The University Senate of Michigan Technological University

Proposal 23-26

Proposal to Establish a Master of Science in STEM Public Policy

Basic Program Information

Primary Contact: Dr. Adam Wellstead (Department of Social Sciences), awellste@mtu.edu
Program/Degree type: Master of Science
Program Title: STEM Public Policy MS
Planned Implementation Date: Fall 2027
Program location/modality: Online
Target student population: Working professionals, Recent STEM BS graduates who wish to pursue a policy-focused career

General description and characteristics of the program

Unlike a traditional Master of Public Administration (MPA) or Public Policy (MPP) program, a STEM-based approach places heavier emphasis on the role of data analytics, engineering and technology management in policy making. This coursework-based degree encompasses core elements of public management, including policy analysis, leadership, ethics, and program evaluation, and is grounded in a strong technical foundation, ensuring graduates can effectively manage modern, tech-driven public-sector challenges (e.g., smart city initiatives, digital governance, cybersecurity threats).

Rationale

Over the past three years, MTU has expanded online opportunities (certificates and online degrees). The online graduate public policy certificate, established in 2022, has attracted a growing number of non-traditional, off-campus students (at least 20). This established certificate will serve as an anchor for this proposed online MS degree program. This degree will capitalize on MTU's strength as a leader in STEM by incorporating the established STEM-based certificates into this new degree program in one of five tracks: **Health Policy** (certificate options include: Public Health Informatics, Security and Privacy in Healthcare, Artificial Intelligence in Healthcare), **Advance and Applied Methods for Policymaking** (Foundations in GIS for Natural Resources, Advanced GIS for Natural Resources, Applied Statistics, Remote Sensing for Natural Resources, Artificial Intelligence for Business Information Systems), **Cybersecurity & Computer Engineering** (Foundations of Cybersecurity, Control Systems), **Natural Resources and Sustainable & Resilient Systems** (Advanced Photogrammetry and Mapping with UAS, Advanced Electric Power Engineering, Engineering Sustainability and Resilience,

Resilient Water Infrastructure, Water Resources Modeling, Automotive Systems & Control, Hybrid Electric Drive Engineering), and **Engineering Management** (Dynamics Engineering Systems in Aerodynamics OR Dynamic Systems; Manufacturing and Production Systems; Structural Engineering Management in Advanced Analysis, Bridge Analysis and Design, Building Design, Hazard Analysis OR Timber Building Design).

Related programs: within MTU and at other institutions

A Master of Public Policy degree is well understood, and many institutions in the United States and globally house these degrees. This program will be consistent with the standards of the Network of Schools of Public Policy, Affairs, and Administration (NASPAA). Our program format would be unique to MTU, and stackable. This is designed to provide public management training that is useful across a number of professional domains, e.g., health informatics, engineering management, project management, etc.
Some examples of online MPP programs include:
Master of Public Policy University of Michigan
Master of Public Policy University of Colorado-Denver
Master of Public Policy Oregon State University
Master of Public Policy Drexel University

Projected Enrollment

The enrollment in this program is tied to the current online Graduate Public Policy Certificate, which is central to this stackable degree. Initially, we anticipate a modest enrollment of 5 students in this degree. From the Department of Social Sciences' perspective, these students represent additional enrollment in the certificate program, which can be accommodated without additional resources. In collaboration with Global Campus, we will develop an aggressive marketing strategy and capitalize on ongoing corporate scholarships over the next 2-3 years. Concurrently, we will work with the College of Science and Arts to market an accelerated version of this degree to current undergraduate students. In the short term (2-3 years), we anticipate enrolling 10 students, with the potential to reach a program size of approximately 20 students.

Specialized Accreditation Requirements

For this proposal, there are no immediate accreditation requirements. However, as noted above, one of our longer-term goals is to gain NASPAA accreditation.

Professional Licensure Requirements

None

Curriculum Details

Learning Goals

Learning goals and student learning outcomes are taken from the NASPAA identified competencies (Appendix A). NASPAA is the global leader in public service education.

