

# PhD Handbook for School of Mathematical and Statistical Sciences (SoMSS)

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## 1 Introduction to SoMSS

The School of Mathematical and Statistical Sciences (SoMSS) in the College of Liberal Arts and Sciences (CLAS) at Arizona State University (ASU) offers advanced academic programs leading to the Doctor of Philosophy (PhD) degree. The PhD programs in SoMSS aim to prepare students for conducting independent research in mathematics while ensuring deep knowledge in the area of specialization and a breadth of knowledge in various areas of mathematics. The programs require core and elective coursework, qualifying courses or exams, a Comprehensive Exam, a prospectus proposal, a written dissertation, and an oral defense of the dissertation. The PhD degree

is offered to exceptional students who have completed a Bachelor's or Master's degree in mathematics, or a closely related field. SoMSS has four PhD programs:

- Mathematics
- Applied Mathematics
- Statistics
- Mathematics Education,

Sections 2 - 4 and section 6 apply to all programs whereas the specifics of each Ph.D. program are discussed in sections 5.2 - 5.5.

## 1.1 Who does what at SoMSS

**Parts of the administrative structure of SoMSS that are most relevant to PhD students:**

| Name              | Position                                 | Email                     | Phone         |
|-------------------|--|---------------------------|---------------|
| Al Boggess        | School Director                          | boggess@asu.edu           | (480)965-5892 |
| Dieter Armbruster | Associate Director for Graduate Programs | armbruster@asu.edu        | (480)965-3953 |
| Joelle Park       | Graduate Program coordinator             | jrpark4@asu.edu           | (480)965-3953 |
| Melissa Delgado   | Graduate Program coordinator             | melissa.l.delgado@asu.edu | (480)965-3953 |
| Beth Fiacco       | Travel funds                             | fiacco@asu.edu            | (480)965-0488 |
| Renate Mittelmann | Computers                                | renate@asu.edu            | (480)965-0096 |
| Jeff Luczak       | Coordinator                              | jeff.luczak@asu.edu       | (480)965-0210 |
| Katie Kolossa     | TA Training                              | kolossa@asu.edu           | (480)965-6437 |

## 2 Objective of the handbook

The purpose of this handbook is to provide guidance and information related to admission, degree requirements, and general policies and procedures. Please note that in some cases you will find differences between the Graduate College Policies and Procedures and the SoMSS program requirements. In these cases, SoMSS has established higher standards. Students must satisfy both sets of requirements. Please note that policies and procedures are

occasionally amended to improve the program. Changes will be communicated to students through email, which is our primary form of communication. We will also post any updates to this handbook on our website <http://math.asu.edu>.

### **3 Student responsibility**

All students are expected to become familiar with university and program policies and procedures and abide by the terms set forth. Information is available online. Most importantly you should visit the following websites:

- The Graduate College - <http://graduate.asu.edu>
- Graduate College Policies and Procedures - [https://graduate.asu.edu/sites/default/files/asu-graduate-policies-and-procedures\\_032019\\_0.pdf](https://graduate.asu.edu/sites/default/files/asu-graduate-policies-and-procedures_032019_0.pdf)
- The SoMSS Graduate Degree Programs - <https://math.asu.edu/degrees/grad>

### **4 Admission and eligibility**

Admission to a SoMSS PhD program requires a Bachelor's or Master's degree in math or a closely related field from an accredited institution. Students are encouraged to contact SoMSS Graduate Student Support [grad.math@asu.edu](mailto:grad.math@asu.edu) for more information.

#### **4.1 Eligibility**

Prior to applying to all SoMSS PhD programs, students are required to have taken courses in linear algebra (equivalent to ASU's MAT 342 or 343) and advanced calculus (equivalent to ASU's MAT 371).

#### **4.2 Application**

All students are required to submit an application and all required supporting materials with the Office of Graduate Admission and pay the required fee in order to have their application properly processed.

### 4.3 GRE scores

All students are required to submit official general Graduate Record Examination (GRE) scores directly to the Office of Graduate Admission. We do not require specific subject GRE scores. The ASU Institution code is 4007. If a department code is required use 000 for GRE.

### 4.4 English proficiency

The University requires all international applicants whose native language is not English to provide proof of English proficiency. The English language requirement cannot be waived. Acceptable proof is as follows (tests must not be older than two years):

- Test of English as a Foreign Language (TOEFL) score of at least 550 (PBT) or 80 (iBT). ASU's institutional code is 4007. ASU only accepts electronic copies of the TOEFL score report.
- International English Language Testing System (IELTS) overall band score of at least 6.5. No institutional code is needed.
- Pearson Test of English (PTE) score of at least 60.

### Exemption

You could qualify for an exemption from this requirement by one of the following two options:

1. You successfully complete the highest level at the Global Launch Intensive English Program with grades of B or better  
OR
2. You have attended in person a regionally accredited college or university in the United States and meet one of the following conditions:
  - earned a Bachelor's degree or higher in residence from a regionally accredited college/university in the US (Official Transcripts Required), OR

- completed at least 12 credit hours of graduate course work with a cumulative GPA of 3.00 on a 4.00 scale or higher from a regionally accredited college/university in the US (Official Transcripts required)  
OR
- completed at least 90 credit hours of undergraduate course work with a cumulative GPA of 3.00 on a 4.00 scale or higher from a regionally accredited college/university in the US (Official Transcripts required)  
OR
- completed the American English and Culture Program (ACEP) Advanced Level II with grades of ‘B’ or better along with the recommendation of the Director of AECP.

SoMSS requires all students whose native language is not English and who wish to apply for teaching assistantships to pass an examination that certifies their skill in speaking English—either the Interview Test, or the Speaking Proficiency English Assessment Kit (SPEAK) test. Tests are administered at ASU; additional information may be found at <https://global.asu.edu/aecp/ita>.

Non-native English speakers that graduated from a US High School are exempt from this examination.

For anyone applying for support as a TA by the School of Mathematical and Statistical Sciences, a minimum Test of English as a Foreign Language (TOEFL) score of 100 (IBT) is required.

## 4.5 Personal statement

The application must include a personal statement of no more than two pages. The statement should: 1) explain professional goals and reasons for desiring to enroll in the Ph.D. program; 2) describe any research experiences; 3) indicate personal research interests; and 4) if possible, identify one or more ASU SoMSS faculty with matching research interests.

## 4.6 Letters of recommendation

SoMSS requires three (3) letters of recommendation, at least one of which must come from a former professor of the applicant. There is no standard

form for letters of recommendation. Our current application process allows students to submit the letters of recommendation electronically by indicating the names and the emails of the recommender. In turn, the Office of Graduate Admission sends an email to the recommender alerting him or her to go online and submit a recommendation. Students are encouraged to get letters from people who know them well, such as teachers, professional associates and supervisors, and should ask the recommenders to comment on the student's academic, emotional, intellectual and professional development.

