



Guidelines for Honors Students

### **A degree in mathematics or statistics: Excellent preparation for many careers**

Graduates from mathematics and statistics programs rarely hold positions that are explicitly called “mathematician” or “statistician.” Thus few people realize how many of the top positions in a wide range of professions are held by graduates from mathematics or statistics programs. Indeed, undergraduate degrees in mathematics and statistics are among the most versatile degrees, providing excellent preparation for disciplines ranging from business and law to the sciences and medicine, and many more. Every year, degrees in mathematics and statistics are unanimously rated at or near the top when ranked by pay levels, by job satisfaction, or by value as preparation for many careers. This is no surprise, as mathematics plays an ever more important role in ever more professions, and problem solving skills and training in clear logical thinking are crucial for any career.

### **Mathematics & Statistics: Vibrant research with exciting new discoveries every day**

Contrary to widespread misconceptions, mathematics is a vibrant field that is characterized by new discoveries and powerful applications every day. These range from very abstract theories such as algebraic number theory and cryptography, which are at the heart of modern telecommunications (e.g., cell phones) to modeling, analysis, and computer simulation of biomedical problems (e.g., spread of infectious diseases), fluid flows (e.g., weather, or airflow over the wing of a plane), and the business world (the world’s economic and financial systems). Common to an increasing number of disciplines is the need for professionals with better training in mathematics, making a degree (or concurrent degree) in mathematics or statistics increasingly valuable.

### **Undergraduate coursework, honors credit, and meeting possible thesis advisors**

The usual starting point for SoMSS students is three semesters of calculus (MAT 270, 271, and 272). Some students continue with a first course in differential equations (MAT 275). Following these are a required course in linear algebra (MAT 342 or 343), which mixes calculations with more abstract study, and the “*transition course*” MAT 300, which is the gateway to higher mathematics.

The School of Mathematical and Statistical Sciences (SoMSS) regularly offers special sections *for honors students only* of all of the above courses. All honors students are strongly encouraged to select these special sections in which they automatically earn honors credit. These small sections provide a superior environment for deeper exploration of the topics, and are taught by faculty who are enthusiastic about working with honors students. As such they offer a great opportunity to get to know research faculty and their research interests.

MAT 300 is a writing-intensive class that is fundamental to further study in mathematics. It focuses on constructing rigorous arguments, and writing and polishing mathematical proofs.

Almost all subsequent courses rely in essential ways on the material covered in MAT 300 and its follow-on course MAT 371. Beyond these two classes students have the choice between many courses that quickly diverge in many different directions. Usually there are no special honors sections offered for any of the classes beyond MAT 300, but most instructors will be happy to supervise work beyond the normal syllabus through honors enrichment contracts. Projects often involve study of chapters not normally addressed in the class, or small research projects that arise from questions asked in class. It is not unusual that such studies evolve into larger research projects that then become the foundation for an honors thesis.

MAT 448, ACT 310, and ACT 430 are taught as regular sections, but carry automatic honors credit. Another great option for honors students in SoMSS is our sophomore-level MAT/STP 298. This course number is used for individualized instruction on a topic or project that could be preliminary to an honors thesis. It represents an early chance to explore topics outside of your regular courses. Enrollment is with instructor permission, and carries automatic honors credit.

### **REUs and other opportunities**

All students are encouraged to engage actively in the discovery process beyond their routine study in regular coursework. Among the most exciting opportunities are summer research programs offered in many places around the country, generally supported by grants from the National Science Foundation, and known collectively as REUs (Research Experiences for Undergraduates). You will need to plan ahead and apply early (typical deadlines are in December or January) as spots in these programs are competitively awarded. In addition to having a strong record in your coursework, you will need a faculty member to write in support of your application (another reason to get to know the SoMSS faculty early, and have them get to know you). Many REUs not only offer the opportunity to do exciting mathematics and make new friends, but they also provide generous travel support and stipends.

If you choose to stay in Arizona, SoMSS offers its own REU program in applied math (called AM<sup>2</sup>) with projects involving computational mathematics and modeling. Alternatively, many individual SoMSS faculty members are willing to supervise REU-like experiences in a wide variety of areas. Depending on the level of the material, credit can be earned for these through MAT/STP 298 or MAT/STP 495.

### **More on honors theses**

For policy on honors theses, thesis prospecti, and deadlines, etc., the main references are the Barrett webpages and advisors. Here, we only add some remarks specific to SoMSS.

To get an idea of the wide array of different areas of specialization in mathematics and statistics, you should start attending as many public events aimed at a general mathematical audience as possible. These include events hosted by student organizations such as Math Club, AWM@ASU, or Actuarial Club. Also, keep an eye on the SoMSS events calendar for seminars, colloquia, public lectures, and other opportunities to hear about the research projects underway by SoMSS faculty and students, and by distinguished researchers from other

institutions. To make the most informed decision about your thesis topic, start learning as soon as possible about the different areas in mathematics and statistics, what they have to offer, and which is the best match for you. Most faculty members are delighted to talk with you about their research. Have a look at the attached information on research opportunities for undergraduates, and then at the more detailed descriptions on the faculty members' webpages. If someone's research is interesting to you, consider requesting an appointment to discuss it further. Questions to ask include what courses you should take as preparation for a project in their field.

By the time you are taking MAT 300 and MAT 371 you should already have gotten to know some of the faculty working in potential areas for your thesis, and should be planning your future coursework accordingly. If you need advice or help identifying a faculty member whose research aligns with your interests, contact your SoMSS faculty honors advisor (Professor Nancy Childress, [nc@asu.edu](mailto:nc@asu.edu)).

Obtaining permission to register for MAT/STP 492 (Honors Directed Study) or for MAT/STP 493 (Honors Thesis) requires that you first complete the SoMSS-BHC honors thesis workshop, offered once per semester. In addition, you must have a thesis director and at least one committee member who have agreed to serve. Finally, you will need a title and brief abstract of your proposed thesis (the abstract can be a portion of your prospectus, or a separate summary of your project's goals, why they are of interest, and what techniques you anticipate using to accomplish them. (Consult your thesis director for guidance on this.) Once you have assembled this information, go to <https://clas-forms.asu.edu/math/permission-enroll-honors-directed-study-492-and-honors-thesis-493> and submit your request. You will receive an email notification when you are cleared to enroll.

You are strongly encouraged to submit your prospectus to Barrett by the priority deadline (the semester *before* you enroll in MAT/STP 492). It is much more difficult to complete a thesis by the deadline if you have not settled on a topic and enlisted a thesis supervisor well in advance of the start of MAT/STP 492. Be mindful that the deadline to defend your completed thesis is significantly earlier than the end of the semester in which you take MAT/STP 493.

In the semesters prior to your own defense, consider attending one or more thesis defenses in SoMSS. Contact the student defending their thesis in advance and ask to attend. And when it is your turn to defend, be a role model for the next generation of honors students and welcome student colleagues to attend your honors thesis defense so they have a better idea how to prepare for their own.

### **Areas of specialization**

All areas of mathematics and statistics offer opportunities for undergraduates to do original research, discovering new mathematics that no one else has done before. For a detailed listing of areas of interest and specialization of honors faculty at SoMSS, have a look at our research opportunities for undergraduates (attached).