dissertation advisor and corresponding committee, with the approval of the Statistics Doctoral Committee. The candidate and the dissertation advisor will select, with the approval of the Dissertation Committee, a research topic for the candidate. In each of the above situations final appointment is subject to the approval of the Department Chairperson and the Graduate College.

4.5 Upon selection of the dissertation advisor, committee, and topic, the candidate will prepare a written pre-proposal of the dissertation topic. It is expected that this pre-proposal will be completed and submitted to the dissertation advisor and committee no later than November of the ensuing Fall semester.

6. During the subsequent Spring semester, the candidate must also pass a Dissertation Proposal Defense, which is an oral presentation of a written thesis proposal to his/her Dissertation Committee. Both the pre-proposal and proposal defense typically takes place during the end of the first year after passing all three preliminary examinations.

5.7 Following a successful dissertation proposal defense, the candidate is expected to finish his/her dissertation work and defend the dissertation some time during the following Fall semester. The ensuing Spring semester is typically devoted to final revisions and Graduate College approval of the dissertation. Once the Graduate College has approved the dissertation a student is allowed to graduate.