#### **4.7 GPA requirement**

Students applying directly from an undergraduate program must have a minimum GPA of 3.0 (on a 4.0 scale) overall and in Mathematics courses. Students who are applying following a Master's degree must have a minimum GPA of 3.0 for the last degree awarded.

#### **4.8 Writing sample (only for Mathematics Education Ph.D)**

The Mathematics Education Ph.D. program requires a 10-page minimum writing sample. This requirement does not apply to any other SoMSS Ph.D. program.

#### **4.9 Transcripts**

Official transcripts of all prior University and College coursework are required.

#### **4.10 Application evaluation**

Several factors are taken into consideration when evaluating an application: cumulative GPA, major, institution, personal statement, letters of recommendation, standardized test scores, official transcripts, and performance in advanced math courses and (if applicable) the quality of the provided writing sample.



## 4.11 Notice of admission

SoMSS submits its recommendation of admission to the Office of Graduate Admission and the final decision is delivered in writing by the Office of Graduate Admission. Students may check their application status on MyASU (<https://webapp4.asu.edu/myasu/>).

Before starting a PhD program, each student is assigned a Mentor (who need not be the student's eventual Dissertation Advisor). The student should meet immediately with the mentor, and continue to meet regularly each semester, for advice concerning courses or other program requirements. When the student chooses a Dissertation Advisor, there is no longer a need for a separate mentor. Throughout this handbook, both the mentor and the dissertation advisor will sometimes be referred to as the "advisor".

## 4.12 Pre-admission credits and transfer credit

Credit for course work taken from an accredited institution can be awarded in the following situations:

1. A student who has earned a Master's degree in Mathematics or related fields at another accredited institution can receive a blanket transfer of thirty credit hours.
2. 0-12 credit hours of graduate-level courses can be transferred. Those courses must come from a program that did not lead to a completed degree. I.e. they cannot come from a completed Master program nor from an Undergraduate degree. Such pre-admission credits must have been taken within three years of admission to the ASU degree program to be accepted.
3. ASU (only) Undergraduate students can transfer up to 12 hours of graduate classes, if they have been reserved for graduate studies and have not been counted for the Undergraduate degree.
4. The equivalent of a grade of B (at ASU) or higher should have been earned on every transferred course. A course with a grade of 'Pass', 'Credit', or 'Satisfactory' is not acceptable for transfer.

A student who wishes to transfer credits from another institution should contact the SoMSS graduate coordinator to initiate the transfer credit process.

### 4.13 Transfer between programs

Students who want to change programs within SoMSS, from a Masters to a Ph.D., from a Ph.D. to a Masters or from one Ph.D. program specialization to another should talk to a Graduate Program coordinator. They must submit a new application with the Graduate College. Admission to the new program can be denied. Such transfers should be requested early in the program since in general a student is allowed to use only twelve credits from the original program in the new program.

## 5 Doctoral degree requirements

### 5.1 Overview

The SoMSS PhD programs aim to prepare students to conduct independent research while ensuring deep knowledge in the area of specialization and a breadth of knowledge in pure mathematics, applied mathematics, statistics, or mathematics education. To achieve its aim, the PhD programs have multiple requirements. This section outlines the requirements as well as the procedures that need to be followed to satisfy these requirements.

Degree requirements for a PhD include a minimum of 84 semester hours beyond the Bachelor's degree and deficiency courses. Thirty credit hours taken during the Master's degree can be applied to a PhD degree, provided that coursework is approved as applicable to the doctoral degree.

In consultation with his or her advisor, the student must submit a plan of study (iPOS) in the second year of his/her degree program. The iPOS must be approved by the student's advisor, the SoMSS Graduate Associate Director, and the Graduate College.

A student at any time has to make *Satisfactory Academic Progress*, as defined on page 11 of the Graduate Policies and Procedures Manual. In particular the iPOS GPA, the Cumulative ASU GPA and the Overall Graduate GPA must be at least 3.0 (on a four point scale with A=4.0).

SoMSS has four PhD programs:

- Mathematics
- Applied Mathematics

- Statistics
- Mathematics Education

which will be described separately in the following subsections.

## 5.2 Mathematics Ph.D Program

The Mathematics PhD program has four distinct groups of specialization:

- Analysis
- Discrete Math
- Geometry/Topology
- Number Theory,

which have mostly the same program requirements, except for minor variations in the way that exams are run (see below).

The Mathematics PhD program has five major milestones:

1. Qualifying exams
2. Plan of study
3. Comprehensive exam
4. Dissertation prospectus
5. Dissertation defense,

which are described in the following subsections.

### **Sample timetable for Mathematics PhD students:**

- Year 1
- Prepare for qualifiers. Pass both qualifiers by May of year 1.
  - Start search for a dissertation advisor.
- Year 2
- Choose a dissertation advisor in semester 3 if this has not been done already.
  - Choose four more dissertation committee members.
  - Plan your Comprehensive Exam.
- Year 3
- File a program of study in semester 5 if this has not been done already. This must be done before taking the Comprehensive Exam.
  - Pass the Comprehensive Exam.
  - Choose a dissertation topic.

- Pass the dissertation prospectus.
- Year 4
- Do dissertation research.
- Year 5
- Finish research and write dissertation.
  - Defend dissertation by end of semester 10.

### 5.2.1 Additional admission requirements

The general admission requirements outlined in section 4 apply. Additional eligibility requirements include competitiveness in an applicant pool as evidenced by coursework in linear algebra (equivalent to ASU course MAT 342 or MAT 343) and advanced calculus (equivalent to ASU course MAT 371).

### 5.2.2 Course requirements

The required courses are determined by the path that a student takes to pass the Qualifying Exam (see next section) and the Comprehensive Exams 5.5.5.

### 5.2.3 Qualifying Exams

Mathematics PhD students must have passed two Qualifying Exams by the end of the second year. Each exam is based upon a 2-semester sequence of courses, taken in the first year, in a fundamental area of graduate-level math.

The qualifier sequences go together with the four groups, and there is some variation in the policies for the four Qualifying Exams:

**Analysis:** The exam is on Real Analysis, consists of a single 4-hour exam on MAT 570–571, and is given in May and August.

**Discrete Mathematics:** The exam is on Combinatorics and Graph Theory, consists of two 3-hour parts, with the first part on MAT 512 given in January, the second part on MAT 513 given in May, and both parts given in August.

**Geometry/Topology:** The exam is on Geometry and Topology, consists of a single 4-hour exam on MAT 501–502, and is given in May and August.

**Number Theory:** The exam is on Abstract Algebra, consists of two 3-hour parts, the first part on MAT 543 and the second part on MAT 544, and is given in May and August. Both parts have to be taken in the same exam session.

It is possible to take a Qualifying Exam without registering for the course.

