Faculty Development Plan

[redacted]
Assistant Professor
Department of Mechanical Engineering, Brigham Young University
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Summary

My central aim is to help students become capable, influential engineers through rigorous classroom learning, meaningful research, and high-impact experiential learning in a spiritually strengthening, gospel-centered environment. Building a sustainable research program, expanding robotics capacity, and deliberately improving my teaching will support their development while strengthening the impact and recognition of BYU Mechanical Engineering.

1. Teaching

Self-Assessment

I care deeply about students and try to consider their development holistically. Before my first class in ME EN 275, I learned every student's name. Throughout the course I worked to strengthen students' sense of belonging and empower them to learn. I used varied teaching techniques, frequent opportunities for practice, and regular checks for understanding. I also recorded notes after every lecture about how the material was received, questions students asked, and changes that could improve the next offering.

In my first offering of ME EN 275, I collected midcourse feedback and the university's end-of-course evaluations. Student feedback was positive, and students performed strongly on exams and in their final grades. My principal areas for improvement are slowing the pace of selected presentations, opening class with stronger hooks that engage students with the concepts sooner, and improving the structure and clarity of course materials, especially homework sets.

Goals

Near term, 2026–2027

- **Low-stakes assessment:** Refine the frequent, low-stakes assessment strategy in ME EN 275. Explore the effect of reading quizzes vs weekly quizzes and create variety in the preparation assessments.
- **Culminating experiences:** Add a culminating experience to the numerical-methods portion of the course, potentially a unit in which students create a tutorial that explains and applies one concept.
- **Course materials:** Improve the structure and clarity of homework sets. Students felt they were sometimes unclear and scattered.
- **Mechatronics:** Teach the established mechatronics course in Winter 2027 with the initial objective of learning its content and operation before attempting any major changes.

Longer term

- Continue refining my annual teaching assignments through evidence-informed changes and consider participating in the scholarship of teaching and learning.
- Expand meaningful experiential learning experiences in the classroom.
- Ensure an adaptive and holistic approach to AI integration into my courses and the department as a whole.
- Introduce and support robotics curriculum in the department, including our new introduction to robotics class and the interdisciplinary robotics team.

Relationship to Department and University Aspirations

These goals support the preparation of influential engineers by combining deliberate instruction, frequent practice, and culminating learning experiences. Attention to belonging, student agency, and evidence-informed revision supports the broader goal of helping students participate, learn, and succeed.

Resources and Measures

No major additional teaching resource has yet been identified. Teaching assistants, equipment, or course-development support will be requested only when a concrete need emerges. I will assess progress using:

- performance on relevant assignments and exams
- midcourse and university end-of-course feedback
- quality of the culminating numerical-methods experience and student engagement with it
- post-lecture reflection notes and documented revisions
- comparisons with the prior offering where they are meaningful

2. Scholarship

Self-Assessment

My research program centers around field robotics, with current emphasis on autonomy, path planning, and analysis for data gathering. I am building a coherent program around intelligent robotic systems that produce useful information in real environments and keeping the applications broadly applicable. A distinctive strength of this work is its combination of fundamental and applied research with the difficult work of deploying systems in the field.

I have had early success with industry and am actively building relationships in conservation, wildlife science, and the ONR, AFRL, and ARL communities. Since joining BYU, I have secured a first grant from Lockheed Martin, partnered on a funded sage-grouse detection project, received a Redd Foundation IDR award, and received an NVIDIA Academic Grant that provides substantial computing hardware. I have also submitted more than $1 million in proposals and invested significant effort in collaborations, networking, and white papers.

My group currently includes three funded master's students. One received a SMART Fellowship and plans to transition to a PhD program. I have mentored 14 undergraduate researchers while at BYU. Four are currently paid, four former students have entered competitive graduate programs, two received prestigious fellowships at their respective institutions, and one received a Utah NASA Space Grant Consortium undergraduate scholarship. The central constraint on growth is securing longer-term funding in a changing funding environment. As opportunities develop, I need to learn when to slow down on opening new funding threads and concentrate on the strongest directions.

