Graduate Student Handbook

Department of Statistics

Western Michigan University

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Graduate Student Handbook

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1. INTRODUCTION

Overview of the Department

The Department of Statistics was created in 2001 when the Statistics Area Group separated from the Department of Mathematics and Statistics. The Department now has eight faculty members and the chair. The faculty are active in the areas of teaching, statistical and collaborative research, statistical consulting and service. At the undergraduate level the Department has a major in Statistics and two minors (Statistics and Applied Statistics). At the graduate level the department offers two graduate programs: a MS in Statistics and a PhD in Statistics. The Department offers numerous general education and service courses for both undergraduate and graduate students.

Mission Statement

The mission of the Department of Statistics is to provide quality education, conduct research and offer statistical support for data collection and analysis.

Vision Statement

Our undergraduate major is designed to teach students the basics of statistical theory and applications. As a result, graduates of this program should be able to complete routine statistical thinking, recognize appropriate statistical methods and to perform standard statistical analyses such as design of experiments and regression.

Our undergraduate minors are designed to provide students with enough statistical knowledge to apply standard statistical procedures to data generated in their major field of study and to understand statistical arguments appearing in the practice of their chosen field.

Our Masters of Science program is designed to give students the knowledge and ability to conduct advanced statistical analysis. Students gain a strong theoretical background which enables them to distinguish between standard and nonstandard situations, search statistical literature and apply appropriate statistical methods. The strongest graduates of this program are encouraged to enter into a statistics doctoral program.
Our Doctoral Program is designed to prepare students for theoretical as well as applied work in statistics. Students graduating from this program can distinguish standard from nonstandard statistical situations and apply the correct existing methodology or develop an approach to gain appropriate solutions. Approximately one-half of our graduates are employed in academia, the rest work in industry or government settings.

**Department Faculty**

Loren Heun - Faculty Specialist II  
Director for Business Statistics, STAT 2160

Joseph McKean (PhD Penn State U., 1975)  
Robust and nonparametric analyses; linear and multivariate models; propensity analysis and quasi-experimental design.

Joshua Naranjo (PhD Penn State U., 1989)  
Robust rank regression, regression effect, and diagnostics for procedure selection

Magdalena Niewiadomska-Bugaj (Mickiewicz U., 1987)  
Dependence analysis, classification, categorical data, meta-analysis, and methodology for zero-inflated data.

Rajib Paul (PhD Ohio State, 2008)  
Bayesian hierarchical models and diffusion based MCMC, spatial and spatio-temporal statistics, disease mapping and spatial survival analysis, applications in glacial dynamics, climate change issues, environmental health and epidemiology.

Gerald L. Sievers (PhD Iowa, 1967)  
Quality and productivity improvement, robust correlation methods, linear models.

Michael Stoline (PhD Iowa, 1967)  
Regulatory environmental statistics, design of experiments, spatial analysis.

Jeffrey Terpstra (PhD WMU, 1987)  
Nonparametric and robust statistics in the areas of time series analysis, order restricted inference, and ranked set sampling.

Jung-Chao Wang (PhD U. of Wisconsin, 1989)  
Design of experiments, quality and productivity improvement, statistical computing and graphics.

**Facilities**

The main office is located in 3304 Everett Tower. Faculty offices are all located on the fifth floor of Everett Tower. Magdalena Niewiadomska-Bugaj, Professor and Chair of the Department, is available by appointment. Cheryl Peters can answer many frequent questions; her office is 3303 Everett Tower or you contact by calling 269-387-1421 or by email at: cheryl.peters@wmich.edu.
The Department of Statistics at Western Michigan University houses the Statistical Consulting Center (SCC) in 3379 Rood Hall. The SCC is directed by Dr. Jeff Terpstra, Associate Professor. The SCC’s primary mission is to help faculty and staff at WMU in the broad areas of statistical design, data collection, data analysis, report writing and preparation of grant proposals. The SCC also assists graduate students in collaboration with the Graduate College. Additionally, the SCC works with local entities such as the Kalamazoo Center for Medical Studies, Bronson hospital and start up companies from the Biosciences Research & Commercialization Center like Innovative Analytics. Much of the work of the SCC is completed by doctoral students from the Department under the supervision of the director and/or a departmental faculty member.

The Statistical Computing Lab (SCL) in 3381 Rood Hall contains up-to-date computers which are networked to increase speed and functionality. This lab also serves as a wireless location for our students to access the internet on their personal laptops. This lab was designed to create a central location where our graduate students can work on class assignments and research projects.

