Request for Proposals

Grant Evaluator Consultant – NSF ATE Grant

RFP 8-2025/2026

Addendum #1

Questions:

1. **Can you clarify what certifications and licenses are required?**

Answer:

Grant evaluation consulting does *not* require a professional license in Florida. It's an unregulated field.

If you operate physically in Florida, you only need:

- Business registration with Florida's Division of Corporations (Sunbiz)
- Local business tax receipt from the county/city
- EIN and normal business compliance

If you operate remotely from another state, you don't need to register in Florida unless you have a physical presence, employees, or a client requires foreign registration.

No state-issued consulting license is required.

2. **What evidence is expected to be provided by out-of-state firms to demonstrate authority to do business in the State of Florida?**

Answer:

Refer to the Answer for Question #1. Additionally, provide the registration documentation from the state where your business is registered.

3. **Can you advise on how to register with the College's Purchasing Office for any forthcoming addenda and/or official communications regarding this RFP?**

Answer:

For the purposes of this RFP, registration with the College's Purchasing Office can be accomplished by simply sending an email to the Purchasing Office at purchasing@pensacolastate.edu with your name and email address, with the subject line: REGISTRANT for RFP 8-2025/2026 Grant Evaluation Consultant. Any correspondence from the College will be via email. Respondents are reminded that they are responsible for checking the website to ensure they have all of the most current addenda and information. For reference, the link for the website is: https://pensacolastate.edu/purchasing/request-for-proposal-8-2025-2026-grant-evaluator-consultant-nsf-ate-grant/

4. **Does the College prefer an in-state vendor/supplier?**

Answer:

The College does not have a preference for in-state vendors/suppliers. The College is interested in finding the best qualified person/company for our needs.

5. **Where can the Grant Evaluator Profile Form referenced on Page 5, Item 6, be found?**

Answer:

The Grant Evaluator Profile Form is available on page 6 of this addendum.

6. **Are the 3 Independent References from 3 different projects required from Page 5, Item 6E, sufficient in number for samples of previous work?**

Answer:

Yes, three samples are sufficient in number.

7. **Do you want actual reports written as examples of previous work, or a list with a summary of previous work completed?**

Answer:

A list with summaries of previous work will be sufficient.

8. **What evaluation activities are expected to be led by the evaluator vs. supported by PSC? For example, who is responsible for data collection? We assume we would oversee analysis and reporting?**

Answer:

PSC Staff will be collecting data.

9. **Is this intended to be a light-touch compliance evaluation or a more developmental/embedded evaluation? We have worked on NSF-funded grants with variation in our role, so having this clarity would help with developing our scope of work. If the latter, how does PSC envision the evaluator contributing beyond compliance (e.g. curriculum refinement, industry alignment)?**

Answer:

The expectation is this will be more of a "light touch" evaluation, but that could change if something specific arises that should be addressed.

10. **Can you share the funded NSF proposal so we can align our evaluation plan more intentionally?**

Answer:

Our Grant Proposal is included at the end of this addendum, beginning on page 7.

11. **To what extent do you want our team to revise the existing evaluation plan?**

Answer:

Since we developed the plan ourselves, we are open to revision, where it makes sense or is appropriate.

12. **What is the NSF Reporting requirement?**

Answer:

There is only an annual reporting requirement.

13. **How frequently are meetings expected (monthly, quarterly, ad hoc)?**

Answer:

Once a semester, and/or ad hoc as needed.

14. Who will have access to institutional data, and how will access be granted?

Answer:

Institutional data will be provided to the evaluator, as appropriate.

15. What are expectations for site visits (if any), especially given geographic distance?

Answer:

While an in-person visit by the evaluator would not be objected to (and if those costs were included in their budget), it is expected that necessary business can be conducted virtually.

16. Are travel, software, or data collection incentives expected to be included in the evaluator's cost?

Answer:

Refer to Page 5, Section 7e, specifically.

17. Is there a predefined budget range for evaluation services?

Answer:

Yes, a fixed amount of $45,000. Broken into $15,000/year for 3 years. Total budget of $445,576.

18. Is there an incumbent evaluator?

Answer:

No, there isn't an incumbent evaluator.

19. When will the learning modules be implemented?

Answer:

The first module is planned to be piloted this summer.

20. How many students are expected to participate?

Answer:

Unknown at this time. The expectation is for a small number.

21. What are the deadlines for the annual work plan and progress reports? What other reports are required?

Answer:

The Annual Report is due in the fall, so the deadline will be sometime before that. A date has not been set for that yet and will be determined with evaluator input.

Grant Evaluator Profile Form

Instructions: Please complete all sections below. This profile will be used by the Selection Committee to score your technical expertise and organizational capacity. Attach a CV/Resume for each key team member.