The Qualifying Exams are normally taken in May of the first year of the program (preceded by a part in January for Discrete Mathematics), and a student who does not pass the exams by this time is placed on probation. While on probation, the student may retake the exams in August at the start of the second year, and then one more time in May (preceded by a part in January for Discrete Mathematics) of the second year. If a student has not passed the Qualifying Exams by May of the second year, SoMSS will recommend that the student be dismissed from the PhD program.

In preparation for each Qualifying Exam, the Graduate Associate Director will appoint a Qualifying Exam committee, normally consisting of two or three faculty and chaired by the faculty who taught the qualifying sequence most recently. The exam committee writes an exam following the syllabus on file with the SoMSS graduate office. Each exam committee member grades the whole exam, then the exam committee meets to determine the result, which can be PhD Pass, Master's Pass, or Fail.

Every Mathematics PhD student must get a PhD Pass on the Qualifying Exam. If an exam is broken into two parts, there is a separate result for each part, and then the student must get a PhD pass on both parts.

The chair of the exam committee communicates the result to the Graduate Associate Director. The results are subject to approval by the SoMSS graduate committee.

If an exam is broken into two parts, a student who gets a Phd Pass on one part but not on the other only needs to retake one part.

#### **5.2.4 Plan of study**

In consultation with his or her advisor, the student must submit a plan of study (iPOS) in the second year of his/her degree program. The iPOS must be approved by the student's advisor, the SoMSS Graduate Associate Director, and the Graduate College.

The iPOS is a record that shows the breadth and depth of a student's study. Once a student and the advisor agree on the courses relevant for this

goal and have listed them, the only other requirement for the iPOS is to have 12 hours of dissertation credit (MAT 799) after the prospectus. A seminar may be taken for 3 credit hours, provided that the student gives at least one lecture. To make up any discrepancy between the total hours and the required 84 credit hours, research credits may be used. All PhD students must attend 75% of the Colloquium/Distinguished Lecture Series for four semesters.

Students need not list every course or credit on an iPOS. In particular, an iPOS may list only one 3-credit seminar (and no 1-credit seminars).

### **5.2.5 Comprehensive Exam**

Students must pass a written Comprehensive Exam before the beginning of the fourth year. By passing the Comprehensive Exam, the student demonstrates mastery of the knowledge required to conduct research in his or her specialization area.

- The Comprehensive Exam is based upon material that includes the content of at least two 500-level courses, chosen with the advice of the student's dissertation committee. In particular, the student must choose a dissertation advisor and four other dissertation committee members before scheduling the Comprehensive Exam.
- The courses must be beyond the level of the qualifier courses. The topics on the exam should be relevant to the student's dissertation research area.
- The exam is usually given in one sitting, graded as a single unit. The length of the exam is four hours, two for each of the courses.
- An exam will be scheduled by the student and the student's advisor. The scheduling of the exam must be approved by the graduate committee at least 2 months before the exam is taken.
- A detailed syllabus for the exam will be made available at least 2 months before the exam is taken. The syllabus must be approved by the dissertation committee and the graduate committee.
- The exam is written and graded by a committee consisting of at least two faculty.

- The faculty writing the exam will not have to be present at the time of the exam but must be available by Skype or email to answer questions.
- At least one of the courses should be a MAT course that is either in the catalog or a special topics course that is regularly offered. The second course could be, for example, a reading course based on material relevant for the student's research.
- Although the Comprehensive Exam can be taken any semester following the one during which the Qualifying Exam is passed, the student must attempt the Comprehensive Exam during the third year, and must pass it before the beginning of the fourth year. If the student does not pass it on the first try, one retake is allowed, no sooner than three months after the first attempt. The retake is normally on the complete exam. If the Comprehensive Exam is not passed by the beginning of the fourth year, the student is dismissed from the PhD program.
- Special cases are subject to the approval of the graduate committee.

In preparation for Comprehensive Exam, the Graduate Associate Director will appoint a Comprehensive Exam committee, normally consisting of two or three faculty and chaired by the dissertation advisor. The exam committee writes an exam following an approved syllabus on file with the SoMSS graduate office. Each exam committee member grades the exam, then the exam committee meets to determine the result, which can be Pass or Fail. If an exam is broken into two parts, there is a separate result for each part, and then the student must get a pass on both parts. The chair of the exam committee communicates the result to the Graduate Associate Director. The results are subject to approval by the graduate committee.

### **5.2.6 The dissertation committee**

Since the Comprehensive Exam must be approved by the dissertation committee, before scheduling the exam the student must choose a dissertation advisor and four other members of a dissertation committee. The dissertation advisor is chosen first, and then the other committee members are chosen in consultation with the dissertation advisor.

The dissertation advisor must have the right to chair Mathematics PhD committees, and will serve as the chair of the dissertation committee. The list



of faculty with the right to chair can be found on Graduate College's faculty website: <https://graduateapps.asu.edu/graduate-faculty/degree/G9>.

Membership in the SoMSS dissertation committee is a privilege that is extended to tenure track faculty members of ASU as well as to other individuals as described in the following membership rules.

**Members:** A Mathematics PhD dissertation committee must have at least 5 members.

**SoMSS Graduate Faculty members:** Members of the Graduate Faculty can serve on a Mathematics PhD dissertation committee. This includes both tenure track faculty from other units as well as other faculty (research faculty for example) who are members of the SoMSS Graduate Faculty.

**Co-Chair:** For a faculty member to serve as co-chair of a Mathematics PhD supervising committee, the faculty member must be a member of the SoMSS Graduate Faculty with right to Co-Chair or be approved by the SoMSS Graduate Associate Director.

**External members:** Individuals who are not affiliated with ASU can serve on a SoMSS PhD supervising committee subject to approval by the SoMSS Graduate Associate Director.

See Appendix A for Absent Committee Member Procedures.

### 5.2.7 Dissertation prospectus

Students must pass a dissertation prospectus exam by the end of the 8th semester. While the Comprehensive Exam shows that the student has the necessary knowledge to conduct research in a specialization area, the dissertation prospectus demonstrates mastery of the methods needed to identify, formulate, and plan research.

The dissertation prospectus must contain:

1. A statement of the proposed research and why it is important.
2. An overview of the relevant literature.
3. A description of the student's competence to conduct the proposed research.

4. Any evidence of initial results in the scope of the dissertation research.
5. A discussion of how the research will be approached.
6. A projected time-table and outline of the dissertation.

The dissertation prospectus has two components: written and oral. It is the student's responsibility to schedule the oral exam, and the student must distribute the written prospectus to the dissertation committee at least one week prior to the oral exam. The dissertation advisor may require the student to distribute the prospectus two weeks in advance, giving the advisor an opportunity to collect questions from the dissertation committee, which are then given to the student one week before the prospectus exam; in this case the committee is of course still free to ask other questions at the exam. During the oral exam, the student first presents the prospectus, after which the dissertation committee questions the student orally.