2. MASTER OF SCIENCE DEGREE IN STATISTICS

Advisor: Dr. Joshua Naranjo  
5507 Everett Tower  
269 387-4548  
Email: Joshua.naranjo@wmich.edu

This program offers students a combination of knowledge of statistical techniques, experience with using these techniques in applied situations, and understanding of the theoretical principles behind these techniques. Students receive excellent training for professional employment in industry or government, while obtaining sufficient theoretical background to qualify them to teach elementary statistics or continue into a more advanced degree program. Students are encouraged to apply for internship experiences (STAT 7120) where it is expected that students will collaborate with professional statisticians in an actual work environment working with real data on existing problems.

Admission Requirements

Admission to the Masters program in statistics requires candidates have completed an undergraduate program containing a substantial amount of mathematics, including a complete calculus sequence through multivariate calculus, a course in probability, a course in statistical methods, and a course in linear algebra. A complete undergraduate mathematics major is not required.

Program Requirements

(i) Acquire at least 32 hours of approved courses from the following groups:

Required Courses

- STAT 5620 - Statistical Theory Credits: 4 hrs.
- STAT 6600 - Statistical Inference I Credits: 4 hrs.
• STAT 6620 - Applied Linear Models Credits: 3 hrs.
• STAT 6640 - Design of Experiments I Credits: 3 hrs.
• STAT 6800 - SAS Programming Credits: 3 hrs.

Elective Courses

• STAT 5610 - Applied Multivariate Statistical Methods Credits: 3 hrs.
• STAT 5630 - Sample Survey Methods Credits: 3 hrs.
• STAT 5650 - Design of Experiments for Quality Improvement Credits: 3 hrs.
• STAT 5660 - Nonparametric Statistical Methods Credits: 3 hrs.
• STAT 5820 - Time Series Analysis Credits: 3 hrs.
• STAT 6610 - Multivariate Statistical Analysis Credits: 3 hrs.
• STAT 6630 - Linear Models Credits: 3 hrs.
• STAT 6650 - Statistical Inference II Credits: 3 hrs.
• STAT 6660 - Nonparametric Statistical Theory Credits: 3 hrs.
• STAT 6670 - Introduction to Random Processes Credits: 3 hrs.
• STAT 6680 - Categorical Data Analysis Credits: 3 hrs.
• STAT 6690 - Studies in Probability and Statistics Credits: 3 hrs.
• STAT 6810 - Survival Data Analysis Credits: 3 hrs.
• STAT 6830 - Robust Statistical Analysis Credits: 3 hrs.
• STAT 6840 - Design of Experiments II Credits: 3 hrs.
• STAT 7120 - Professional Field Experience Credits: 2-12 hrs.

(ii) Pass the Department Graduate Exams (DGE) which cover material in:

• STAT 5620 - Statistical Theory Credits: 4 hrs.
• STAT 6600 - Statistical Inference I Credits: 4 hrs.
• STAT 6620 - Applied Linear Models Credits: 3 hrs.
• STAT 6640 - Design of Experiments I Credits: 3 hrs.

The DGE's are typically given on Thursday and Friday of the first week of Summer I. For the exact dates contact Dr. Naranjo or view the department website. Eligible students must register by the end of the Spring semester to take this departmental exam.

Students who have passed the Departmental Graduate Exams (DGE), with prior approval of advisor, may elect to complete an internship during one semester in their second year. Internships usually involve working for a firm under the supervision of a statistician. With advisors approval, the student can earn a maximum of three credit hours to count as an elective course. Students may seek internship opportunities independently or in cooperation with Statistics faculty members. Occasionally internships have become permanent job opportunities.

(iii) Incoming students are expected to meet with the graduate advisor to complete a Plan of Study before the end of their first semester. A tentative plan may be submitted online at http://www.stat.wmich.edu/naranjo/msstat/index.html.
Typical Program and Plan of Study

Students that receive funding from the department, are expected to complete their program within two academic years. A typical Plan of Study for a Masters degree in Applied Statistics is as follows:

**Year 1 - Fall Semester**
- STAT 5620 (Theory 1) 4 cr.
- STAT 6620 (Methods 1) 3 cr.

**Year 2 - Fall Semester**
- STAT 6800 (SAS) 3 cr.
- Elective 3 cr.

**Year 1 – Spring Semester**
- STAT 6600 (Theory 2) 4 cr.
- Elective 3 cr.

**Year 2 – Spring Semester**
- STAT 6620 (Methods 2) 3 cr.
- Elective 3 cr.
- Elective 3 cr.

**Year 1 - Summer Session I or II**
- Approved Elective 3 cr.

Total: 32 credit hours

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3. DOCTOR OF PHILOSOPHY IN STATISTICS

Advisors:  Dr. Joseph McKean  
5506 Everett Tower  
(269) 387-4541  
joseph.mckean@wmich.edu

Dr. Jeffrey Terpstra  
5505 Everett Tower  
(269) 387-0611  
jeffrey.terpstra@wmich.edu

The Doctor of Philosophy in Statistics is designed to prepare students for careers in teaching and research universities, industry or government. Students, through courses and other experiences, will develop facility in theoretical statistics and in several applied areas. Choices available in the electives area allow the program to be designed to suit a variety of career interests.