1. Develop the capacity for critical thinking about public policy issues and the ability to conduct professional analyses of social, political, and economic structures and bureaucratic processes;
2. Analyze the feasibility of solving complex social problems within the context of existing political and economic institutions and processes.
3. Articulate the essential role of public institutions in democratic societies and the importance of democratic values in the delivery of public services;
4. Apply concepts and measures of efficiency, equity, and adequacy to the evaluation of government policies;
5. Diagnose problems and develop feasible solutions through the application of theories and frameworks to “real world” problems;
6. Appraise substantive topical areas of public policy and an understanding of policy theory design, implementation, and effectiveness;

Assessment Plan
In terms of assessing the above competencies and student outcomes, instructors of the core Social Sciences and Economics courses will incorporate these competencies and selected student outcomes into their syllabi, readings, course materials, and assignments. See Appendix B.

Upon entry to the program, students will discuss with the STEM Online Public Policy MS advisor(s) their desired certificate choices, at which point, prerequisites, requirements, and other details for that particular certificate will be discussed, and the advisor will communicate this to the appropriate certificate administrator to ensure that the student is completing the appropriate coursework.

Degree Schedule
Total Credits Required: 30 credits (minimum)

Required Core (15 credits)

- **SS5301 Policy Process** (3 credits) (asynchronous; currently offered during the Fall, Spring, and Summer terms)
- **SS5350 Policy Analysis** (3 credits) (asynchronous; currently offered during the Fall, Spring, and Summer terms)
- **SS5318 Public Management** (3 credits) (asynchronous; currently offered during the Fall, Spring, and Summer terms)
- **SS5626 Program and Policy Evaluation** (3 credits) (asynchronous; new for Fall 2025)

- **EC5300 Managerial Economics** (3 credits) (asynchronous; currently offered during the Spring term)
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Note: Completion of SS5301, SS5318, and (SS5350 or SS5626) meets the requirements for the nine-credit online graduate public policy certificate.

Required Online STEM-based Tracks (9 credits minimum)

- **Build-Your-Own (choose 15 credits from options below)**
- **Health Policy (choose one certificate option)**
    - Public Health Informatics (15 credits)
    - Security and Privacy in Healthcare (9 credits)
    - Artificial Intelligence in Healthcare (12 credits)
- **Advanced and Applied Methods for Policymaking (choose one certificate option)**
    - Foundations in GIS for Natural Resources (9 credits)
    - Advanced GIS for Natural Resources (12 credits)
    - Applied Statistics (9 credits)
    - Remote Sensing for Natural Resources (9 credits)
    - Artificial Intelligence for Business Information Systems (9 credits)
- **Cybersecurity & Computer Engineering (choose one certificate option; REQUIRED: undergraduate in computer science, computer engineering, or software engineering)**
    - Foundations of Cybersecurity (9 credits)
    - Control Systems (9 credits)
- **Natural Resources & Sustainable & Resilient Systems (choose one certificate option; REQUIRED: undergraduate in civil engineering, mechanical engineering, or electrical engineering)**
    - Advanced Photogrammetry and Mapping with UAS (9 credits)
    - Advanced Electric Power Engineering (15 credits)
    - Engineering Sustainability and Resilience (9 credits)
    - Resilient Water Infrastructure (9 credits)
    - Water Resources Modeling (9 credits)
    - Automotive Systems & Controls (15 credits)
    - Hybrid Electric Drive Vehicle Engineering (15 credits)
- **ENGINEERING MANAGEMENT (three sub-tracks)**
    - **Dynamic Engineering Systems (choose one certificate option; REQUIRED: undergraduate in Mechanical engineering or Materials Sciences Engineering)**
        - Aerodynamics (9 credits)
        - Dynamic Systems (9 credits)
    - **Manufacturing and Production Systems (choose one certificate option; REQUIRED:** undergraduate in Mechanical engineering or related field)
        - Manufacturing Engineering (9 credits)

    - **Structural Engineering Management (choose one certificate option; REQUIRED:** undergraduate in Civil or Environmental Engineering, or related field)
        - Structural Engineering: Advanced Analysis
        - Structural Engineering: Bridge Analysis and Design (9 credits)
        - Structural Engineering: Building Design (9 credits)
        - Structural Engineering Hazard Analysis (9 credits)
        - Structural Engineering: Timber Building Design (9 credits)