Although the dissertation prospectus can be taken any semester following the one during which the Comprehensive Exam is passed, the student must attempt the prospectus by the 7th semester, and must pass it by May of the 8th semester.

If the dissertation committee deems the student's dissertation prospectus to be unsatisfactory, the student may request one more opportunity to submit a dissertation prospectus. Failure of the dissertation prospectus is considered final unless the dissertation committee, the head of the academic unit recommend, and the Dean of the Graduate College approve a second attempt. If a petition is approved, the student must submit the new prospectus within six months after the first dissertation prospectus oral exam was held. If the academic unit does not grant the student a second attempt, or if the student fails to pass the second attempt, the Graduate College may dismiss the student from the degree program.

See Appendix A for Absent Committee Member Procedures.

### **5.2.8 Dissertation defense**

The dissertation is the culmination of the doctoral program. By writing and defending a dissertation the student demonstrates readiness to conduct independent research in a specialization area.

There will be a public oral defense following the completion of the dissertation. It is the student's responsibility to schedule the dissertation defense,

and the student must distribute the dissertation to the dissertation committee and to an external reviewer at least four weeks prior to the defense. The reviewer is determined by the chair of the Ph.D. committee in consultation with the Graduate Director. The chair of the committee informs the Ph.D. committee.

During the defense, the student first presents the dissertation, after which the dissertation committee questions the student orally. When this questioning is finished, the student is excused from the room, and the committee discusses the dissertation and the student's performance on the defense, and determines the result, which can be Pass, Pass with minor revision, Pass with major revision, or Fail. If the result is pass with revision, the student has one year to present the final approved document, maintaining continuous enrollment. If the result is fail, the student may request one more opportunity to submit a dissertation and pass the defense. The student must wait until the next semester or summer session before making the second and final attempt, and the student must make this second attempt within one year after the first attempt.

See Appendix A for Absent Committee Member Procedures.

### 5.3 Applied Mathematics

The Applied Math PhD program has five major milestones:

1. Core Courses
2. Plan of study
3. Comprehensive exam
4. Dissertation prospectus
5. Dissertation defense,

which are described in the following subsections.

#### **Sample timetable for Applied Mathematics PhD students:**

- Year 1
- Take all six core courses.
  - Start search for a dissertation advisor.
- Year 2
- Choose a dissertation advisor in semester 3 if this has not been done already.
  - Choose four more dissertation committee members.
  - File an iPOS.
  - Take your Comprehensive Exam.
- Year 3
- Finish coursework
  - Choose a dissertation topic.
  - Pass the dissertation prospectus.
- Year 4
- Do dissertation research.
- Year 5
- Finish research and write dissertation.
  - Defend dissertation by end of semester 10.

### **5.3.1 Additional admission requirements**

The general admission requirements outlined in section 4 apply. Additional eligibility requirements include:

- be competitive in an applicant pool as evidenced by coursework in linear algebra (equivalent to ASU course MAT 342 or MAT 343) and advanced calculus (equivalent to ASU course MAT 371);
- have scientific programming skills (desirable).

### **5.3.2 Course requirements**

The following six applied math (APM) courses are considered core courses. It is strongly recommended that all six courses be taken. Odd (even) numbered courses will always be offered in Fall (Spring) semesters. Students should plan to take them in their first year.

- APM 501 Differential Equations I - ordinary differential equations
- APM 502 Differential Equations II - partial differential equations
- APM 503 Applied Analysis
- APM 504 Applied Probability
- APM 505 Applied and Numerical Linear Algebra
- APM 506 Scientific Computing

Students may be given a second year to complete this coursework with approval from the director of graduate studies.

### **5.3.3 Qualifying Exams**

Completion of five of the six core courses with an overall GPA of 3.33 and no grade less than B- serves in place of Qualifying Exams for the degree.

### **5.3.4 Plan of study**

See the description of the iPOS in Subsection 5.2.4.

### 5.3.5 Comprehensive Exam

Students must pass a written Comprehensive Exam before the beginning of the fourth year. By passing the Comprehensive Exam, the student demonstrates mastery of the knowledge required to conduct research in his or her specialization area.

- The written Comprehensive Exam is based upon material that includes the content of at least two 500-level courses, chosen with the advice of the student's thesis committee. In particular, the student must choose a thesis advisor and two other thesis committee members before scheduling the exam.
- The courses must be beyond the level of the qualifier courses. The exam topics should be relevant to the student's thesis research area.
- The exams will be given during the Finals week of the Spring semester and one week before the start of the Fall semester in August. A student should attempt the exam by the beginning of the 5th semester, typically in August and must have passed the exam by the end of the 6th semester (May).
- A detailed syllabus for the exam will be made available at least 2 months before the exam is taken. The syllabus must be approved by the thesis committee and the Graduate Committee.
- The exam is written and graded by a committee appointed by the Graduate Associate Director and consisting of at least two faculty members.
- The exam is given in one sitting.
- The exam committee meets to determine the result, which can be Pass or Fail and communicates the result to the Graduate Associate Director. The results are subject to approval by the graduate committee.
- The faculty writing the exam will not have to be present at the time of the exam but will have to be available by Skype or email to answer questions.
- Special cases are subject to the approval of the grad committee.

### **5.3.6 The dissertation committee**

The rules presented for the Mathematics Ph.D in section 5.2.6 apply, *mutatis mutandis*, to the Applied Mathematics Ph.D program. The list of faculty with the right to chair an Applied Mathematics Ph.D committee can be found [here](#).

### **5.3.7 Dissertation prospectus**

The rules presented for the Mathematics Ph.D in section 5.2.7 apply.

### **5.3.8 Dissertation defense**

The rules presented for the Mathematics Ph.D in section 5.2.8 apply.

## 5.4 Statistics

Milestones in the Statistics PhD program consist of

1. Required courses
2. Qualifying exam
3. Plan of study
4. Comprehensive exam
5. Dissertation prospectus
6. Dissertation defense

Details are provided in the next subsections.

### **Sample timetable for Statistics PhD students:**

- Year 1
- Take required courses STP 501, 502, 530 and 531, plus electives
  - Take the qualifier exam in May
  - Learn about research interests of faculty
- Year 2
- Take required courses STP 526, 527 and APM 503/504 or MAT 570/571, plus electives
  - Choose a dissertation advisor
  - Choose a comprehensive exam chair and committee
  - Write a comprehensive exam proposal
- Year 3
- File a program of study; this should be done before taking the comprehensive exam
  - Finish course work
  - Pass the comprehensive exam in the fifth semester
  - Select a dissertation topic and committee
  - Pass the dissertation prospectus
- Year 4
- Do dissertation research
- Year 5
- Finish research and write dissertation
  - Defend dissertation by end of semester 10



### 5.4.1 Additional admission requirements

The general admission requirements outlined in section 4 apply. Additional eligibility requirements include: Completion of the following courses is required (ASU equivalents in parentheses). Applicants who lack any of these prerequisite courses must normally complete the prerequisites before being considered for admission.