**Admission Requirements**

A student may enter this program with a Master’s degree or directly upon completion of a Bachelor’s program. The degree should be in Statistics or a closely related field. 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 students are expected to meet with an advisor who will assist with developing a plan of study until the student reaches the stage of candidate (i.e., when all preliminary exams are passed).
Program Requirements

(i) 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). At WMU, this exam material corresponds to the following courses: STAT 5620, 6600, 6620, and 6640. The DGE is given once a year, usually in May during the first week of the Summer I session.

(ii) Acquire at Least 60 Hours of Course Work - 30 credits must be earned at WMU.

Note: Students admitted to the program with a Masters degree in Statistics or a closely related field may receive credit for as many as 30 of the 60 required hours.

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 5620 - Statistical Theory Credits: 4 hrs.
- STAT 6600 - Statistical Inference I Credits: 4 hrs.
- STAT 6620 - Applied Linear Models Credits: 3 hrs.
- STAT 6640 - Design of Experiments I Credits: 3 hrs.
- STAT 6800 - SAS Programming Credits: 3 hrs.

Doctoral Preliminary Examination Courses

- STAT 6610 - Multivariate Statistical Analysis Credits: 3 hrs.
- STAT 6630 - Linear Models Credits: 3 hrs.
- STAT 6650 - Statistical Inference II Credits: 3 hrs.
- STAT 6660 - Nonparametric Statistical Theory Credits: 3 hrs.

Course Electives at the 6000 Level

- STAT 6670 - Introduction to Random Processes Credits: 3 hrs.
- STAT 6680 - Categorical Data Analysis Credits: 3 hrs.
- STAT 6690 - Studies in Probability and Statistics Credits: 3 hrs.
- STAT 6810 - Survival Data Analysis Credits: 3 hrs.
- STAT 6830 - Robust Statistical Analysis Credits: 3 hrs.
- STAT 6840 - Design of Experiments II Credits: 3 hrs.
- STAT 6850 - Applied Data Mining Credits: 3 hrs.
Note: A minimum of 21 hours must be 6000-level electives: STAT 6910, 6960 and/or 6990 may be substituted as electives with prior approval of the Statistics Doctoral Committee.

Course Electives at the 5000 Level

- STAT 5610 - Applied Multivariate Statistical Methods Credits: 3 hrs.
- STAT 5630 - Sample Survey Methods Credits: 3 hrs.
- STAT 5650 - Design of Experiments for Quality Improvement Credits: 3 hrs.
- STAT 5660 - Nonparametric Statistical Methods Credits: 3 hrs.
- STAT 5820 - Time Series Analysis Credits: 3 hrs.

Note: No more than 9 hours of 5000-level electives can be applied to the program of study.

(iii) Three Preliminary Examinations

A student must pass preliminary examinations in Multivariate/Linear Models (STAT 6610 and 6630) and in Statistical Inference (STAT 6650 and 6660). The third exam is satisfied by completion of project reports in an area to be chosen, with the approval of the Doctoral Committee, from two advanced statistics courses. 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 can result in a failed attempt.

(iv) Competency in Two Research Tools

In accordance with the requirements of the Graduate College, each student is required to attain competence in two approved research tools. Normally for students in Statistics these will consist of demonstrated competence in computer usage or a foreign language. Competence in computer usage can be demonstrated by obtaining a satisfactory grade in STAT 6800 or an equivalent statistics course. 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.

(v) 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: 15 hrs.
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 dropped from the program. Grades, performance on preliminary exams, the schedule of completed classes and exams, general progress towards completion of the 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 from our program or loss of department funding.

Chronological progression of the program:

1. Upon acceptance to the doctoral program in Statistics, students are expected to meet with a doctoral academic advisor annually for the purpose of developing and updating the student’s program of study until the student reaches the status of candidate.

2. During the first semester of study, the student must complete the on-line plan of study form and arrange to meet with their academic advisor for approval. Selection of preliminary exams and research tools should also be decided upon and noted on this form.

