Mathematics and Statistics Strategic Plan (March 29, 2022)

Mission Statement
The Department's mission is three-fold: • Provide undergraduate and graduate programs and instruction in mathematical sciences and Mathematics Education at the forefront in quality and innovation that meet needs of students, university, community, and society. • Embolden and support research and professional activity in mathematical sciences and Mathematics Education among students, faculty, sponsors, and partners that enhance the educational experience, set the pace in offering insights and solidifying a research presence nationally and globally. • Interact with the larger university community and with selected segments of the local, state, and national communities to engage in mutually advantage collaborations and services.
Vision Statement
The Department of Mathematics and Statistics aspires to reach new levels of excellence in execution and outcomes that elevate the department's stature as a leading research institution regionally, nationally and globally. The department meets the challenges of offering Charlotte's growing 32,000 and more students mathematics and statistic educational opportunities that employ technology to advantage and reflect best practices in pedagogy. The department expects to continue to review and revitalize curriculum offerings that engage students and improve retention including preparation of future math teachers. The department is committed to expand the graduate and undergraduate programs and add options that prepare students for a wide variety of future careers.

Core Values

- **Excellence** in research and education
- **Synergy** with interdisciplinary academic streams
- **Connection** with research, government, industry, and K-12 communities
- **Service** to students in their mathematics and statistics education
- **Proactive** in prioritizing continual improvement and embracing change
- **Welcoming** and productive climate for all

Key Leadership Principles

- Responsiveness to a changing environment and changing needs
- Vision to position our department and discipline at the forefront of emerging research and practice
- Accountability to students, staff, faculty, administration, and trustees to achieve high standards and performance excellence
- Decisions and actions that are driven according to best data analytics practices
- Commitment to participate in communities of mathematicians and statisticians nationally and globally
- Adopt perspectives, knowledge, and behaviors that ensure a climate of opportunity for all in the spirit of diversity, equity, and inclusiveness.

Five-Year Department Strategic Plan

Department:	**Mathematics and Statistics Department**
Unit:	**College of Liberal Arts and Sciences**
Date:	**March 15, 2022**

Goal 1: **Undergraduate Education (includes Service Teaching**	The Department of Mathematics and Statistics will expand and enhance the experience of undergraduate students and provide services to encourage student academic success.		
	Objective 1.1	Add programs and academic concentrations to better serve student needs and interests.	
		Action 1.1.1	Increase the number of students who choose Secondary Education as a minor by adding program options and flexibility.
		Action 1.1.2	Strengthen the connection between our concentration in statistics and careers in data science.
		Action 1.1.3	Seek external funding (NSF) to establish research experiences for undergraduates in the department.
		Action 1.1.4	Create one or two signature study abroad programs centered on mathematics and statistics for undergraduate students.
		Measures and Performance Outcomes	• Addition of flexibility to improve appeal of selecting Secondary Education as a minor. • Collect and publicize the connection between statistics and data science with emphasis on trends and careers. • Funding of research experiences for undergraduates supplemented by external sources. • Number of study abroad and exchange programs for undergraduate mathematics and statistics: students (2 summer programs, 1 spring break program), 2021 to 2026: 0 to 3.
		Costs	• Costs of research endeavors by undergraduates (may be funded by external source NSF). • Two study abroad programs for undergraduate students. • Adding programs for additional secondary Education students.
	Objective 1.2	Offer additional options for students to pursue academic goals.	
		Action 1.2.1	Increase the number of students who enter the Early Entry program for the M.S. in Mathematics, particularly in actuarial science and mathematics education.
		Action 1.2.2	Increase the number of students who choose to major or minor in mathematics and mathematics for business.