1. General Information

- **Organization Name:** _____
- **Primary Contact Name & Title:** _____
- **Years in Business:** _____
- **UEI / Tax ID Number:** _____

2. Areas of Expertise

Check all that apply to your firm's capabilities:

[ ] Federal Grant Compliance (ED, NIH, NSF, etc.)
[ ] Quantitative Data Analysis (Statistical modeling, surveys)
[ ] Qualitative Data Collection (Interviews, focus groups)
[ ] Logic Model / Theory of Change Development
[ ] Longitudinal Impact Studies

3. Relevant Project Experience

Provide at least three (3) examples of similar grant evaluations completed in the last five years.

Client Name	Grant Type (e.g., Title III)	Total Grant Amount	Evaluation Budget

4. Technical Approach (Executive Summary)

Briefly describe your firm's philosophy on evaluation and the primary data analysis software your team utilizes (e.g., SPSS, NVivo, R, Tableau).

_____

_____

5. Personnel Qualifications

List key staff assigned to this project. Note their highest degree and years of evaluation experience.

1. **[Name]:** [Degree] | [Years Exp] | Role: _____
2. **[Name]:** [Degree] | [Years Exp] | Role: _____

6. Attestation & Compliance

- **Debarment:** Has this firm or any principal been debarred or suspended from federal programs? [ ] Yes [ ] No
- **Conflict of Interest:** Does any member of your team have a relationship with this organization that could be perceived as a conflict of interest? [ ] Yes [ ] No

Authorized Signature: _____ **Date:** _____

STEAM Interdisciplinary ATE: Creative Design Thinking, Automation, and Manufacturing of Precision Systems – Pensacola State College (PSC)

RESULTS FROM PRIOR SUPPORT FROM NSF ATE

Pensacola State College (PSC) has not been awarded any funding from NSF ATE.

RATIONALE

Background

Advanced manufacturing of electronics and mechanics has been widely identified as a key regional and national priority. The "making things" movement is harnessing the latest 2D and 3D digital fabrication technologies to creatively combine manufacturing and entrepreneurship, allowing students to choose career objectives of sole proprietorship, working for an employer or pursuing further schooling. This movement shows promise to redefine local economies around the country and specifically in NW Florida (NWFL). Manufacturing and creative design provides well-paying employment, but more importantly, it is the source of many products and services innovations that create tomorrow's products and jobs. Science, Technology, Engineering, and Math (STEM) knowledge is the backbone for state-of-the-art manufacturing and product development. STEM and Arts (STEAM) is a growing extension [(1)] for generating creative technicians that can drive and participate in this emerging career pathway and provide deep value to an employer.

The current framework for educating technicians does not provide sufficient preparation to fully allow undergraduates to participate in the interdisciplinary emerging landscape of STEM and Arts. Traditionally, two-year technician undergraduate education has been designed to develop STEM practitioners who can design and carry out independent research that leads to new knowledge, but with little to no emphasis on how that knowledge can be implemented in practice to meet employer needs. An integrated STEAM curriculum fosters key skills which employers indicate are essential for college graduates, including critical and creative thinking, problem-solving, collaboration and teamwork, and the application of learning to real-world settings [(7)]. STEAM education can cultivate a creative culture that fosters innovation, risk taking and idea creation [(2-4)]. Two-year technician education needs to produce students who understand strategies and approaches to providing adaptive skills to complex business problems and systems and need to be exposed to systems-level approaches to problem solving, cause-and-effect in an interconnected world, and the challenges and risks of pushing design [(5,9-11)] and manufacturing to compete in the growing area of business product and services customization.

Regional Growth

Since 2018, the region's population has increased by 7.0% and is expected to increase an additional 5.9% by 2028. Jobs grew by 12,403 over the last 5 years and are projected to grow by 8,970 over the next 5 years. About 18% of residents possess a bachelor's degree (2.6% below the national average), and 11.7% hold an associate degree (2.9% above the national average). The top three regional industries in 2023 were Hospitality, Federal Government, and the Military. The College's service area – Escambia and Santa Rosa counties in NW Florida – where military veterans make up almost 15% (57,332) of the civilian population 18 years and over, has a higher concentration of veterans than both the state (7.4%) and the nation (6.2%). There is a growing need for education and economic development to support the solid shift to high value precision industries, business, and services in Pensacola and greater NW Florida. Precision industries, and the U.S. in general, need a resilient and sustainable U.S.-based automation and robotics industry to support their microtechnology production and due to the current and projected high-risk global economic landscape and uncertain supply chain.

In addition to microtechnology design and manufacturing, the digitalization of industries, rising internet penetration, and the use of mobile devices, has fueled the demand for automation in business, government, and industrial solutions. The global industrial automation market is expected to grow at a compound annual growth rate (CAGR) of 8% to attain $253 billion by 2026. By developing education in transformative automation concepts along with microsystems knowledge and creative design thinking skills, this project can satisfy a need for the growth of STEAM and automation Knowledge Skills Abilities (KSAs).