Goals

By December 2026

- Submit at least two manuscripts with BYU student authors and continue meeting the department expectation of averaging two journal papers per year.
- Submit two additional major proposals, currently anticipated for ONR and NSF.
- Create a prioritized 12–18-month funding plan identifying the strongest multi-year opportunities, anticipated submission windows, and next actions.

Short term, 1–4 years

- Establish a diversified funding portfolio that includes at least one multi-year award capable of supporting a core group of graduate and undergraduate researchers.
- Build, as funding and mentoring capacity allow, a sustainable group of approximately 5–8 graduate students and at least 8 funded undergraduate students.
- Develop toward 5–8 papers annually with BYU students as the program matures, while emphasizing quality, student development, and research impact.
- Strengthen complementary field-robotics capabilities that broaden BYU's research and educational opportunities.
- Expand durable collaborations across BYU, government, industry, and relevant application communities.

Long term, 5–8 years

- Increase the visibility and impact of BYU field-robotics research.
- Become known for consequential, deployable research and excellent student preparation.
- Define more specific indicators of external recognition as the research program and its organizing themes mature.

Mentoring and Institutional Alignment

Student development is central to my scholarship. I want students to become capable engineers and researchers who are competitive in the job market and equipped to pursue their aspirations. The group will combine fundamental and applied research, provide meaningful ownership, and give students experience deploying robotic systems in real environments. Growth will be paced by funding and by my ability to mentor students effectively while also enabling graduate students to become mentors themselves.

This approach supports BYU's aspiration to prepare influential engineers through research ownership, publication, collaboration, and deployment. My research program can also increase BYU's research impact and external visibility while creating complementary research, educational, and experiential-learning opportunities.

Resources and Measures

Required resources

- stable funding for graduate and undergraduate researchers
- travel and field-deployment support
- suitable lab space and continued technical support
- continued access to high-performance computing
- continued senior-faculty and departmental mentoring

Measures of progress

- manuscripts submitted and journal papers published, including BYU student authorship
- funding duration, source diversity, and students sustainably supported
- outcomes of deployed systems, field campaigns, software, or data products
- student fellowships, publications, placements, and progress toward individual career goals
- durable collaborations and external recognition

3. Citizenship

Self-Assessment

I enjoy my citizenship responsibilities and find them to be meaningful and rewarding. I currently serve on the Assessment Committee and the department's AI ad hoc committee. Through the Undergraduate Research Working Group, I helped complete an assessment, report, and proposed plan. That work is now moving into a pilot unified undergraduate research-for-credit program. I advise BYU Combat Robotics, helped launch an interdisciplinary BYU robotics club working toward the RoboBoat competition, and am supporting development of a new introductory robotics course in our department. My lab has also completed planned outreach with Utah Underwater Robotics, local FIRST Robotics Competition teams, and the state competition. On the larger citizenship level, I continue to consistantly review papers for leading robotics journals and conferences and am currently serving on the Senior Program Committee for the 2026 IEEE International Conference on Intelligent Robots and Systems (IROS).

My biggest struggle at this stage is balancing citizenship with teaching and scholarship. I need to keep focused on the most consequential citizenship activities and avoid overcommitting to new initiatives. I will continue to seek guidance from my mentor and chair to ensure that my citizenship contributions are meaningful, sustainable, and aligned with departmental priorities.

Goals

Active and near-term commitments

- Continue contributing actively to the Assessment Committee.
- Support the Fall 2026 undergraduate research-for-credit pilot and use its results to inform the next iteration.
- Help BYU Combat Robotics create meaningful experiences across academic levels and a sustainable organizational structure.
- Help the interdisciplinary robotics team prepare for the RoboBoat competition in early 2027.
- Continue reviewing papers for leading robotics journals and conferences and attending devotional in person with my group or department.