		Action 1.2.3	Expand undergraduate learning experiences including undergraduate research and internships.
		Measures and Performance Outcomes	• Number of Early Entry Students (2% increase annually): 15 to 25. • Number of students Minoring in Math (5% growth annually): 522 to 665. • Expansion of research opportunities for undergraduates.
		Costs	Added number of students and programs will require additional funding to develop the infrastructure.
	Objective 1.3	Strengthen interdepartmental and external collaborations**.**	
		Action 1.3.1	Expand the options for our mathematics and statistics undergraduate programs.
		Action 1.3.2	Create a concentration in operations research and explore dual degree programs with engineering, data science, and physics.
		Action 1.3.3	Expand Mathematics Pathways program in response to the university's Quality Enhancement Plan (QEP) and the general education competency that emphasizes quantitative, qualitative, and data reasoning.
		Action 1.3.4	Improve curriculum and pedagogy in service courses through course coordination and collaboration with service departments.
		Action 1.3.5	Maintain and support the actuarial program and outreach to regional and state businesses.
		Measures and Performance Outcomes	• Increase in dual degree programs with engineering, data science and Physics. • Number of coordinated gateway courses: 3 to 6. • Increase in number of math pathways courses 2021 to 2026: 1 to 7. • Tracking of faculty participation in curriculum and pedagogy learning opportunities. • Initiation and implementation of cooperative programs with regional and state businesses with emphasis on actuarial services.
		Costs	• Addition of study concentration in operations research and dual degree programs. • Curriculum and pedagogy improvements. • Outreach to regional and state business to promote the actuarial program.
	Objective 1.4	Improve delivery of processes and services associated with pursuing student academic endeavors.	
		Action 1.4.1	Amplify our success in recruiting and graduating underrepresented students in mathematics majors and minors.
		Action 1.4.2	Improve our math placement diagnostic process.
		Action 1.4.3	Further develop a teaching and learning culture and community in the department.

		Action 1.4.4	Secure necessary funding for improvements in the mathematics placement process for new students.
		Measures and Performance Outcomes	• Assessment of gains in under-represent student population and priorities related to teaching and learning, such as attendance at seminars, workshops, and guest speaker events. • Upgraded mathematics placement diagnostic and placement processing.
		Costs	• Process improvements in mathematic placement and the math placement diagnostic process for new students.
	Objective 1.5	Support student success and retention.	
		Action 1.5.1	Improve the success rate of non-mathematics majors in first year mathematics and statistics courses.
		Action 1.5.2	Increase the number of students in the Mathematics Honors program.
		Action 1.5.3	Host an award ceremony in recognition of teaching and student accomplishments.
		Action 1.5.4	Increase recognition of our student excellence by competing in regional, national, and international competitions.
		Measures and Performance Outcomes	• Number of undergraduate degrees award (5% growth annually), 2021 to 2026: 113 to 145. • DFW rates in gateway math courses (Fall 2019 data, pre-Coved): 25% average over 7 classes. • Number of undergraduates in REU or faculty supervised research projects or honors projects (50% growth over 5 years): Honors—7 to 14. • Tracking of retention rates of students who receive awards and participate in competitions. • Tracking of postgraduate employment of mathematics and statistics majors.
		Costs	• Funding for TAs for co-requisite smaller recitation sections for math pathways for STEM majors. • Funding for undergraduate preceptors for active, adaptive learning activities in the classroom. • Permanent budget lines for stipends, release time for course coordinators. • Adding award ceremonies and participating in competitions will require administrative and coaching assistance.
	Objective 1.6	Build capacity by adding staff, faculty, administration, and facilities to accommodate projected growth in numbers of students and services.	
		Action 1.6.1	Secure resources for strengthening critical infrastructure for active learning, adaptive learning, the Mathematics Learning Center, and growth messaging.
		Action 1.62.2	Expand existing resources (physical and technological) to support best practices in teaching.