- calculus (MAT 270, 271 and 272)
- an upper-level proof-oriented calculus course (MAT 371)
- linear algebra (MAT 342 or MAT 343)
- computer programming (CSE 100)
- introductory applied statistics (STP 420)

### 5.4.2 Course requirements

The required courses are as follows:

- STP 501: Theory of Statistics I: Distribution Theory
- STP 502: Theory of Statistics II: Inference
- STP 526: Theory of Statistical Linear Models
- STP 527: Statistical Large Sample Theory
- STP 530: Applied Regression Analysis
- STP 531: Applied Analysis of Variance
- Either the sequence APM 503: Applied Analysis and APM 504: Applied Probability and Stochastic Processes, or the sequence MAT 570: Real Analysis I and MAT 571: Real Analysis II

### 5.4.3 Qualifying Exams

PhD students in Statistics must earn a PhD Pass on a qualifying exam that is based on the courses STP 501 and STP 502. This exam is offered twice a year, once in May, approximately 1 or 2 weeks after final exams for the spring semester, and once in January, just before the beginning of the spring semester. Precise dates are announced ahead of time.

To make satisfactory progress, students must take this exam in May of their first year. A student who does not receive a PhD Pass on the first attempt can retake the exam in January of their second year. If the second attempt also does not result in a PhD Pass, SoMSS will recommend that the student be dismissed from the PhD program. A student can appeal such a decision, and, if successful, can be given the opportunity to take the exam a third time in May of the second year.

At each offering, the exams are graded by two selected faculty members. Recommendations for the outcome (PhD Pass, MS Pass, or Fail) are made by the members of an appointed Statistics Examination Committee. After an opportunity for discussion, the entire statistics faculty votes to decide the outcome. In order for a student to earn a PhD Pass, more than 50% of the votes must be in favor of that outcome. If this criterion is not met, but more than 50% of the votes are in favor of a PhD Pass or MS Pass, then the outcome is an MS Pass. If this criterion is also not met, then the outcome is a Fail.

While a PhD student must earn a PhD Pass, an MS Pass can have value towards a Statistics Masters in Passing (MIP) provided that other requirements for the Statistics MS degree are met.

### 5.4.4 Plan of study

The description for the iPOS in Section 5.2.4 applies also for Statistics PhD students, but with the following changes:

- The iPOS can be submitted early in a student's third year rather than in year two.
- Students take STP 799 rather than MAT 799 for dissertation credit.
- No seminar credit hours are offered.

- Concerning the requirement for the Colloquium/Distinguished Lecture Series, Statistics PhD students are allowed to replace this by attending 75% of the Statistics Seminar Series for four semesters.

#### 5.4.5 Comprehensive Exam

The PhD program in Statistics seeks to train students as independent researchers and practitioners in statistics. The first stage of the program is to impart a foundation in the classical theory and practice of statistics including the qualifier exam over such material. The comprehensive exam is a transition point towards increased independence for the students. A student is expected to examine current trends in a specific area of statistics and to present in both written and oral forms a succinct summary and analysis of specific academic works as well as a plan on how this research could be extended in meaningful ways. This exercise is meant to move the student's training from foundational coursework to research that will be expected for the dissertation prospectus and dissertation research.

All statistics PhD students must pass the statistics comprehensive exam. Students should start preparing for this exam during the fourth semester in the program, and complete the oral exam during their fifth semester. They must have selected a Comprehensive Exam Committee (CEC) chair (or chairs) and CEC members before taking the exam. The CEC should consist of at least three members, including the chair(s). Typically, the members of the CEC will be a subset of faculty that will eventually be members of the student's Dissertation Committee.

The following list provides details about the comprehensive exam:

- The exam consists of both a written and oral part. The CEC is to be established during the student's fourth semester, and the exam is to be taken during the fifth semester.
- The outcome of the exam is Pass, Conditional Pass, or Fail.
- A student who fails the exam has an opportunity to retake the exam. Both the written and oral part must be retaken by the end of the sixth semester. The second attempt can be on the same topic as the first attempt.
- The CEC can give a conditional pass with a stipulation of the condition. For example, the CEC could stipulate that the student retake the oral

part of the exam. Any such conditions must be resolved before the end of the sixth semester.

- In order to take the exam, a student is required to first obtain a PhD pass on the STP qualifying exam and complete the required coursework. These requirements should be completed before the oral exam can be scheduled. However, since preparations for the exam must start during the fourth semester, a student will typically not have completed all of the courses at that time.

A summary of the exam process can be found in Appendix B

#### **5.4.6 The dissertation committee**

All of the Dissertation Committee policies as expressed in Section 5.2.6 apply also for the Statistics PhD program, with the exception that the Comprehensive Examination Committee (CEC) rather than the Dissertation Committee (DC) is in charge of the Comprehensive Exam. Typically, the chair of the CEC will also become the chair of the DC, while members of the CEC will also become members of the DC.

The list of faculty with the right to chair a Statistics PhD committee can be found here.

#### **5.4.7 Dissertation prospectus**

The rules presented for the Pure Math PhD in Section 5.2.7 apply.

#### **5.4.8 Dissertation defense**

The rules presented for the Pure Math Ph.D in Section 5.2.8 apply, except that there is no requirement for an “external reviewer”.

## 5.5 Mathematics Education

The Mathematics Education PhD program has five major milestones:

1. Core Courses
2. Plan of study
3. Comprehensive exam
4. Dissertation prospectus
5. Dissertation defense,

which are described in the following subsections.

### Sample timetable for Mathematics Education PhD students:

- Year 1
- Research in Undergraduate Mathematics Education (RUME) I and II (Qualifying exam courses).
  - Start to take four graduate level courses from mathematics, applied mathematics, or statistics (Qualifying exam courses).
  - Start search for a dissertation advisor.
- Year 2
- RUME III and IV
  - Choose a dissertation advisor in semester 3 if this has not been done already.
  - Choose four more dissertation committee members.
  - File an iPOS.
  - Start taking electives from mathematics, cognitive science, psychology, educational technology, philosophy, research, etc. (12-15 hours)
- Year 3
- Finish coursework and start research
  - Choose a dissertation topic.
- Year 4
- Pass Comprehensive Exam
  - Pass Prospectus Exam
  - Do dissertation research.
- Year 5
- Finish research and write dissertation.
  - Defend dissertation by end of semester 10.

### 5.5.1 Additional admission requirements

The general admission requirements outlined in section 4 apply. Additional eligibility requirements include:

- be competitive in an applicant pool as evidenced by the required GRE scores - 700 quantitative (155 on new scale) and 500 verbal (153 on new scale).