PSC is primarily an associate degree-granting institution offering more than 100 programs leading to associate degrees, vocational certificates, and bachelor's degrees, in addition to providing non-credit corporate professional courses. PSC serves more than 13,000 credit and noncredit students enrolled in programs at three campuses and three centers as well as through distance learning programs. Following national trends in higher education, the PSC student body is about 36% male and 64% female. The student body is reflective of the diversity of the services area: about 59% White; 18% Black, 3% Asian; 12% Hispanic; 0.7% American Indian/Alaskan Native; and 7% declare themselves to be multi-race.

This proposed project aims to introduce and develop two significant areas of skills – creativity/entrepreneurship (STEAM) and automation. The project will introduce design thinking and arts along with STEM through student-machine teamed robotic manufacturing of devices and systems (using the focal point of wearable watch designs), plus creative visualizations and graphic designs, customizable prototyping, and entrepreneurial thinking of made products

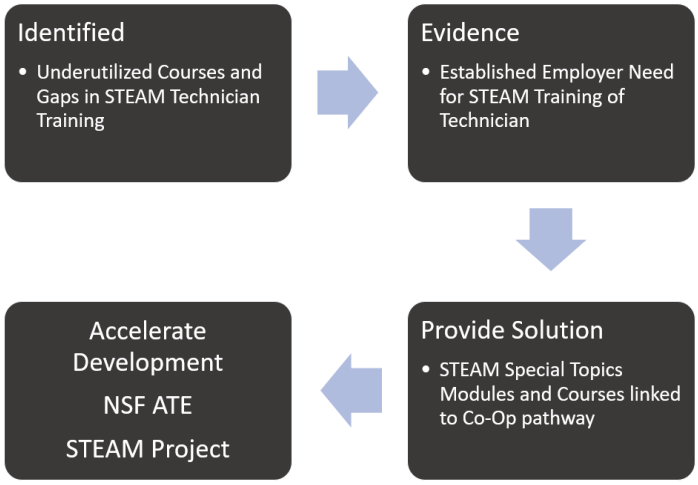

Figure 1. Opportunity for technician education in Innovation thinking, STEAM and Automation to support regional precision industries in NW Florida.

The Regional Need

Evidence emerged from employer discovery activity and direct interviews with area representatives from Escambia precision-based industries, and Advisory Committee member feedback on the need for creative technical, design and entrepreneurial thinking employees trained with the knowledge to produce precision systems for use by humans and machines. Current and potential future industries, expressed the need for trained precision technicians with multi discipline skill sets:

(1) aerospace tech (*ST Engineering*)
(2) medical tech (*Actigraph*)
(3) biotech (*Cytiva*)
(4) space tech (*Guided Particle Systems*)
(5) small custom machining (*2020 Manufacturing*)
(6) small enterprise product manufacturer (*Katybar*)
(7) precision biotech products (*emp BIOTECH GMBH*)
(8) military operations and contractors (*Naval Air Station- NAS Pensacola*)

The VP of People and Culture at Actigraph, a precision diagnostic wearable medical wearable watch manufacturer, stated that the type of trained student emerging from this project is "precisely the multidisciplinary type of employee they are looking to hire", after they experienced an exemplary arts-engineer employee that came to the company on assignment from Europe. Cytiva Research Process Engineering representatives remarked they have been interested in connecting with PSC to supply technicians for both their R&D wing and their manufacturing facility; however, the College does not have a precision technician program sequence in place to date to feed the company with the talent needed. The company makes high performance membranes and declared a need for technical staff to support automation of their in-line production processes plus skilled technicians in the R&D labs. 2020 Manufacturing is another small boutique mechanical manufacturing firm looking for more electromechanical staffing to "attract new business and is seeking multidisciplinary employees that can perform different duties" in their dynamic business of customized manufacturing support to their clients. The founder, and CEO of BIOTECH in Berlin, a successful company (90 employees, $60M USD) is being asked by North American customers to expand their product research, development and manufacturing of their analytical purification products and precision fluid process systems within the States. In a direct interview, [he] stated that the Pensacola area is a likely site for his North American operations expansion since it has significant rail transport of raw materials used by their processes, however without the necessary technician talent supply in place by PSC, he does not see Pensacola as competitive as other US sites and would not make such a move. The County Economic Development Office partially depends on offering a skilled workforce to potential employers, such as BIOTECH, considering the area for their growth and operations.

The former Naval Air Station Commanding Officer, and now head of University of West Florida's Business School's Center of Leadership, said in an interview with the PI-faculty that NAS Pensacola, a major employer for aircraft operations and training needs of the Navy, "absolutely needs" a new type of trained employee and naval candidates that can think in "creative systems thinking" with today's complex aircraft and operations that are housed at the base. He also saw value in bringing entrepreneurial thinking to technicians that can lead to employee autonomy within the large Navy organization. NAS Pensacola is a major employer in the area and represents a key anchor demand signal for trained precision technicians.