ELECTIVES
The number of elective credits needed to reach the program minimum will vary depending on the certificate selection above, from 0-6 credits. Electives can be satisfied via the following options:

- **Transfer Policy Courses from a NASPAA-accredited program**
    - Budgeting/Finance
    - Evidence-based decision-making
    - Non-profit management
    - Organizational management and behavior
    - Public human resource management
    - Public service leadership and ethics
    - Or a similar course to those above
- **A prerequisite advisor-approved course required for any of the above certificate options.**
- **Other Policy Courses Offered Online by the Department of Social Sciences and approved by the program advisor**
- **Other courses offered by Michigan Tech and approved by program advisors.**

Model Schedule*

Scenario #1–1 Year Degree Schedule *Core + Foundations of Cybersecurity Certificate*
Fall (Year 1)
SS5301 Policy Process (3 credits)**
SS5318 Public Management (3 credits)**
CS5471 Computer Security (3 credits)
Elective (3 credits)

Spring (Year 1)
EC5300 Managerial Economics (3 credits)**
SS5350 Policy Analysis (3 credits)**
CS5470 Development of Trusted Software** (3 credits)
Elective (3 credits)

Summer (Year 1)
SS5626 Program Evaluation** (3 credits)

CS4723 Network Security (3 credits)

*** only offered once during an academic year*

Scenario # 2–2-Year Degree Schedule *Core + Public Health Informatics Certificate*
Fall (Year 1)
SS5301 Policy Process (3 credits)**
SS5318 Public Management (3 credits)**
SAT4650 Applied Computing in Python (3 credits; prerequisite or transfer of similar course from other institution)

Spring (Year 1)
SS5350 Policy Analysis (3 credits)**
SAT5424 Population Health Informatics (3 credits)**
SAT 5165 - Introduction to Big Data Analytics (3 credits)**

Fall (Year 2)
SS5626 Program Evaluation (3 credits)**
EC5300 Managerial Economics (3 credits)**
SAT5317 Internet of Medical Things (IoMT) and Remote Patient Monitoring (RPM) (3 credits)**

Spring (Year 2)
KIP4740 Epidemiology (3 credits)**
SAT5424 Population Health Informatics (3 credits)**

*** only offered once during an academic year*

New Course Descriptions

No new courses are needed

Faculty Qualifications

Name	Role	Role Detail
Adam M. Wellstead	TTF & Co-Director	SS5301, SS5318, SS5350, SS5626
Kayla Gabehart	TTF & Co-Director	SS5301, SS5318, SS5350, SS5626
Leeann Youn	ITF	SS5350, SS5626
Jenny Apriesnig	TTF	EC5300
Laura E. Connolly	TTF	EC5300
Mark Rouleau	TTF	SS5350, SS5626
Angie Carter	TTF	SS5318, SS5626
Dan Shtob	TTF	SS5318, SS5626
Roman Sidortsov	TTF	SS5318, SS5626

All of the above faculty have Graduate faculty status (Senate Policy 711.1 and procedure 711.1.1) and have met the Standards for Online Courses (Senate Policy 116.1 and procedure 116.1.1).

Note: Only the faculty who will teach the required policy and economics courses have been identified.

Program-specific policies, regulations, and rules

No additional policies, regulations, or rules required.

Resources Needed

Library and other learning resources needed

No additional resources required.

Suitability of existing space, facilities, and equipment

No additional space, facilities, or equipment required.

Program Costs

MTU Global Campus will provide marketing assistance.
No additional costs are expected to launch this program.

108.1.2: Criteria for Financial Evaluation Proposed Academic Programs

Relation to University Strategic Plan

Michigan Technological University's stated vision and mission are as follows:

> **Vision**
> Michigan Tech is a globally recognized technological university that educates students, advances knowledge, and innovates to improve the quality of life and to promote mutual respect and equity for all people within the state, the nation, and the global community.
>
> **Mission**

> Create solutions for society's challenges by delivering action-based undergraduate and graduate education, discovering new knowledge through research, and launching new technologies through innovation.