### 5.5.2 Course requirements

Students are required to complete a sequence of four courses over two years in Mathematics Education: Research in Undergraduate Mathematics Education (RUME) I and II and III and IV. In addition, students take four graduate level courses from mathematics, applied mathematics, or statistics. Acceptable graduate level mathematics courses are

- Applied Mathematics
  - APM 501 Differential Equations I, ODE
  - APM 502 Differential Equations II, PDE
  - APM 503 Applied Analysis
  - APM 504 Applied Probability
  - APM 505 Applied and Numerical Linear Algebra
  - APM 506 Scientific Computing
- Mathematics
  - MAT 512 Discrete Mathematics I
  - MAT 513 Discrete Mathematics II
  - MAT 516 Graph Theory I
  - MAT 517 Graph Theory II
  - MAT 543 Algebra I
  - MAT 544 Algebra II
  - MAT 570 Real Analysis I
  - MAT 571 Real Analysis II
- Statistics
  - STP 501 Theory of Statistics 1
  - STP 502 Theory of Statistics 2
  - STP 525 Advanced Probability
  - STP 526 Theory of Statistical Linear Models

- STP 527 Statistical Large Sample Theory
- STP 530 Applied Regression Analysis
- STP 531 Applied Analysis of Variance
- STP 532 Applied Nonparametric Statistics
- STP 533 Applied Multivariable Analysis
- STP 535 Applied Sampling Methodology

Four to five graduate-level (500 and above) elective courses from mathematics, cognitive science, psychology, educational technology, philosophy, research, etc. should be taken as approved by the advisor. All PhD graduate students should sign up for at least 3 hours of seminars (MTE 591).

### **5.5.3 Qualifying exams**

The finals in RUME I and RUME II serve as Qualifying exams. They should be attempted in year 1 and must be passed in semester 5. Attaining at least a B in each of the four required graduate-level mathematics courses is also a condition for passing the Qualifying Exams requirement.

### **5.5.4 Plan of study**

See the description of the iPOS in Subsection 5.2.4.

### **5.5.5 Comprehensive Exam**

Students must pass a written and oral Comprehensive Exam after completing RUME IV and within the person's first four years in the program. By passing the Comprehensive Exam, the student demonstrates mastery of the knowledge required to conduct research in his or her specialization area. Details are:

- The student's advisor writes the first draft of the 4-5 question exam and circulates this exam to the student's other committee members for editing and approval.
- The student has 2 weeks to complete the written part of the exam.
- The oral part of the exam is scheduled at least 2 weeks after the written exam is submitted to the student's committee members. The oral exam involves the student's committee members posing questions related to the student's responses on the written exam.

- The student may receive a pass, conditional pass, or fail. The exam grade is determined by a vote of the student's committee.
  - The student receives a pass if all (or all but one) committee members vote to pass.
  - The student receives a fail if more than 1/3 of the exam is judged to be unsatisfactory by all (or all but one) committee member.
  - The student receives a conditional pass if at least 2/3 of the exam is completed satisfactorily (at most 1/3 of the exam needs to be rewritten). In the event of such a conditional pass, the student has two weeks to rewrite only the part of the exam that was deemed to be unsatisfactory by more than one committee member. After the student rewrites the part of the exam that was judged to be unsatisfactory, the student has a second oral exam that focuses on the students' revised responses. The student then receives a pass if all (or all but one) committee member votes to pass. Otherwise, the student receives a fail.

#### **5.5.6 The dissertation committee**

The rules presented for the Mathematics Ph.D in section 5.2.6 apply, *mutatis mutandis*, to the Mathematics Education Ph.D program. The list of faculty with the right to chair a Mathematics Education Ph.D committee can be found here.

#### **5.5.7 Dissertation prospectus**

The rules presented for the Mathematics Ph.D in section 5.2.7 apply.

#### **5.5.8 Dissertation defense**

The rules presented for the Mathematics Ph.D in section 5.2.8 apply.



## **6 General information, policies and procedures**

### **6.1 Costs (tuition & fees)**

The costs of enrollment can be obtained from ASU Financial Aid and Scholarship Services. Tuition and fees are subject to annual approval by the Arizona Board of Regents. Use the Tuition Estimator to calculate estimated total cost of attendance. For questions about tuition and fees, please contact the Student Accounts Office. For questions about financial aid and cost of attendance, please contact Student Financial Assistance.

### **6.2 Grievances and appeals**

Students who are enrolled in a College of Liberal Arts and Sciences (The College) course and believe they have been unfairly or improperly graded are assured of just treatment and fair consideration. Any such grievance must be started within the regular semester immediately following the course at issue, whether the student is enrolled in the university or not.

There are two stages to the grade grievance process, the informal process and the formal process. Each contains a series of steps. The steps must be followed by any student seeking to appeal a grade. This process does not address academic integrity allegations, faculty misconduct or discrimination.

Refer to [The College Academic Grievance Policy](#) for more information and specific processes.

### **6.3 Continuous enrollment**

Once admitted to a PhD program, students must be registered for a minimum of one credit hour during all phases of their graduate education, including the term in which they graduate. This includes periods when students are engaged in ASU-funded research, conducting a doctoral prospectus, working on or defending theses or dissertations, taking examinations, or in any other way utilizing university resources, facilities, or faculty time. Exceptions are discussed in section 6.4.

Registration for every fall semester and spring semester is required. Summer registration is required for students taking examinations, conducting a doctoral prospectus, defending theses or dissertations, or graduating from the degree program during a summer term.

To maintain continuous enrollment the credit hour(s) must:

- Appear on the student's Plan of Study, OR
- Be for research (592, 792), thesis (599), dissertation (799), or continuing registration (795), OR
- Be for a graduate-level course.

Grades of 'W' and/or 'X' are not considered valid registration for continuous enrollment purposes. 'W' grades are received when students officially withdraw from a course after the drop/add period. 'X' grades are received for audit courses. Additionally, students completing work for a course in which they received a grade of 'I' must maintain continuous enrollment as defined previously. Graduate students have one year to complete work for an incomplete grade; if the work is not completed and the grade changed within one year, the 'I' grade becomes permanent. Additional information regarding incomplete grades can be found at <http://asu.edu/aad/manuals/ssm/ssm203-09.html>.

## 6.4 Voluntary withdrawal from ASU

If a student wishes to withdraw from his/her graduate degree program and the university, they must complete the Voluntary Withdrawal form. Students must separately complete the appropriate forms with the University Registrar to withdraw from their courses. International students should contact the International Student and Scholars Center (ISSC) before submitting a *Voluntary Withdrawal form*, as it most likely will affect their visa status.

### **Voluntary withdrawal from a graduate degree program**

If a student wishes to transition from one graduate degree program to another graduate degree program, the student should complete the Voluntary Withdrawal form. The student should not take this action until they have been admitted to the other graduate degree program.