The 2024-2025 Florida Regional Demand Occupations List indicates that Engineering Technologists and Technicians is a High Skill/High Wage occupation and there is ~1% growth rate expected annually. To further establish evidence of emerging employer demand signals for precision systems technicians and develop student-employer Co-Op placement strategies, direct interviews were completed with a spectrum of Escambia County small and multinational industries (cited above). For future planning purposes, an interview was also completed with West Fraiser a major employer (industrial wood manufacturing) in proximity of PSC's rural Century Center with "dire need for locally trained electromechanical and automation technicians", as stated by the President of West Fraiser, which has invested in a Jacksonville, FL area state college 350 miles away to train staff to work at the highly automated West Frasier facility.

The project will work with regional economic development agencies (Escarosa Workforce Development Office, Chamber of Commerce, and the Escambia County Economic Development Office) for marketing, exposure, and access of the PSC STEAM project to area employers (the PI has 8 years' Workforce Investment Board member experience and maintains an ongoing direct dialogue with both the Workforce Development Office, the Chamber and County Economic Development leadership). Additionally, an ATE project activity will include the mining of workforce board

employer database of over 20,000 employers of all sectors. This data-driven project will use the extensive employer data for recruitment (outreach) and partnering with candidate employers to match STEAM students with employer needs. The STEAM skilled students can be connected and placed into a larger swath of employers that may incorporate either, or both, technical and aesthetic skill sets.

The faculty will leverage long-established relationships with FLATE (Florida ATE), National Institute of Standards and Technology (NIST), Manufacturing Extension Partnership (MEP) in NWFL, and NCDMM (National Center for Defense Manufacturing and Machining), a Manufacturing USA Institute, for resources that can be used during development of the modules (specific examples include 3D printing, and intelligent manufacturing systems) and for workforce impact measurement tools.

This project will develop six key learning modules in a three-course pathway toward precision industry employability that will lead students in designing, troubleshooting, and prototyping a common precision (time) instrument that will meet industry needs for developing precision systems skills and competencies. The modules will be used to enhance the quality of current instructional programs and further develop business and industry partnerships in alignment with institutional priorities outlined in the college's strategic plan. The project will support knowledge acquisition in precision systems, microelectronics, micro-mechanics, and advanced electronics packaging, in addition to system's design thinking, graphical arts information design, and science visualizations.

These project topics support NSF ATE 2024 technology focus area goals of Micro, Nanotechnologies and Engineering Technologies. With confirmed participating faculty members across disciplines (engineering and arts), this project creates technician education opportunities for STEAM students.

Overarching goals of this project are to: (1) graduate competent technicians with knowledge of precision electronics, mechanics, and microsystems-making principles and practical skills that can be applied to high-value industries in the region; (2) increase industry-recognized certifications earned; and (3) providing the completers with a fabricated time piece (representative precision microsystem), which is a tangible product from participation. These goals improve the technical skills and the general STEAM preparation of technicians and educators and result in producing more qualified science and engineering technicians to meet workforce demands.

The technician education focuses on supporting precision (time instrument) systems, STEAM and automation conceptual knowledge building and hands-on skills through a fusion of an intelligent, multifunctional robotic manufacturing platform combined with multi-physics substrates and processing. This robotic prototyping and material processing will allow for easily made time instruments by technician level students. The robotic platform can create high performance microstructures on surfaces and the use of various material processing steps allows the generation of micro components yielding miniaturized systems with significantly reduced sizes. This platform and processing workflow integrates electrical, mechanical, fluidic, and optical functions into time pieces and enables integrated heterogeneous systems education and experiences that can transfer over to precision industries in the region (robotics, space, marine, etc.).

Students will get exposure to an all-in-one multifunctional robotic end-effector for making a precision system. The robotic tool unifies various core capabilities, enabling end-to-end execution of advanced manufacturing processes. The functions encompass maskless patterning and lithography, microscopy inspection, surface metrology, machine learning, AR (Augmented Reality) projection, and data acquisition/analysis. The industry lacks such comprehensive and accessible micro-scale processing,

patterning, and analysis capabilities for intricate surfaces. PSC currently has the unique technology in its lab and has successfully tested the system in previous robotic courses with 35 students.

Technician Education Pathway Development

We seek to specifically develop a STEAM and automation three-course pathway with supplemental graphics design technician education using the design and production of creative precision microsystems to support technician education. This project will develop courses and workshop and associated modules, listed below, offered through existing underutilized two-semester Special Topics course offerings followed by an enhanced Co-Op course for student-employer participation.

The sequence of courses that students register for as follows: (EET1931, ETI1931L, EET2949, and Graphics Design Education Workshop) or (EET1931, ETI1931L, ETI2947, and Graphics Design Education Workshop). The following table will guide the reader through the sequence of course pathways.