Impact on University Enrollment

- **Projected number of students in the program**: Five initially with a five year goal of 20 students per year.
- **Source of new students**: Professional certificate-based students interested in stackable degrees, Current STEM-based undergraduate students enrolled in or outside of Michigan Tech
- **How will demand for the new program correlate with existing enrollment patterns?**
- **Current enrollment in the unit**: Per the MTU Compendium:

Impact on Resources in Home Department

This would include, but not be limited to:

- **Faculty lines**: NONE
- **Faculty and student labs** NONE:
- **Advising**:. NONE
- **Assessment**:

Impact on Resources in Other Units Within the University.

Based on the expected enrollment, this new program will increase the number of students taking a range of courses across units on campus. However, the number of certificate options prevent any one unit from taking on an overwhelming number of newly enrolled students. Additionally, those units where students complete non-social science certificates will receive additional returns.

Impact on other resources

Minimal to none.

Assessment of the ability to obtain the necessary resources assuming requested funds are obtained

Faculty and resources are already committed

Past Proposal Outcomes

The proposing unit has initiated the following new degree programs in the last five years:

Master of Science in Sustainable Communities
- Current Enrollment: 15
- Projected: 15

Bachelor's of Science Degree in Policy and Community Development
- Current Enrollment: 2
- Projected: 0

How have degree programs added in the past five years affected total enrollment in the department? They have had a modest (MS-SC) to minimal impact (BS-PCD).

How do the benefits from this program compare to other alternatives that are currently under consideration or development?

There are no alternatives under consideration. The proposed degree has a number of benefits.
- It aligns the Department of Social Sciences curriculum with MTU's broad STEM goals
- It provides STEM-based students and current professionals many options to develop a flexible and stackable degree based on their career trajectory
- It would be a unique degree. Based our research, there is no STEM-based MS degree in the United States
- It promotes the online mission of MTU Global Campus
- The additional costs associated with the degree are nearly zero. Thus, one graduate would more than result in a "break even" scenario.

Appendix A. NASPAA Competencies

NASPAA Competency	Example Student Learning Outcomes
To lead and manage in the public interest.	● Apply public management organization theories. ● Appraise the organizational environment, both internal and external, as well as the culture, politics and institutional setting. ● Demonstrate the ability to lead change in a complex environment. ● Lead, manage, and serve a diverse workplace and citizenry. ● Assemble and manage inclusive and productive cross-sector paid and volunteer workforces. ● Lead and manage people effectively, whether volunteers or compensated, fostering team building, commitment, creativity, and performance. ● Manage large and complex programs and projects. ● Manage information and networks. ● Leverage data and technological change for public good. ● Adopt agile technologies to solve complex mission problems. ● Lead or operate in networks of people and organizations. ● Manage contracts and public-private partnerships. ● Apply risk management principles to support organizational missions. ● Resolve conflict through negotiation and consensus-building processes. ● Understand the relationships between public policy, whether proposed or enacted, and leadership and management in implementation. ● Identify and apply key elements of a strategic planning or other community-based planning processes to a nonprofit or government organization. ● Demonstrate an appreciation for the complexities of decision-making in the public interest. ● Create sustainable communities through effective public budgetary and nonprofit fund development practices.
To participate in, and contribute to, the policy process.	● Apply techniques for program evaluation and forecasting. ● Demonstrate the ability to structure a policy problem and analyze policy alternatives, using a variety of frameworks and tools. ● Understand the value of citizen participation and social inclusion in the policy process. ● Formulate and communicate an impact evaluation plan. ● Describe and work within the institutional, structural, and political contexts of policy making and implementation. ● Describe and execute the policymaking process, including defining the problem, setting the agenda, formulate policy, implement policy and evaluate policy. ● Incorporate interest groups, executive-legislative relationships, judicial decision-making, and the media in the policy process. ● Prepare a budget reflecting policy priorities.