3. Students are required to take preliminary exams at the first opportunity after the necessary course work is completed. Failure to take the exam when scheduled will result in a failed attempt. Preliminary makeup exams are scheduled in August. Two failures, on the same preliminary examination, will result in dismissal from the program.

4. During the semester in which the student attains the status of candidate the student will meet with the doctoral committee to select a dissertation advisor. The candidate and dissertation advisor will select the dissertation committee which will assign an initial research topic for the candidate. In each of the above situations final appointment is subject to the approval of the Department Chairperson as well as The Graduate College.

5. A student must also pass a Dissertation Proposal Defense, which is an oral presentation of a thesis proposal to his/her Dissertation Committee. This normally takes place at the end of the first year after passing all three preliminary examinations.

4. ASSISTANTSHIPS, ASSOCIATESHIPS AND FELLOWSHIPS

The following appointments are available on a competitive basis for students in the Department of Statistics. Application may be made for more than one of the following. However, a student may hold only one appointment at a time.

University Fellowships are available from The Graduate College for outstanding students starting a Master’s degree program. Application forms, transcripts and letters of recommendation must be
submitted to The Graduate College by February 15. Students applying for a University Fellowship are also encouraged to apply for one or more of the appointments below. University Fellowships are not renewable. Please see the Graduate College’s website for more details.

**Graduate Assistantships** are available from the Department of Statistics. Application forms, transcripts and letters of recommendation should be submitted to the Department of Statistics by February 15. Applications submitted after that date will be considered for funding only if an unfilled position(s) remain. See departmental website for more details at [www.stat.wmich.edu](http://www.stat.wmich.edu).

**Associateships** are awarded only to doctoral students. Application forms, transcripts and letters of recommendation must be submitted to the Graduate Committee by February 15.

**Application Process**
The application process for admission to our graduate program is online. The teaching assistantship application is a separate form, but is also found online (see below).

1. Application for Admission: The Application for Admission to your desired Statistics Graduate Program (MS in Statistics or PhD in Statistics) is submitted to the Graduate College for US residents or Office of International Student and Scholar Services (OISS) for international students. US Residents apply at: [http://www.wmich.edu/grad/futurestudents.html](http://www.wmich.edu/grad/futurestudents.html)
   Int’l Students apply at: [http://www.wmich.edu/coe/cecp/admission/international.htm](http://www.wmich.edu/coe/cecp/admission/international.htm).

2. The Application for Teaching Assistantship is a separate application submitted directly to the Department of Statistics. Applicants must first submit the on-line application for admission to a graduate program. TA decisions for the Fall semester are made starting Feb. 15. Applications are accepted as late as August, if positions remain available. The form may be completed at: [Statistics Department Online TA Application](http://www.wmich.edu/statistics/taapplication).

**General Requirements**

1. Student must be admitted to a graduate program in our Department.
2. Student must satisfactorily complete a minimum of 6 approved credit hours each semester. Students awarded a University Fellowship must carry at least 9 credit hours each semester.
3. Student must maintain at least a 3.0 semester and overall GPA.
4. Student must complete all examinations and research requirements as outlined on their program of study.
5. Students on appointments must perform satisfactorily in their assigned teaching and assigned responsibilities.
6. Students on an appointment may not engage in employment outside the department without prior approval of the Chairperson and graduate committee. Non compliance will result in immediate termination of the current award.

**Renewal**
Contracts typically are awarded for the academic-year. Each February the graduate committee reviews new and current applicants. Applicants are ranked and available funding is awarded based on this ranking. Appointment renewal is merit based and the following minimal requirements must be met for consideration:
• The student has satisfactorily fulfilled the General Requirements outlined above. Please note: Auditing or withdrawing from a course will not count toward the 6 credit hours required. Incomplete grades only count once a grade is issued.

• The student will be supported for two years for the Masters level program. The maximum funding allowed is five years for the doctoral program.

Partial or single semester appointments will be made if appropriate. Students receiving these awards are expected to fulfill the same requirements as those with fulltime appointments.

Summer session appointments are awarded to students who held an appointment the preceding academic year. Positions are very limited. To receive a summer appointment a student must meet the same conditions as for a renewal appointment. If awarded, the student must complete at least 3 hours of approved credit.

You must officially apply to one of our graduate programs before your application will be considered for acceptance or funding.

Additional support

1. Graduate College Dissertation Completion Fellowships

The Graduate College offers Dissertation Completion Fellowships for up to two semesters and two summer sessions awarded in open competition and on the basis of superior scholarly achievement to assist full-time doctoral students with the completion of their dissertations. The Fellowship also pays the Fellow’s tuition for 1-6 hours per semester and 1-3 hours per session, depending on how many hours of 7300 the Fellow has yet to complete.