		Action 1.6.3	Increase space and scope of the Mathematics Learning Center.
		Action 1.6.4	Work with the Director and the Steering Committee of the QEP to implement and achieve the student success outcomes of the QEP. Seek access to more active learning classroom spaces for service learning courses.
		Measures and Performance Outcomes	• Addition of capacity to improve adaptive learning, provide more space in the Mathematics Learning Center, and enlarge active earning classroom spaces. • Number of classrooms available for active learning: 1-2 to 10.
		Costs	• A line to hire a new faculty who specializes in active and adaptive learning. • Additional infrastructure due to projected growth in number of students served. • Additions to faculty and staff to accommodate added programs. • Expansion of the mathematics learning center. • Facilities expansion to increase classrooms and amenities.

Goal 2: **Research**	The Department of Mathematics and Statistics will advance in standing among R1 and R2 universities on key measures including faculty talent acquisition, externally funded research, and research concentration on foundational areas that serve interests across the university including research growth areas to continue our momentum.		
	Objective 2.1	Expand faculty size, increase research funding, and add postdoc positions.	
		Action 2.1.1	Increase the faculty size from 40 to 50 T/TT faculty members back to the level of mid 1990s (during 1997-98 our faculty was composed of 45 T/TT, 2-3 postdocs).
		Action 2.1.2	Hire new faculty with proven records of excellent promise in areas with funding potential. Continue to build on research areas with existing strengths.
		Action 2.1.3	Increase the department research funding from ~$1M per year to ~$1.5M per year within the next 3 years by Fall 2025.
		Action 2.1.4	Create a competitive, university-funded teaching-postdoc/visiting scholar program. Hire 1 postdoc each year with a goal of having 3 such positions by Fall 2026.
		Measures and Performance Outcomes	• Change in Tenure/Tenure-Track Faculty 2021 to 2026: 40 to 50. • Change in external funding per year 2021 to 2026: ~$1M to $1.5M per year. • Increase in percent of faculty with funding 2021 to 2026: 15% to 30%. • Change in number of college/university funded postdocs 2021 to 2026: 0 to 3. • Change in the number of articles published in peer-reviewed journals 2021 to 2026: 75 to 100.

		Costs	• Additional faculty lines (ten new lines). • External outreach plus direction and staffing to execute contracted research. • Addition of postdoc scholar lines (three postdoc lines).
	Objective 2.2	Build on foundational mathematics research areas that advance both fundamental and applied research across engineering, information technology, and scientific disciplines.	
		Action 2.2.1	Focus on dynamical systems, commutative algebra and combinatorics, set theory and topology, functional analysis, and number theory.
		Action 2.2.2	Over next 3 years, hire new faculty in foundational research areas to leverage our preeminent faculty who will develop and mentor new faculty.
		Action 2.2.3	Over next 3 years, add to faculty in mathematical analysis to meet a deficit.
		Measures and Performance Outcomes	• Implementation of plan to replace faculty for foundational research areas of mathematics by 2026. • Implementation of plan to hire new faculty in foundational research areas of mathematics by 2026. • Change in the number of articles published in peer-reviewed journals 2021 to 2026: 75 to 100.
		Costs	• Additional funds will be needed for recruiting, and adding faculty lines (two replacement and two new lines).
	Objective 2.3	Strengthen our excellent position in growth areas of mathematics and statistics research including applied and computational mathematics, probability and stochastic processes, mathematical physics, mathematical finance, and inverse problems.	
		Action 2.3.1	Over next 3 years, hire new faculty with research interest in probability and stochastic process, mathematical physics, and inverse problems to take advantage of our preeminent faculty who will develop and mentor new faculty.
		Action 2.3.2	Over next 3 years, rebuild faculty in applied and computational mathematics, which directly correlates with research areas across the university.
		Measures and Performance Outcomes	• Implementation of plan to replace faculty in growth areas of mathematics by 2026. • Implementation of plan to hire new faculty in growth areas of mathematics by 2026. • Change in the number of articles published in peer-reviewed journals 2021 to 2026: 75 to 100.
		Costs	• Additional funds will be needed for recruiting and adding faculty lines (three replacement and five new lines).
	Objective 2.4	Attain a leadership position among universities in teaching, research, and external funding in the programmatic and research growth areas of statistics and data science.	

