

Contact: Rachel Boon

**REQUEST FOR NEW PROGRAM AT IOWA STATE UNIVERSITY: MASTER OF APPLIED STATISTICS**

**Action Requested:** Consider approval of the request by Iowa State University for a Master of Applied Statistics in the College of Liberal Arts and Sciences.

The Council of Provosts and Board office support approval of this program.

**Description of proposed program.** The proposed program will teach students statistical methods and their application to data-driven problems in a variety of fields. When compared to ISU's current Master of Science in Statistics degree, the proposed program:

- emphasizes practical applications and experiences with current statistical methodology and computing;
- includes a course on statistical consulting covering communication skills and ethical issues;
- provides course credit for experiential learning;
- is offered as an online program; and
- can be completed in 15 months of full-time graduate study.

The proposed program consists of 30 credits, of which 23 credits are online versions of existing courses currently taught in person on campus. The remaining seven credits come from new courses: (3 credits for Introduction to Statistical Learning, 2 credits for Statistical Consulting, and 2 credits for Work Experience in Statistics). Full-time students could complete the program in 15 months – starting during a summer session and ending after the following summer session.

**Academic objectives.** The overall goal of this proposed program is to prepare students to be effective, responsible and ethical users of statistical methods. The program is designed to provide recent graduates, researchers and current professionals with a strong foundation in statistical applications, helping to create a “Future Ready Workforce”.

At the end of the proposed program, graduates will be able to:

1. correctly use and interpret the most used classical and modern methods in statistics;
2. explain the theoretical foundations of classical and modern statistical methods;
3. identify relevant methods for a particular data-driven problem and describe advantages and disadvantages of each method;
4. effectively communicate statistical results to all stakeholders, including non-statisticians; and
5. successfully complete a work experience in statistics.

Students will earn two credits for work experience in statistics. Students who are employed full time may satisfy the work experience requirement by completing and documenting a statistically oriented project with their current employer. Other students may choose to complete an internship. Paid internships for students with statistical expertise are frequently offered by many well-known pharmaceutical companies, tech companies, financial services organizations, government agencies, and other employers. In addition, the statistical consulting group in the Department of Statistics at Iowa State, which assists ISU student, faculty and staff researchers with the statistical challenges of their research, can offer unpaid work experiences to students in the program. Students may alternatively opt for an unpaid work experience through Iowa State's

Statistics in the Community (STATCOM) group. STATCOM provides pro bono statistical consulting to local nonprofit, governmental and community service organizations.

Need for program. There is an enormous and growing demand for statisticians and data science professionals in Iowa, the U.S. and internationally. The U.S. Bureau of Labor Statistics ranks statistician as one of the fastest growing occupations in the next decade (more than 30% projected growth compared to an average of 3% across all jobs). Statistician is highly ranked among best technology jobs, best business jobs, and within the 100 “best jobs” category. Iowa State University is perfectly positioned to provide leadership in preparing future professionals in this field because of its strong presence in the field of statistics and long history in collaborative data-driven sciences. This program is designed to expand existing graduate degrees to a broader audience, including working professionals as well as remote students, and prepare them with an in-depth understanding of statistics and its applications in a variety of fields.

Relationship to existing programs at the institution. There are two graduate programs at Iowa State for different audiences and having different emphases that are related to the proposed program. The department offers the Master of Science (MS) in Statistics as a full-time in-residence program. Students in this program complete a two-course sequence in statistical theory, a three-course sequence in statistical methods, one course in statistical computing, and a creative component. Additional credits are earned through elective courses in these three areas. In comparison, the proposed program can be completed fully online, attracting remote students/professionals; it is shorter, making it appealing to more students; it provides more emphasis on the use of statistics rather than the mathematical theory of statistics; it trains students in modern statistical computing techniques; and it requires a work experience instead of a creative component which will make the graduating students more valuable in the job market.