Course Title	Credit & Hours	Class Goals: Specific Skill Modules
1. EET 1931-- Special Topics course in Electronics Engineering Technology designed to cover various emerging and specialized topics within the field of electronics engineering technology.	Three Credit -30 hours/cr.	1. Current Electronics Engineering Trends 2. Electronic Systems Designs and Concepts 3. Precision Measurements and Controls 4. Precision Electronics Manufacturing Techniques
2. ETI 1931L - Special Topics in Engineering Technology laboratory course designed to complement the systems design theoretical knowledge gained in special topics within the field of engineering technology with mechanical skills.	Three Credit -30 hours/cr.	1. Hands on Electromechanical Systems Prototyping 2. Robotics for Microelectromechanical Manufacturing 3. Microelectromechanical Systems Prototyping
3. EET 2949 -- Co-Op/Engineering Technology Work Experience course designed to provide practical, supervised work experience in electronic engineering technology.	One Credit -30 hours/cr.	1. Electronic Engineering Use Case Work Experiences 2. Use Case Specific Electronic Prototyping Experience 3. Case Specific Precision Electronics and Measurements
4. Graphics Design Education Workshop -- Innovative Time Instrument Design for Engineering Students.	Six weeks, Two hours per session, Total: 12 hours of in-class instruction.	1. Design and Styles Introduction 2. Color Style and Typography 3. Brand Designing 4. Observational Techniques 5. Iterative Design and Experimentation
5. ETI 2947—Co-Op/Advanced Manufacturing designed to provide students with practical, hands-on experience in the advanced manufacturing industry.	1 Credit Course Co-Op 30 contact hours/cr.	1. Electromechanical Use Case Work Experiences 2. Use Case Electromechanical Prototyping Experiences 3. Use Case Precision Mechanical Experience
Note: Students must meet academic and departmental requirements to qualify for Co-Op course placement. Students are assigned a Faculty Advisor who, along with the Co-op staff, will monitor student progress. The Co-op program offers academic and vocational credit for each term worked, and the Faculty Advisor will assign either a Pass or Fail grade at the end of the work assignment.		

GOALS and OBJECTIVES

The goal of the project is to provide technician education for developing creative STEAM technician skills, competencies, and hands-on experiences needed for employment in regional precision systems industries.

This project will be faculty-led and will develop curriculum for credit-bearing courses and modules and career pathway development for the advancement of student's knowledge for student employability. This small-scale project is an exploration of engaged student learning and skills enhancement with a focus on creating precision microsystems, and an expansive student with STEM, Arts, and entrepreneurship experience. A key strategic goal is to inculcate a fusion of *systems thinking-design thinking-creative thinking* into an engineering curriculum and microelectromechanical and microsystem workflow. This project's particular intent is to improve the preparation of current and future students so they can succeed as *creative* and commanding members of the future technical workforce that is scientifically *and* artistically literate. Placement of students in employers of regional precision companies will be a key activity in this project.

The project will be accomplished by achieving three primary objectives: 1) increasing student enrollment; 2) increasing student retention; and 3) increasing students' STEAM mastery.

The three-course pathway will be introduced in the last quarter of the degree sequence. Specifically objective sought for the project are:

1. Increase the number of students enrolling in Special Topics courses and Co-Op by 25%, (targeted 20 students total for the project) which will lead to successful completion of STEAM competency, and support AS degree in Electronics Engineering Technology and AS degree in Engineering Technology in Mechanical Design and Fabrication.
2. Retain at least a completion of 75% of students that are enrolled in the Special Topics courses and Co-Op course pathway and provide STEAM and automation exposure and completion within two years in support of the Electronics Engineering Technology and Engineering Technology in Mechanical Design and Fabrication program.
3. Achieve a mastery level of 80% of the STEAM skills defined in the six skill components (listed below) and content knowledge for students completing the STEAM and Automation Special Topic course pathway. This pathway contributes to earning an AS degree in Electronics Engineering Technology and AS degree in Engineering Technology in Mechanical Design and Fabrication

DELIVERABLES -- During the project there will be six (6) deliverables completed:

1. Outreach Materials: generate a comprehensive information package (with aid from Graphics Arts and student participants) for Employer *and* Student Recruitment Campaigns (supports Goal 1).
2. AS degree and Certificate progression: modules will be developed and embedded in the Courses (EET 1931 and ETI 1931L) to support students AS pathway and certificate completions (Supports Goals 2 and 3).
3. STEAM technicians: progress two cohorts of up to 10 students through the interdisciplinary education with successful completion of made STEAM object (Supports Goal 3).
4. Certs and Degrees: in each cohort, at least 4 students earn AS degrees and 8 complete certificates (Supports Goals 2 and 3).
5. Industry Placements: target the placement of 6 STEAM trained students with Industry partner (Co-Op) cooperative education experiences (supports Goals 2 and 3).
6. External Evaluations: complete the External Evaluation Lifecycle (Supports Goals 1,2,3)