		Action 2.4.1	Maintain strengths of preeminent faculty in biostatistics and bioinformatics, statistics in finance with emphasis on data science, machine learning, and applied statistics, which directly contribute to research across the university.
		Action 2.4.2	Over next 3 to 5+ years, hire faculty in computational and mathematical statistics to take advantage of our preeminent statistics faculty who will develop and mentor new faculty that advance applications of statistics across campus.
		Measures and Performance Outcomes	• Implementation of plan to replace faculty in programmatic and research growth areas of statistics and data science by 2026. • Implementation of plan to hire new faculty in programmatic and research growth areas of statistics and data science by 2026. • Change in the number of articles published in peer-reviewed journals 2021 to 2026: 75 to 100.
		Costs	• Additional funds for recruiting and adding faculty lines (two replacement and two new lines).
	Objective 2.5	Attain a leadership position among universities in teaching, research, and external funding in mathematics education focusing on first-year mathematics learning.	
		Action 2.5.1	Continue to add to strengths in mathematics education especially pedagogical knowledge of mathematics teachers, conceptual learning, problem solving, and reasoning in mathematics.
		Action 2.5.2	Over next 3 to 5+ years, hire faculty in mathematics education with research interests in first-year mathematics learning.
		Action 2.5.3	Improve in assessment and educational research in mathematics and statistics teaching and learning.
		Action 2.5.4	Build capabilities in the growing area of adaptive teaching in first-year college mathematics, which is part of the university gen ed QEP.
		Measures and Performance Outcomes	• Implementation of plan to replace faculty in growth areas of mathematics education by 2026. • Implementation of plan to hire new faculty in growth areas of mathematics education by 2026. • Advancement in pedagogy and availability of resources to improve mathematics education. • Change in student assessment tools and application of best practices for mathematics and statistics teaching and learning. • Implementation of adaptive teaching for first-year college mathematics. • Change in the number of articles published in peer-reviewed journals 2021 to 2026: 75 to 100.
		Costs	• Additional funds for recruiting and adding faculty lines (two replacement and one new line). • Strengthening training and professional development in mathematics education and pedagogy. • Improving instructional capabilities for adaptive teaching.

	Objective 2.6	Intensify and support the research output of the department.	
		Action 2.6.1	Revise and implement a variable workload model for our top quartile researchers to enhance research output of the department.
		Action 2.6.2	Increase number of TA lines, doctoral fellowships, and grant funded graduate research assistants for the PhD program.
		Action 2.6.3	Create a Research Committee in the bylaws that advises the department on research initiatives and helps prioritize research for hiring future departmental postdocs and inviting visiting scholars.
		Action 2.6.4	Support travel to external funding agencies and conferences where program directors will be present to increase contacts for external funding.
		Action 2.6.5	Continue to support faculty participation in multidisciplinary and interdisciplinary activities across research areas.
		Action 2.6.6	Increasing coverage of research accomplishments in university and external media.
		Measures and Performance Outcomes	• Enhanced research output for the department evidenced in more research projects, publication authorship, and speaking invitations at conferences • Revitalized culture of research activity throughout the department with addition of TA lines and graduate research assistants for the PhD program. • Higher funding level due to increase in the number of research assistants. • Increased participation by program directors and faculty outreach for funding and participation in academic events domestically and globally.
		Costs	• Increase in the number of TA lines and externally funded research assistants for the PhD program. • Budget for travel and per diem expenses for participating Program Directors and Faculty. • Outreach and publicity resources for funding and participation in academic events domestically and globally.

Goal 3: **Graduate Education**	The Department of Mathematics and Statistics will expand options toward optimizing the experience of graduate students including updated courses, programs, delivery, and opportunities for funding.		
	Objective 3.1	Add program options for PhD and MS students and strengthen existing programs.	
		Action 3.1.1	Increase the number of students in the graduate program (PhD and MS).
		Action 3.1.2	Increase stipend for graduate assistants to $25K per year.