The Ivy College of Business offers a Master of Business Analytics, which has a focus on business applications of analytics techniques. In comparison, the focus of the proposed program is training students in the foundations of statistics, a broad set of statistical methods, and statistical computing with the aim of preparing them for real-life problem-solving in a variety of fields. One course required for the proposed Master of Applied Statistics program (STAT 572: Introduction to Time Series) is also an elective of the Master of Business Analytics program. There is no other overlap in the course lists for the proposed program and the Master of Business Analytics. While the proposed program requires 10 courses in statistics, Master of Business Analytics students take between one and three statistics courses and augment them with training in marketing, management information systems, computer science, industrial engineering or finance.

While not related programs, there are potential connections with several mathematical or data-intensive undergraduate and graduate programs at Iowa State, such as mathematics, computer science, data science, economics, finance and engineering. Completing the proposed program shortly after an undergraduate or graduate degree will give students in these fields additional training to meet employer demands for qualified professionals with analytical skills.

Relationship to existing programs at other colleges and universities. No other institutions in Iowa offer a Master of Applied Statistics. The University of Iowa (UI) offers an MS in Data Science, and the Maharishi University of Management offers an MS in Computer Science with a Data Science track. Both require more computing and less applied statistics than the proposed program. UI has had good growth in its on-campus MS in Data Science and noted some overlap between the learning goals for students in one of the tracks in their program. A discussion with college leaders at UI concluded that the online-learning opportunity presented by this proposal, its focus on applied statistics, and the particular research programs and reputation of the faculty contributing to these two different graduate programs, make this proposal distinctive and of interest to a

different set of students. Like Iowa State, UI also offers an MS in Statistics that provides a different type of preparation. Unlike the proposed program, none of the potentially related programs at other universities are online degree programs.

Resources to establish a high-quality program. The Department of Statistics at Iowa State University has a long tradition of the scholarship in and the teaching of statistical methods and their application, dating back to the 1920s and the founding of the Statistical Laboratory in 1933. Currently, the department maintains a widely respected statistical consulting group on campus, has nationally and internationally recognized faculty engaged in research in a wide variety of statistical methods, theory and computing, and is well known for training graduate students in statistics, ranking second in granting PhDs in the country over the last 10 years. The department teaches more than 7,000 students and 25,000 student credit hours each year in courses at all educational levels, including 24 MS level classes on statistical methods.

Offering the Master of Applied Statistics is a natural extension of the department's strengths and existing programs and courses. In addition, having the support of the professionals in Online and Distance Learning unit on campus is expected to play a crucial role in making such an online program possible. This program is perfectly aligned with the University President's "Degrees of the Future" initiative. As outlined in President Wintersteen's "Jumpstarting the Strategic Plan," this new academic degree will meet student and employer demands and create a new revenue stream for the university.

In addition to support for students and faculty provided by Iowa State Online, the Department of Statistics hired a new Graduate Student Services Specialist in October, 2022, who supports the Statistics MS and PhD programs and will also provide staff support for the proposed program. The proposed program involves 10 different courses. To allow flexible start times, two courses (STAT 586 Introduction to Statistical Computing, STAT 587: Statistical Methods for Research Workers) that serve as prerequisites for other courses in the proposed program will be offered each summer session and each fall and spring semester. This will result in a total of 14 course offerings annually, which can be covered by the teaching assignments of two tenured/tenure eligible faculty and one term teaching faculty member. Hiring these three faculty will cost approximately \$425,000 annually, including salary and benefits. Snedecor Hall, home of the Department of Statistics, has office space available for these new hires. One-time startup costs associated with the hiring of these faculty and the purchase of computing equipment will total approximately \$200,000. No new facilities or equipment are required for the proposed program beyond the startup costs of faculty hires. Current faculty in the Department of Statistics with outstanding teaching credentials will create online versions of the program's courses at a cost of no more than \$100,000 for faculty time. An additional \$20,000 per year is budgeted for course maintenance and updates.