### **Other types of withdrawal**

There are appropriate circumstances when students may need to withdraw from the university (i.e. medical withdrawal, compassionate leave). The policies for such withdrawals are the same for both undergraduate and graduate

students. Types of withdrawals and procedures can be found at: <https://students.asu.edu/drop-add>. For course withdrawals contact the University Registrars Office.

## **6.5 Leave of absence policies**

Graduate students planning to discontinue registration for a semester or more must submit a Request to Maintain Continuous Enrollment form. This request must be submitted and approved before the anticipated semester of non-registration. Students may request to maintain continuous enrollment without course registration for a maximum of two semesters during their entire program.

Having an approved Request to Maintain Continuous Enrollment by the Graduate College will enable students to re-enter their program without re-applying to the university. Students who do not register for a fall or spring semester without an approved Request are considered withdrawn from the university under the assumption that they have decided to discontinue their program. Students removed for this reason may reapply for admission to resume their degree program; the application will be considered along with all other new applications to the degree program.

A student with a Graduate College approved Request to Maintain Continuous Enrollment is not required to pay tuition and/or fees, but in turn is not permitted to place any demands on university faculty or use any university resources. These resources include university libraries, laboratories, recreation facilities or faculty time.

## **6.6 Maximum time limit**

Doctoral students must complete all program requirements within a ten-year period, or five years after passing the Comprehensive Exam, whichever comes first. The ten-year period starts with the semester and year of admission to the doctoral program. Graduate courses taken prior to admission that are included on the Plan of Study must have been completed within three years of the semester and year of admission to the program (previously awarded Master's degrees used on the Plan of Study are exempt).

Any exception must be approved by the dissertation committee and the Graduate College. The Graduate College may withdraw students who are

unable to complete all degree requirements and graduate within the allowed maximum time limits.

## **6.7 Registration requirements for research assistants (RA) and teaching assistants (TA)**

Students awarded an assistantship within SoMMS are required to be registered for at least 6 credit hours each semester. Audit credit hours do not count towards the 6 credit hours.

A regular Teaching Assistantship or Research Assistantship is considered to have a workload of a 50 percent Full Time Equivalency (FTE). Regular TAs/RAs do not pay tuition during the semester or summer session of their employment. In addition, the university pays the individual health insurance premium for those TAs and RAs.

TAs/RAs working 25–49 percent FTE receive a 50 percent remission of tuition for the semester or summer session of their employment.

Any TA/RA offer does not cover additional fees beyond tuition.

More details on regulations pertaining specifically to TAs and RAs can be found in the Graduate College TA/RA Handbook.

## **6.8 Policy for maintaining academic satisfactory progress**

Each semester, the SoMSS PhD program reviews students' files for satisfactory progress towards completion of the degree. All students who do not meet one of the four categories are placed on probation or dismissed from the program:

1. Satisfactory progress;
  2. Academic Probation;
  3. Progress probation;
  4. Dismissal from the PhD program.
1. **Satisfactory progress** means that a student does not have any academic or progress probationary issues. In addition to the probationary rules, satisfactory progress includes discussion with the advisor each semester.

## 2. **Academic probation**

SoMSS PhD students must maintain a minimum of 3.00 GPA on both the iPOS and Graduate GPAs. If either GPA falls below 3.00, the student must develop, with their advisor, an academic performance improvement plan that includes the conditions and timeframes for making satisfactory academic progress in their degree program. The student is considered to be on academic probation until the conditions specified in the academic performance improvement plan are met and both GPAs are above 3.00.

## 3. **Progress probation** pertains to any of the following issues:

- Failure to pass the qualifier exam.
- Failure to pass the Comprehensive Exam.
- Failure to attempt the Comprehensive Exam by the end of third year.
- Failure to pass the dissertation prospectus.
- Failure to remain continuously enrolled.

## 4. **Dismissal from a SoMSS PhD program:**

A PhD student may be dismissed from program for any of the reasons listed below:

- (a) Cumulative or semester GPA is less than 3.0 for two consecutive semesters. (A student with such a GPA will be put on probation after the first semester.)
- (b) Failure to meet a requirement specified for the PhD degree, including not making satisfactory progress toward the completion of the degree.

A student will be recommended for dismissal from a SoMSS PhD program for failure to meet the probationary conditions imposed in the semester mentioned in the probationary letter.

- The student will receive a letter from the SoMSS PhD program explaining the reasons for the dismissal. The student will have 5

calendar days from the date of the letter to appeal the decision. If the student decides to appeal, the SoMSS graduate committee will review the case and will make the necessary recommendation. The Graduate Associate Director, on behalf of the graduate committee, will provide a written explanation of the outcome.

- If the outcome is favorable, the student will have to meet all the outlined requirements at the end of the specified period. The student will be required to sign an agreement acknowledging the recommendations and the consequences if the agreements are not met.
- If the graduate committee recommends that the appeal is not granted in favor of the student, the Graduate Associate Director, on behalf of the graduate committee, will recommend to the Dean of Academic Affairs that the student be dismissed from the SoMSS PhD program.
- The student will then have the opportunity to appeal to the The College' Standards Committee, which reviews the student's case and makes the final ruling to the Associate Dean and the SoMSS Graduate Associate Director.
- If the appeal is not granted in favor of the student, the Dean of Academic and Student Affairs will recommend to the Graduate College that the student be dismissed from the SoMSS PhD program.

## **6.9 Filing for graduation**

During the final semester, a student must file an application for graduation with the Graduation Office of the Registrar on My ASU. The student's approved final plan of study (iPOS) must be on file with the Graduate College before the student can apply for graduation.

## **6.10 Academic integrity**

The highest standards of academic integrity are expected of all graduate students, both in the academic coursework and in their related research activities. The failure of any graduate student to meet these standards may

result in serious consequences including suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of individual schools as well as the university.

Violations of academic integrity include, but are not limited to: cheating, fabrication, tampering, plagiarism, or aiding and/or facilitating such activities. At the graduate level, it is expected that students are familiar with these issues and each student must take personal responsibility in their work. In addition, graduate students are expected to follow university guidelines related to the Student Code of Conduct. University policies related to academic integrity and code of conduct are available in the Office of Student Life, or at <https://graduate.asu.edu/current-students/policies-forms-and-deadlines/academic-integrity>.

## 6.11 Student chapters of professional societies

Our graduate students are involved in many professional societies. Most branches of math have professional societies associated with them. Participation in professional societies is an excellent road to career and interest group connections. Student membership typically costs less than \$30 and includes many benefits—for example, discounts at meetings and including a monthly magazine. The American Mathematical Society (AMS), the Association for Women in Mathematics (AWM), the Mathematical Association of America (MAA), and the Society for Applied Mathematics (SIAM) are particularly important.

## 6.12 Student Support Services

### 6.12.1 Healthcare & Insurance

All students, whether they have health insurance or not, are eligible to use ASU Health Services. Graduate students must be enrolled in a graduate degree or certificate program and registered for at least three credit hours or one dissertation/thesis hour.