		Action 3.1.3	Secure 20 more TA lines including tuition remission particularly for MS students to attract domestic students including BIPOC students for MS bridge to PhD program.
		Action 3.1.4	Continue to grow and sustain our Mathematics Education collaborative Ph.D. with Education.
		Action 3.1.5	Maintain our strength in the Math Finance Program.
		Action 3.1.6	Develop an online graduate program in Mathematics Education.
		Action 3.1.7	Explore the establishment of new programs in statistics and data science at both masters and doctoral level.
		Action 3.1.8	Create one or two signature study abroad and exchange programs for mathematics and statistics graduate students.

		Measures and Performance Outcomes	• 2021 to 2026 changes
			  • Number of TA Lines (critical to MS bridge to PhD program and first year mathematics delivery as a part of the QEP): 28 to 48.
			  • Annual stipends: TA $18,500 to $25,000.
			  • Number of PhD students (dependent on number of TA lines): 50 to 80.
			  • Number of MS students: 20 to 40.
			  • Number of graduate degrees awarded: PhD 6 to 10 and MS 10 to 15.
			• Creation and development of the online graduate program in Mathematics Education.
			• Development of criteria to strengthen and measure program gains in Mathematics Education, Math Finance, plus statistics and data science.
			• Availability of study abroad and exchange programs for graduate students.

		Costs	• Adding fellowships, higher stipends for existing TA lines plus 20 more TA lines. • Additional programming and added academic program options. • Participation in domestic and global programs including study abroad and exchange programs. • Expansion of facilities capacity to provide workspace, along with furnishings, and equipment.
	Objective 3.2	Increase research and professional development opportunities for graduate students through external funding and collaborations including sponsorships, internships, and research partnerships.	
		Action 3.2.1	Increase research experience opportunities for our students particularly MS students.
		Action 3.2.2	Increase number of doctoral fellowships and grant funded graduate research assistants.
		Action 3.2.3	Expand our contacts with industry and business by engaging industry alumni interacting with the department faculty and students.
		Action 3.2.4	Pursue sponsorships by regional non-academic entities of internships and collaborative research.

		Action 3.2.5	Increase engagement including global engagement of graduate students.
		Action 3.1.6	Expand professional development opportunities for graduate students.

		Measures and Performance Outcomes	• 2021 to 2026 Changes:
			  • Number of graduate students supported by external funding: 2 to 6.
			  • Number of study abroad and exchange programs for graduate students: 0 to 2.
			• Tracking initiated of MS graduates in addition to PhDs on postgraduate employment.
			• Monitoring and tracking PhD and MS student populations and professional development activity using detailed data.
			• Implementation of connection actions (mailing list, events) to gain alumni followers and "ambassadors" for the department.

		Costs	• Establishing research opportunities, sponsorships, internships, and research partnerships. • Funding positions for graduate research assistants at competitive rates. • Adding academic programming options requiring expanded staff and infrastructure. • Training and professional development programs.

Goal 4: **Community Engagement**	The Department of Mathematics and Statistics will strengthen relationships among local and regional research institutes, governments, agencies, industry entities, K-12 schools, colleges, alumni, and the interested public.		
	Objective 4.1	Connect and engage with business and industry entities in the Charlotte area.	
		Action 4.1.1	Increase engagement with Business and Industry.
		Action 4.1.2	Explore cooperative programs involving sponsorships and internships.
		Action 4.1.3	Increase engagement with alumni and industry partners.
		Measures and Performance Outcomes	• Creation of a plan and schedule to produce results from actions. Accountability to scheduled activity. • Publication of an annual newsletter.
		Costs	• Establishing a statistical consulting program and implementing services. • Developing information resources, webs pages/online promotion, and related outreach. • Conducting outreach program to reach alumni, prospective sponsors/collaborators, and followers.
	Objective 4.2	Connect and engage with local and regional research institutes and Government (BIG) including state and federal agencies, and national research laboratories.	
		Action 4.2.1	Expand partnerships with national and international institutes with facilities in the region.