ACTIVITIES LEADING TO OUTCOMES

The faculty led, credit bearing course and curriculum enhancement project, and co-op based experiential learning includes six systemic activities to achieve goals and objectives:

1. *Curriculum Development* - develop six thematic areas related to STEAM, automation, and precision systems, listed below, offered through existing underutilized two-semester Special Topics course offerings followed by an enhanced Co-Op course for student-employer participation.
2. *Building Internal Capacity* – the two Special Topics and one Co-Op course offerings are currently listed in the Course Catalog but do not see significant activity. Developing the courses will enhance capacity in the electronic and mechanical options to students at the College.
3. *Outreach*– the fusion of (systems thinking-design thinking-creative thinking) into an engineering curriculum along with precision systems skills education will expand the recruitment pool of students from engineering, science, and arts.
4. *Creation of Pathways* – linking together an engineering curriculum with microelectromechanical and microsystem workflows to form precision systems trained technicians will create more interest from area precision employers.
5. *Provide Retention Services* – the 2+1 courses and employing a Co-Op pathway can allow for greater retention of students using employer placement as a benefit and end outcome from completion of the course sequence.
6. *Accelerate Employment Connectivity* – The development of the Co-Op course will accelerate the introduction and placement of students into regional precision industry employers and increase the likelihood of job placement for the College's students. This placement of students will be a key activity to help strengthen elements 1-5, listed above.

The project will build out modules (syllabus, quizzes, discussion topics, homework assignments, and hands on activities), and in conjunction with graphical arts design experiences, to support Special Topics Courses in Electronics Engineering Technology (EET 1931) and Engineering Technology in Mechanical Design and Fabrication (ETI 1931L). The modules developed in Canvas will structure and preserve the three-course Pathway for course sustainability past the end term of the project. The first year of activity will be for the development of the modules with a cohort of three recruited students to factor in user design for the modules and the robot user interface, from the beginning of the project. The second year will be the initial deployment of the three-course cycle toward a target of 6 students. The final year will be a second cycle offering (toward a 15-student population) and for module/course/placement optimization.

The courses will focus on a coherent sequence of six STEAM, and precision automation concepts:

1. *Micromechanical Skills* – education content on micro mechanical concepts and principles, exposure to designs, manufacturing of micromechanical elements and assembly.
2. *Microelectronics Skills* – education content on microelectronic concepts and principles, exposure to designs, manufacturing of microelectronic and advanced packaging elements and assembly.
3. *2D Graphical Arts Visualization Design and 3D Product Design Thinking* – material on the design of 2D graphics and 3D object concepts and principles, exposure to designs, manufacturing of and assembly of systems
4. *Microfabrication and Advanced Manufacturing using Robotics and Intelligent Manufacturing Systems* – materials and hands-on practice on automated and robotic systems for prototyping and manufacturing of micromechanical, microelectronics and advanced packaged systems and assembly.
5. *Assembly and Test Skills* – education content and hands on activity on (1) micro mechanical, (2) electromechanical and (3) microelectronic test and assembly.

6. *Product Entrepreneurship* - content for technician education and experiences in product thinking, fabrications and participate in interdisciplinary teams to tackle engineering problems around general purpose microelectromechanical systems and engineering innovation concepts.

Modules	Micromechanical	Microelectronics	Graphics Design	Robotics	Test & Assembly
Key concepts	- Concepts and Principles - Design - Manufacturing - Assembly	- Concepts and Principles - Design - Advanced Packaging - Mfg. & Assy	- Visual Design - Object Design - 2D/3D Impact on Manufacturing - 2D/3D Impacts on Assembly	- Automation - Robotics - Micro Mfg. - Assembly of Microsystems - Advanced Packaging	- Micro Mechanical - Micro electronic - Hybrids
Product Entrepreneurship: interdisciplinary product thinking, fabrications throughout pathway					

Entrepreneurial skills development for students will also be a targeted module and skills development. The project will complement the technical and interdisciplinary content with entrepreneurship acumen. Initial employer interviews were selected for coverage of a wide range of precision industries, (biotech, medical, aerospace, and manufacturing) but also to sample a large domestic regional employer, a large multinational global employer, and small enterprises for a full spectrum of employment environments. The project's module development and faculty advised co-op placements will help students better understand the global economy (large global corps) and understand the attributes of small start-up companies. The problem-based learning approach of being exposed to design and making a precision microsystem ("product") will provide students with experiences and prepare students with entrepreneurial knowledge, skill, and competencies. Additional exposure to graphic art design, visualization, and creative content development will improve technician marketing skills forming distinctive STEAM entrepreneurs who can work effectively in a broad range of industries.