Visit ASU Health Services for additional information and instructions regarding Student Health Coverage Options, Eligibility & Enrollment.

International students will automatically be enrolled in the student health plan upon registration for class.

For students with an RA/TA appointment, refer to the **Benefits** section of the TA/RA Handbook for additional health insurance information.

All students are required to meet the measles, mumps, and rubella (MMR) immunization requirement before class registration. You will see a MMR Immunization hold in the **Priority Tasks** module in My ASU until your MMR information is received and verified. Read additional information about MMR and other immunization information at ASU Health Services.

### **6.12.2 Disability Resources**

The Disability Resource Center (DRC) provides services to qualified students with disabilities on all ASU campuses. Services include testing accommodations, note taking services, on-campus transportation, and more. Students new to ASU must log into DRC Connect to get started with registering with the DRC office. Contact DRC to determine eligibility and submit required documentation.

### **6.12.3 Veterans Resources**

ASU has a robust veteran student services center. The Tillman Center offers advising, assistance with GI benefits, military transfer credit and other services. The Tillman Center is staffed almost entirely by veterans who relate to the challenges that new students experience and provide support in navigating complex governmental systems.

### **6.12.4 Counseling Services**

Students are eligible for personal counseling services at ASU. ASU Counseling Services offers confidential, time-limited, counseling and crisis services for students experiencing emotional concerns, problems in adjusting, and other factors that affect their ability to achieve their academic and personal goals. They will talk with you, help you identify solutions or support, and connect you with those services at ASU or in the community.

### **6.12.5 Title IX**

ASU is committed to providing an environment free from discrimination based on sex and provides a number of resources and services to assist students, faculty and staff in addressing issues involving sex discrimination,



including sexual violence. The university's full statement and policies related to Title IX are available online.

### **6.12.6 International Students Support**

The International Students and Scholars Center (ISSC) at ASU helps international students understand the legalities and requirements of academic and employment-based programs. It deals with all questions regarding visa and lawful status as an international student in the US as well as many other questions pertaining to life at ASU as an international student.

## **Appendices**

### **A Absent committee member procedure**

The following rules apply to both the prospectus exam and the dissertation defense. While it is desirable that all members of a student's dissertation committee be available, there are situations (e.g. faculty travel, faculty emergencies and/or faculty leave) that may necessitate proceeding with one or more committee member(s) absent. SoMSS has established the following policies and procedures for such cases.

1. At most one member of the committee may be substituted or not physically present.
2. A minimum of 50% of the student's official committee must be physically present with the student. If at least 50% of the committee cannot be physically present, the exam/defense must be rescheduled.
3. The chair or (one co-chair) must be physically present. If this is not possible, the exam/defense must be rescheduled. The student cannot submit a committee change after the defense is scheduled to create co-chairs in the case of an absent chair.
4. A committee co-chair or member who cannot be physically present may participate in one of three ways. These options are listed in the order of preference:

- (a) The absent committee member videoconferences into the location and the location must have the necessary equipment to accommodate video/teleconference materials.
- (b) The absent committee member teleconferences into the location. (And the student must provide a copy of their document and any other supporting presentation materials to the committee member at least 5 working days in advance of the exam/defense.)
- (c) The absent committee member provides a substitute to be physically present (approved by the committee chair and the head of the academic unit). The substitute must be someone who is approved to serve on graduate dissertation committees for that program. The absent committee member should provide the substitute questions, in writing, to be asked at the exam/defense. The substitute, although respecting the opinions expressed by the regular committee, must be free to use his/her judgment in voting on whether the student passes or fails. The substitute should sign the absent committee member's name, and add his/her initials directly after the signature.

If the videoconference or teleconference option is selected, the absent member must email the committee chair or co-chair to state that member voted to pass or fail the student and authorize that the chair sign their name on the form. The committee chair or co-chair should sign the name of the absent individual on the form and then add his/her initials directly after the signature.

If a committee member will be absent from the prospectus exam, the student or committee chair/co-chair must notify the Graduate Associate Director before or at the time of scheduling the exam. If the student is notified of an absence after scheduling the exam, the student must contact the Graduate Associate Director prior to the exam, so he/she finds a substitute.

For the dissertation defense, if a committee member will be absent, the student or committee chair/co-chair must notify Graduate College before or at the time of scheduling the defense. If the student is notified of an absence after scheduling the defense, the student must contact Graduate College prior to the defense date.

## B Summary of the Statistics PhD Comprehensive Exam

- For the written part of the exam, which is to be completed first, a student coordinates with their CEC chair. The student must produce a written document analyzing specific works in a selected area of research. The student should select three or more papers which the student would then analyze and discuss in the written document. Of course, it is expected that the student will need to refer to related sources in order to fully comprehend the selected papers. The written document should capture the overall intellectual contribution of the papers and present research opportunities that *could* be pursued based on the selected works.
- When papers are selected, the student should prepare a two-page proposal of the comprehensive exam project and submit to the CEC. The CEC has two weeks to return comments on the proposal. The comprehensive exam proposal must be completed and approved by the end of the fourth semester. This will give the student an opportunity to work on the written document during the summer after the fourth semester.
- By the first half of the fifth semester, the written document is shared with the CEC. The typed document, including figures but excluding bibliography, should be no more than 15 pages, single-spaced, in 11 point or larger font, and with one-inch margins on all sides. CEC members have up to four weeks to submit questions and give comments to the student about this document, if any. These questions and comments can be directly related to material in the written document, but can also test the student on knowledge and understanding of issues that do not explicitly appear in the document. The student should compile all the questions and comments from the members and send this compiled list to the CEC. The student may seek help from the ASU Writing Center to improve the composition of the written report. Clarification can be sought from the CEC chair, but the detailed work of the written document should be completed by the student.
- After all questions and comments have been received from the CEC, the student has up to four weeks to address these in a revised version of the

written document, which is subject to the same format and page limit as noted in the previous paragraph. During this period, the student can discuss the questions with members of the CEC, for example to receive further clarification of the questions.

- Once the revised document is completed, it is again shared with the CEC. At this time, the student should schedule an oral exam where all CEC members are present. The oral exam should be at least one week after the revised written document is shared with the CEC.
- At the oral part of the exam, a student presents their written work to the CEC in the form of a seminar of about 50 minutes. CEC members can ask questions for clarification or to test the depth of the student's understanding of the presented material.
- Once the oral exam is completed and the student has left the room, the CEC discusses the student's performance and decides whether the student receives a Pass, Conditional Pass, or Fail. In the case of a Conditional Pass, the CEC stipulates the condition.
- A student fails if a majority of the CEC vote to fail the student with any tie to be broken by the CEC chair. If this condition does not hold, but there are at least two CEC members who do not support a pass, then the student should receive a Conditional Pass.