		Action 4.2.2	Establish student internship programs with government research centers.
		Action 4.2.3	Encourage faculty participation in summer research fellowship programs at national laboratories.
		Measures and Performance Outcomes	• Increase in partners (business, industry, and government) from 2 to 5 to 10 by 2026. • Establishment of internships and faculty research fellowships with partners and research centers.
		Costs	• Preparing services for cooperative projects services and managing proposals. • Developing information resources, webs pages/online promotion, and related outreach. • Setting up, facilitating, and monitoring internship programs.
	Objective 4.3	Increase visibility among K-12 schools, colleges, alumni, and the interested public regarding news and accomplishments. Offer engagement opportunities and services to the community.	
		Action 4.3.1	Engage with external partners through social media and a department newsletter.
		Action 4.3.2	Establish a yearly luncheon for alumni and partners.
		Action 4.3.3	Maintain and expand partnerships between our department and K-12 education.
		Measures and Performance Outcomes	• Activity reports from individual assigned to oversee and implement actions. Follow-through with alumni, partners, and educational leaders.
		Costs	• Initiating communications to alumni and interested followers and staging events. • Setting up and supervising department and K-12 partnerships.

Goal 5: **Diversity, Equity and Inclusion**	The Department of Mathematics and Statistics will advance our ongoing commitment to foster an inclusive departmental culture that champions diversity to provide equitable pathways to success for all faculty, students, and staff, and welcomes and supports people from diverse backgrounds, abilities, and perspectives.		
	Objective 5.1	Achieve measurable changes with respect to roles of women and under-represented groups that include training, professional development, resources, and supportive activities.	
		Action 5.1.1	Increase participation of women and people from under-represented groups in all levels of department activities.
		Action 5.1.2	Support the professional development of faculty and students.
		Action 5.1.3	Support staff participation in professional and technical training activities at Charlotte.
		Action 5.1.4	Strengthen the support network for graduate students.

		Measures and Performance Outcomes	• 2021 to 2026 Changes:
			  • Percent of women faculty: 32% to 40%, doubling by numbers.
			  • Percent of women PhD students: 40% to 50%.
			  • Percent of women MS students: 50% and continue to maintain at this level.
			  • Percent of women BS students: 25% to 35%.
			  • Number of under-represented faculty: 3 to 6.
			  • Number of under-represented graduate students: PhD 2 to 5 and MS 2 to 4.
			  • Percent of under-represented undergraduate majors: 21% to 30%.
			• Track participation of under-represented categories.
			• Increase professional development activities with internal resources and external activities.
			• Establish formal and informal networking activities for graduate students

		Costs	• Adding recruiting expenses including graduate students admit weekend, recruitment fellowships for BIPOC students, and professional development costs. • Mentoring and sponsorship programs.
	Objective 5.2	Advocate for competitive salary and equity in advancement opportunities.	
		Action 5.2.1	Develop collaborative early entry degree programs with regional HBCU to recruit graduate students from underrepresented groups including BIPOC students.
		Action 5.2.2	Establish a chapter of Association for Women in Mathematics (AWM).
		Action 5.2.3	Create a department standing committee on diversity charged with monitoring diversity, equity, and inclusion including compensation equity.
		Action 5.2.4	Cast a wider net for recruiting women and underrepresented faculty.
		Action 5.2.5	Establish a mentoring program for graduate students, and regular events and a seminar tailored to foster a sense of community.
		Measures and Performance Outcomes	• Improvement in graduate student numbers from under-represented groups due to early entry degree programs, wider recruiting, mentoring, and networking. • Establishment of the UNCC-Charlotte chapter of the Association of Women in Mathematics. • Creation of the department standing committee on Diversity, Equity, and Inclusion.
		Costs	• Supporting faculty and students to attend professional meetings and women's professional association startup costs. • Mentoring, events, and a seminar.