Fellowships typically begin in Summer II and extend through the following Summer I, although sometimes half-year fellowships (Summer II and Fall) are awarded. If the Fellow graduates during the fellowship year, the award terminates at graduation.

Please check the Graduate College website for the details.

2. Support for Travel and Research

Graduate students may apply for funds to support research projects or travel at the links below:

Research fund [www.wmich.edu/grad/funding/gradstudent_research_fund.html](http://www.wmich.edu/grad/funding/gradstudent_research_fund.html)

Travel fund [www.wmich.edu/grad/funding/gradstudent_travel_fund.html](http://www.wmich.edu/grad/funding/gradstudent_travel_fund.html)
5. GRADUATE STUDENT RESPONSIBILITIES AND DEPARTMENT EXPECTATIONS

(i) Minimum GPA for Good Academic Standing: All students pursuing a graduate program must maintain an overall GPA of at least 3.0. Students whose GPA drops below 3.0 are put on probation, and will lose their TA appointment and stipend for the next regular semester. If their GPA improves to 3.0 or better after one semester, then probation is removed, and TA appointments may be continued at the discretion of the Graduate Committee. See the end of this section for the Academic Standards from the WMU Graduate Catalog.

(ii) Satisfactory TA Performance: All graduate assistants (TA's and DA's) must perform satisfactorily in their assigned teaching, academic performance and participation in departmental functions such as colloquia and other activities which may be assigned. The Graduate Committee may withhold renewal of graduate appointments based on poor performance in teaching or other assignments.

(iii) All graduate students are expected to attend all colloquia of the Department of Statistics. Colloquium announcements will be posted on the Department website http://www.stat.wmich.edu. It is recommended that you make the website your browser homepage and that you read announcements regularly in order to facilitate communication regarding department activities and opportunities.

(iv) Each Fall the Graduate Committee will conduct an annual performance review for each student in our programs to assess the student’s progress toward the completion of their degree. One of many components in this review includes the students GPA for individual terms, in addition to overall GPA and departmental involvement.

Departmental Awards

**Teaching Assistant Excellence Award** – awarded at the end of the Spring semester to the teaching assistant who is ranked highest by departmental faculty.

**Highest DGE Result Award** – awarded at the beginning of the Fall semester to the student(s) earning the highest grades on the last DGE.

**ASA Membership Award** – awarded at the beginning of the Fall semester to all students who pass the DGE at least at the Master’s level.

**Colloquium Award** – awarded at the end of the Spring semester to the student(s) with best participation in departmental colloquia and functions.
6. APPENDIX

Academic Standards (from the WMU 2009-10 Graduate Catalog)

Notwithstanding the Academic Standards policy outlined below, a student admitted with Conditional Admission or Provisional Admission status must meet the specified performance level within the time frame identified in the letter of admission. Failure to maintain this timeline will result in removal from the program. Further, the Academic Standards policy inherently presumes the student will first meet satisfactorily any obligations or requirements specified in the letter of admission before the Academic Standards policy shall have any effect on the continuing enrollment of the student.

1. Good Standing: A graduate student admitted to a graduate degree or certificate program is in good standing whenever that student's degree or certificate program grade point average is at least 3.0.

2. Warning: Whenever the grade point average for any enrollment period is less than 3.0, but the degree program grade point average is 3.0 or above, the student will be warned.

3. Probation: If a student's degree program grade point average falls below 3.0, the student will be placed on probation.

4. Extended Probation: The student will be placed on Extended Probation when, following a semester on Probation, the student’s degree program grade point average is below 3.0 and the student’s grade point average for the enrollment period is 3.0 or above.

5. Final Probation: The student will be placed on Final Probation when, following a semester on Extended Probation, the student’s degree program grade point average is below 3.0 and the student’s grade point average for the enrollment period is 3.0 or above.

6. Probation Removed: When the conditions of Good Standing are restored, Probation will be removed.

7. Dismissal: Students on Probation or Extended Probation who fail to achieve at least a 3.0 grade point average for the enrollment period, or students on Final Probation who fail to achieve a 3.0 cumulative grade point average will be dismissed from the University. Dismissed students must apply for readmission through the normal admission process.

8. Appeal Procedure: Upon appeal by the student, the program or academic unit admission body will determine whether to grant Extended Probation or Final Probation status. The status must be granted by the program or academic unit admission body in order for the student to register. The appeal must be initiated and the decision made by the program or unit prior to the subsequent semester's last day to add classes.