Key Performance Indicators for Learning Outcomes for Special Topics Class	
Technical Competence	● Application of Math and Scientific Principles to engineering problems ● Proficiency in using modern engineering tools and techniques
Experimentation and Data Analysis	● Design and conduct experiments, as well as analyze and interpret data. ● Compare experimental results to theoretical models and explain discrepancies.
Problem-Solving Skills	● Identify, formulate, and solve engineering problems. ● Develop and implement solutions to technical challenges.
Communication Skills	● Effectively communicate technical information in both written and oral forms. ● Work collaboratively in teams and communicate with diverse audiences.
Ethics and Professionalism	● Understand and commit to professional and ethical responsibilities. ● Recognize the impact of engineering solutions in a global and societal context.
Lifelong Learning	● Engage in continuous learning and professional development. ● Stay updated with contemporary issues and advancements in the field.

MANAGEMENT PLAN

David Fries (PSC) will provide project management and lead the Selected Topics modules and course design, fabrication, and cohort testing. PI - Fries has 35+ years' industry, academic, and entrepreneurial

experience including failure analysis in electronic systems, underwater sensor systems, and microfabrication technologies. Fries was inducted as a National Academy of Inventors Fellow (2017). He holds 47 patents and 60+ publications in highly diverse fields including oceanography, analytical chemistry, medical technology, biotechnology, engineering, microtechnology, electronics, and robotics. In addition, David served as mentor and PI in three different NSF I-CORPS program teams while a faculty member at the University of South Florida.

The PI will also lead the placement of students of the Co-Op Course with industry partners and seek out additional industry partners and build the Pathway ecosystem throughout the duration of the project. He has commercial contractor protocol development experience at Lockheed Martin, and requirements support to leading industries (GE, HP, Intel, etc..) and Mil-Spec requirements (Hercules Defense). He will lead the data analysis/archiving effort and share in report preparation. The Management Assessment and Feedback Mechanism used will employ data deliverables in the form of quarterly technical reports between faculty contributors and Financial Progress Reports. Final Report to NSF and feedback from the Program Officer will be used to adapt the project to any changing needs as well as feedback will be incorporated from the industry partners and collaborators plus emerging collaborators at other academic institutions and partners.

TIMETABLE

Activities &Tasks	Period	Performance Metric & Responsibility
1. Recruitment Materials: generate info packet for Student & Employer Recruitment Campaigns	YR1: 4 mos.	Project staff develop info packet w/PSC Marketing assistance
2. AS degree/Certificate progressions: modules developed/embedded in EET1931 & ETI 1931L	YR1: 9 mos.	Project staff present results for Course Modules and Syllabus for Special Topics course pathway
3. STEAM technicians: progress first cohort of up to 10 students through STEAM education with successful completion of made object	YR1: 12 mos.	Project staff deploy modules and course sequence, presenting results from initial deployment and access by students. First report to NSF.
4. Industry Placements: target placement of 6 STEAM students with Industry partner for (Co-Op) cooperative education experiences.	YR2: 24 mos.	Project staff document progress made in developing solutions, placement with industry partners/customers and connectivity with the regional employer landscape. Second report to NSF.
5. Repeat and Optimize Steps 3 & 4	YR3: 36 mos.	Project staff document progress made in developing solutions, placement with industry partners/customers and connectivity with the regional employer landscape.
6. External Evaluations: complete External Evaluation Lifecycle and Final Report	YR3: 36 mos.	Project staff and the evaluator document progress made in developing solutions, placement with industry partners and students. Final report to NSF.

ROLES AND RESPONSIBILITIES

The faculty team is composed of a PI, a Co-PI and two Senior Personnel. David Fries (PI/Adjunct Instructor) will provide project management with PSC faculty (Arts and Engineering) and lead the course pathway design, fabrication, and testing. He has experience at PSC in teaching both the Robotics Course (ETS 1603C) and the Properties of Materials (ETC 1250) course in both content and hands-on activities system design and development. He has experience in both cyber system design and physical systems' development, and commercial industry relevant protocols. He will provide expertise in module development in microfabrication, advanced manufacturing, assembly and test and product design and entrepreneurship.

Francesco Donato (Co-PI/Instructor) will lead the 2D and graphic art design and innovation thinking portions of the education modules and coursework. He will support and implement the Graphics and Design Module: Innovative Time Instrument Design for Engineering Students. Donato will use the engineering lab space as the full Arts Classroom and Lab/Studio space and where he will teach; he has a PhD in neuroscience and teaches multiple courses in the Arts Dept on graphics design and innovative graphics. Throughout the STEAM Pathway activities, an emphasis will be placed (through the modules) on advanced electronics packaging concepts (through Fries) and for 3D product design also (through consultant Lodato), in addition to system's design thinking, graphical arts information design (via Think Blue Data- software support), and graphical science visualizations (through Fries-Donato-Lodato-Think Blue Data collaborative activity).