	● Use risk management to meet the mission. ● Recognize the social construction of problems. ● Build consensus.
To analyze, synthesize, think critically, solve problems, and make evidence-informed decisions in a complex and dynamic environment.	● Articulate and apply methods for measuring and improving organizational, program and individual performance. ● Demonstrate ability to apply a variety of analytical frameworks to analyze complex problems and formulate recommendations. ● Employ evidence-informed analytical tools for collecting, analyzing, presenting, and interpreting data, including appropriate statistical concepts and techniques, such as data analytics or artificial intelligence. ● Develop and use statistical models to support strategic decision-making. ● Manage data as a strategic asset. ● Identify and employ alternative sources of funding, including grants, taxes, and fees. ● Develop and implement strategic plans. ● Understand and apply theories of decision-making and models. ● Select and implement a data-collection process appropriate to a resource-constrained small nonprofit organization or local government. ● Demonstrate the ability to collect, analyze and use data from constituent or program beneficiaries. ● Use appropriate technology to evaluate policy problems and offer solutions.
To articulate, apply, and advance a public service perspective.	● Apply concepts of social equity to public service. ● Identify and analyze ethical dilemmas involving fiduciary stewardship of public resources, stakeholders and a variety of power relations, and will weigh alternative courses of action in terms of responsibility, fairness and achieved public interest. ● Know the meanings of due process, authority and social equity; and recognize the role of these values for the assurance of democratic governance, and understand the implication of upholding them for public management practice. ● Behave ethically and with integrity: Tell the truth, keep confidences, admit mistakes, and do not misrepresent oneself, one's goals or the facts for personal advantage. Behave in a fair and ethical manner toward others. ● Distinguish short- from long-term fiscal consequences of program and policy decisions. ● Exercise ethical responsibility when conducting research and making decisions. ● Identify the short- and long-term impacts of program and policy decisions on the physical environment. ● Understand and apply criteria appropriate to public service.

	● Use effective oral communication to articulate policy decisions. ● Negotiate outcomes sensitive to the interests and values of others.
To communicate and interact productively and in culturally responsive ways with a diverse and changing workforce and society at large.	● Communicate effectively in writing by preparing clear, concise and well-organized written materials tailored to the audience's level of expertise and needs. ● Demonstrate interpersonal communication skills required to serve empathetically and effectively diverse sets of people. ● Communicate effectively in speech by presenting oral information accurately, clearly, concisely and persuasively tailored to audience's level of expertise and needs. ● Demonstrate flexibility by adapting behavior and work methods to differences (whether they are differences in thought, communication style, perspective, age, interests, fairness or some other variable); to new information, to changing conditions and to unexpected obstacles. ● Demonstrate self-knowledge through awareness of one's own stylistic preferences for relating to others, communicating with others, making decisions, managing yourself in groups, and the impact that this has on relationships and your ability to influence others. ● Demonstrate sensitivity and responsiveness to beliefs and behaviors associated with differences among people because of their ethnicity, nationality, race, gender, physical characteristics, religion, age, etc. ● Demonstrate facilitation skills by actively and effectively eliciting information, views, input, suggestions, and involvement of others in pursuit of common goals. ● Build actionable consensus. ● Discern the interests and values of others; surface assumptions; secure agreement on ground rules and tolerable outcomes; gain cooperation of others to accomplish goals. ● Relate to all kinds of people and develop appropriate rapport that leads to constructive and effective relationships; finds common ground with a wide range of stakeholders. ● Work productively in teams by demonstrating composure, professionalism and effective working relationships, including understanding others' priorities, needs and concerns and sharing information, expertise and resources. ● Recognize, and adapt to, cultural differences in community interactions and communication.

Appendix B. Illustrative examples of NASPAA assessment of student learning

Learning Outcomes (Competency)	Evidence Collected	Analysis
Manage projects	Project management report	Rubric applied by faculty
Resolve conflict and negotiate	Teams perform in negotiation simulation	Evaluation by panel of practitioners using faculty-designed rubric
Manage public and non-profit partnerships	Students write a paper on a specific non-profit	Evaluated by faculty and the non-profit using 5-point rubric
Recognize and contribute to the public policy process	Students write a thesis on the policy process	Rubric applied by faculty
Manage public and non-profit partnerships	Student grades in course on generic management	Rubric applied by faculty
Formulate and communicate a project that adds public value	Student project requiring development of public policy information and analysis course	Faculty members evaluate student projects against a rubric that details 4 distinct expectations

**Note these are examples to guide in incorporating learning competencies, outcomes, and analysis into courses.*