Longer-term direction

- Choose citizenship activities that build academic community, experiential learning, undergraduate research access, and sustainable robotics capacity.
- Expand professional leadership and outreach selectively after the teaching and research programs reach a more sustainable state.
- Serve as a journal editor

Relationship to Department and University Aspirations

Robotics teams, undergraduate research pathways, and faculty collaboration give students additional opportunities to practice leadership and engineering judgment. Combat Robotics, RoboBoat, and the research-for-credit pilot program extend experiential learning beyond conventional coursework. Assessment and AI policy work address concrete departmental needs, while sustainable student programs and selective professional service can increase BYU's impact and external visibility.

Resources and Measures

Required resources

- continued collaboration and institutional support for the undergraduate research-for-credit pilot
- sustainable student leadership and faculty collaboration for robotics teams
- travel support for selected competitions
- mentorship and guidance from senior faculty and the department chair to ensure citizenship contributions are meaningful, sustainable, and aligned with departmental priorities.

Teaching Development Project Proposal

ME EN 275 - Computational Methods

Fall 2026 | [redacted]

In Fall 2026, I will teach ME EN 275 for the second time. Building on what I learned and observed from my first time teaching the course, my goals are to improve preparation and formative feedback, adding a culminating experience for numerical methods, and making homework directions more reliable and accessible.

1. Mixed Preparatory Quizzes

I will rename the existing reading quizzes as *preparatory quizzes* and retain their consistent pre-class cadence. Each quiz will include three expected reading-comprehension questions plus a varying mix of application, assessment, or free-response questions. This format preserves accountability for preparation while giving students and me more informative evidence of understanding before and during class.

Evidence and use. I will examine completion and attempt patterns, item-level performance by question type, targeted midcourse feedback about usefulness and workload, and my notes about misconceptions revealed in class. I will use these results to refine the approach in the next time I teach the course.

2. Culminating Numerical-Methods Tutorial

I noticed that students do not participate in a culminating experience for the numerical methods portion of the course. I'd like to introduce a new component to address this gap. Each student will create an individual four-to-six-minute video tutorial that accurately explains and applies one numerical-methods concept. Students will view four assigned tutorials and vote on their favorites. Selected finalists will be shared with the class, and an audience-choice winner may receive extra credit. With explicit student permission, selected tutorials may be used in future course materials.

Evidence and use. I will also review patterns of strengths and misconceptions, peer-viewing participation, representative student work, and targeted feedback about the learning value and workload of creating and viewing the tutorials. The evidence will guide future changes to the prompt, preparation, and peer-viewing process.

3. Authoritative Homework PDF

I received a lot of feedback about the clarity and organization of the homework assignments. I will create one organized, versioned PDF that fully contains the assigned textbook problems and contains all instructor alterations, corrections, and errata needed to complete them. A visible revision date and short change log will be kept to track updates.

Evidence and use. I continue to take not of student questions and confusion about homework assignments. I will track correction announcements, clarification questions attributable to problem statements, recurring error patterns, relevant midcourse and end-of-course comments, and revisions to the document.

Evaluation and Continued Improvement

I will combine student-experience feedback, performance data, post-lecture reflections, and documented revisions. The evidence will guide future changes to the prompt, preparation, and peer-viewing process. I will use the combined evidence to decide what to retain, revise, or discontinue in the next offering.

Scholarship Development Project Proposal

Developing Habits of Scholarly Productivity

Through December 2026 | [redacted]

1. Research Focus

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2. Goals by December 2026

- Submit at least two manuscripts with BYU student authors.
- Submit two major research proposals, currently anticipated for ONR and NSF.
- Create a prioritized 12–18-month funding plan identifying the strongest multi-year opportunities, anticipated submission windows, and next actions.

3. Productivity Strategies

Daily protected scholarship hour. I will reserve one uninterrupted hour each workday for working on papers or proposals, with writing, revision, and responses to reviews as the default uses. Analysis, figures, reading, and planning may use the hour when they directly related. I will try to keep this hour free from outine meetings, lab administration, email, experiments, and open-ended exploration.