Student demand. The Department of Statistics at Iowa State has an excellent reputation among units offering graduate degrees in statistics, rising to 19th among 101 such programs according to the most recent U.S. News & World Report ranking. Each year, the department receives far more applications for admission to the existing MS and PhD programs than can be accepted, due to cost in financial terms and in faculty and staff time associated with each admitted student. For example, the number of applications for admission to the department's existing statistics graduate programs has averaged more than 260 per year since 2016, while the incoming class size is typically around just 25 students. The students entering the existing statistics graduate programs are paid stipends and receive tuition scholarships for their work as research or teaching assistants and require substantial faculty support to complete required creative component projects (MS) or dissertations (PhD). For many applicants, the proposed program will better match their prior training and career goals than the existing MS and PhD programs. The proposed program will

also be more attractive to some prospective students because of the flexibility of online instruction and potentially much shorter time to degree. Neither the existing MS program nor the existing PhD program is offered online, and neither is suited for students who are already employed on a full-time basis. The proposed program is designed to serve students who are already working professionals and also students who are not yet working professionals but are seeking the training necessary to begin careers requiring statistical expertise. Based on the applications for existing graduate programs, students from the state of Iowa, throughout the nation, and from various international locations are likely to be candidates for admission to the proposed program.

Workforce need/demand. Data-driven decision-making has become a cornerstone across many fields and industries, creating a demand for well-trained statisticians capable of processing, analyzing and interpreting data of various types, complexity and size. According to the U.S. Bureau of Labor Statistics, the overall employment of statisticians is projected to grow more than 30 percent from 2020 to 2030, which is much faster than the average for all occupations. The U.S. News & World Report 2021 rated Statistician as the #6 overall Best Job, the #5 Best STEM Job, and the #2 Best Business Job; the rankings consider factors such as salary, job market demand and future growth. LinkedIn lists data-driven decision-making skills such as analytical reasoning, scientific computing and development of machine learning models in the top 10 most important skills companies were looking for in 2020. Similarly, Deloitte Insights reported in 2021 the number of jobs posted by tech companies for analysis skills — including machine learning, data science, data engineering and visualization — surpassed traditional skills such as engineering, customer support, marketing, public relations and administration.

Overall, these sources suggest that there is a high potential market demand for qualified professionals equipped with statistical analysis skills. Moreover, many typical entry-level jobs for a statistician need at least a master's degree, again demonstrating the need for highly trained graduates with statistical skill sets.

Funding and Cost. Tuition paid by students will cover the cost of the program. With 45 students averaging 15 credits hours per year and paying \$1,200 per credit hour, annual revenue for the program will exceed the College of Liberal Arts and Science's annual program operating expenses, including college administrative costs and allocated costs assessed for the additional students and faculty. The program expects annual revenue to exceed LAS expenses in the fourth year and in subsequent years of the proposed program. Revenue in excess of expenses will be shared by the College of Liberal Arts and Sciences and the Department of Statistics to strengthen other student programs, such as the MS and PhD in Statistics.

Projected student enrollment. The enrollment projection of an incoming class size of 10 students for year one is based on an approximate 5% enrollment rate from the number of applications the department receives for its MS and PhD programs. A projected increase of ten students is expected in each subsequent incoming class during years two through five, resulting in incoming classes of sizes 25, 35, 45 and 55, respectively. There are some indications that estimates of cohort size may be conservative. For example, Penn State University has an online Master of Applied Statistics program that admitted 79 new students in 2021.

Graduate	Y1	Y2	Y3	Y4	Y5
Majors	10	25	35	45	55

Accreditation. Not applicable.

Date of implementation. December 2024.

Letter of Support



January 22, 2024

To the Board of Regents:

The Council of Provosts discussed the Iowa State University proposal for a Master of Applied Statistics and reviewed associated documentation. The university has the resources and expertise for this program already in place, and there is evidence of student demand and workforce benefit in the state of Iowa and throughout the Midwest. The plan indicates due diligence with the other Regent universities regarding related programs, none of which are currently offered fully online. Based on the evidence and documentation, this program is likely to benefit the Iowa State University and the state of Iowa.

The Council of Provosts is supportive of the program and wishes Iowa State the best in its implementation.

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