Weekly pipeline review. During the final 10–15 minutes of the last protected block each week, I will review active manuscripts and proposals and record each product's current state, next action, responsible person, and target date. I will also identify blockers and deliberately defer lower-priority work.

4. Evaluation

I will maintain a simple weekly record of completed protected hours, the manuscript or proposal advanced in each block, completion of the pipeline review, and the next milestone for each active product.

The target is one protected hour each workday. I will consider the habit established if I average at least four completed protected hours per workweek and complete the pipeline review in at least 80 percent of weeks through December 2026. Completion of the funding plan and submission of the two manuscripts and two proposals will be tracked separately as the principal scholarly outcomes.

Citizenship Development Project Proposal

Building Community through Collaboration

Through December 2026 | [redacted]

I will focus my citizenship development on a small number of initiatives that strengthen departmental programs, create meaningful student opportunities, and connect me more deliberately with the broader robotics community. These priorities are intended to establish regular habits of collegial outreach while keeping my service focused and sustainable.

1. Research-for-Credit Pilot

I will work principally with David Fullwood and other participating faculty to support the Fall 2026 undergraduate research-for-credit pilot. We will check in at key stages—recruitment and launch, midsemester, and the end-of-semester review—to recruit participants, monitor implementation, and refine the program together. By December, I will help evaluate participation, student and faculty feedback, the value of the experience, and its administrative feasibility, then contribute to joint recommendations for the next iteration.

2. Robotics Team and Student Leadership

I will actively mentor and help the interdisciplinary BYU robotics team establish effective operations and prepare for the anticipated February 2027 RoboBoat competition. Our Fall priorities are to recruit and onboard students, establish clear and sustainable student leadership roles, and create a team workflow that enables students to lead with faculty mentoring. By December, the lab should be operational, leadership responsibilities should be documented and active, and the team should be meeting the design and build milestones needed to compete.

3. IEEE RAS Technical Committee

I have joined the IEEE Robotics and Automation Society Technical Committee on Algorithms for Planning and Control of Robot Motion. I will seek opportunities to contribute to the committee's work, including attending meetings and participating in discussions. This will move my professional service beyond paper reviewing and begin building sustained relationships in a community closely aligned with my research.

4. Devotional Community

I will attend the BYU devotional in person each week. I will continue encouraging students in my research group to attend and will go with them when possible. When no students attend, I will join faculty colleagues from the department.

Teaching Grant Proposal

Applying Numerical Methods to Live Motion Data

ME EN 275 - Computational Methods | Fall 2026 | [redacted]

Learning Need

ME EN 275 students apply numerical methods in Python, but prepared data can hide the noise, drift, and model discrepancy found in engineering. This grant will create three reusable in-class activities in which students predict a result, collect motion data from a visible physical system, apply course methods, and interpret the difference between measured and computed behavior.

Three In-Class Activities

In each activity, a student volunteer will operate or release the sensor cart while encoder position, force, and acceleration are acquired wirelessly over Bluetooth directly into Python on the instructor's computer. The data will be shared with the class so students can work in pairs using Python to analyze the data and use the methods they have learned.

- **Numerical differentiation:** Differentiate measured position and compare the numerical acceleration with the cart's accelerometer, making noise amplification and method tradeoffs visible.
- **Numerical integration:** Integrate acceleration to reconstruct motion and compare it with the encoder measurement, exposing drift and initial-condition sensitivity.
- **ODE model validation:** Solve a mass-spring-damper ODE and compare the predicted trajectory with the measured response.

I have used Slido extensively and will use the annual subscription throughout the academic year for predictions, method-selection questions, and checks for understanding. The paid plan is needed to use more than the free plan's three polls per session and to support enrollment of up to 120 students. Repeated cart trials may also support a secondary regression or uncertainty activity. One cart is sufficient because every student will analyze each shared data set with a partner. The cart and Python framework can continue to be used in future classes.

Budget

Vernier Go Direct Sensor Cart	$229
Vernier Springs Set	$19
One-year Slido education subscription	$84
Shipping and student assistance demo setup	$168
Total request	**$500**