Glenn Beech (Instructor), electronics senior personnel will be instrumental in connecting the microelectronics skills module to specific and granular electronic concepts and principles. The college has completed a new state-of-the-art STEM facility where Senior Personnel Faculty Beech has a new lab and classroom capability to support interactions with the staff students who will provide guidance on module content development in the first year. Additional years will require deeper electronics topics development for module completion. The project will link the two Electronic Engineering spaces together designating patterning and processing in one area (Fries) with assembly and testing in the other (Beech).

Senior Personnel, Mike Cannon (Associate Professor), experienced mechanical faculty, will be key in connecting the micro mechanical skills module to specific and granular mechanical concepts and principles. The college has a complete mechanical facility under Cannon, to help support fab and classroom capability and to support interactions with the staff students who will provide guidance on module content development in the first year. Years 2-3 will require deeper mechanical topics development from the faculty member for module completion. The project will link the Electronic Engineering spaces together with the mechanical engineering spaces and the assembly and testing space (Beech) and will provide for final systems integration and testing. The use of multiple connected engineering instruction, prototyping and testing spaces will facilitate continual interactions between the three engineering faculty members plus link in Donato and the Arts Module into the engineering workflow and dynamics.

The PI will lead the data analysis/archiving effort and share in report preparation. He will work early on with ATE Central to develop a plan to ensure resources are migrated over for archiving. PSC will provide accounting, audit, reporting, and project management support for the project.

BROADER IMPACTS

The proposal supports the miniaturization and light-weighting of systems found in high-value and high-paying industries of defense, diagnostics devices and wearables, and aerospace. The

collaboration between PSC and regional industries partners can help meet employers' needs for highly skilled technicians, retain talent in the region, and recruit future corporate partners to the region. The use case of precision microsystem provides a ubiquitous personalized object for students, having the potential to expand recruitment of students, enhance diversity, and promote creative design thinking. Dissemination of project information will be through in/out-of-state conferences to advance other college collaborations and replicate (knowledge-sharing) plus build synergistic CTE relationships among STEM/ART/CTE faculty.

Accrued benefits to the regional employers are direct: precision industries are seeking employees who demonstrate creativity and knowledge in engineering and design, as well as advanced manufacturing skills, along with the ability to organize and plan complex work and the ability to communicate results from that work. Defense, aerospace, biotech, diagnostic devices, aerospace, maritime, and robotic industries are all present in the region to drive workforce needs. The proposed project will help elucidate categories, criteria, and content for these new skills and develop and deploy automation and creative STEAM skills education to support the shift towards an enhanced NWFL automated competent society and job market. Beyond the on-ramped project participants the coursework and intelligent production robotics creates an accessible and creative environment for including postsecondary college students, military veterans, incumbent workers, and low-income individuals.

SUSTAINABILITY PLAN

The PI, with active engagement from Donato, Beech, and Cannon, will use the Canvas Learning Management System (LMS) to develop the specific skill modules, content and pathway structures. PSC commits to keeping the modules for any future faculty instructors past the term of the project. The College will also use tuition generated to offset the expenses to run the program and enable long term sustainability. The project will be continued after the initial three (3) years of funding with additional outreach to industry partners for industry employee upskilling opportunities and services. Grants from and collaborations with industry and government agencies will also be pursued as we market the project's uniqueness to employers looking to expand and fulfill diverse thinking and skilled technicians in their organizations.

Agencies beyond the large Chamber and Workforce Investment Board pool of industrial members also include major regional NWFL government employers: Department of Defense and City and County resource management offices. Additional organizations in need of talented technicians are present in the area -- Florida Fish and Wildlife Conservation Commission (FWC); Institute for Human and Machine Cognition (IHMC); LIFT Technology (accelerator connecting advanced materials, manufacturing processes, systems engineering and talent development), ST Engineering North America (Mobile Aerospace Engineering) -- and can provide opportunities for partnering for labor and collaborative grants and for providing upskilling demand services from the project.

DISSEMINATION PLAN

Project personnel will attend the annual ATE PI conference to showcase the project's progress. Project staff will submit proposals to present at conferences such as the NSF High Impact Technology Exchange Conference (HI-TEC), the NWFL regional "ITEN-Wired" annual summit, and ACTE CareerTech Vision, and through articles published in peer-reviewed journals. Publication of the projects activities, results and impacts will be pursued in educational tech journals (e.g. Journal of Career and Technical Education (JCTE); Career and Technical Education Research (CTER), Journal of Industrial Teacher Education (JITE) and The CTE Journal), regional economic development publications and economic development conferences (Florida Economic Development Council (FEDC) Reports; Pensacola Magazine, Northwest

Northwest Florida Forward; and Florida Chamber Foundation Reports). The project will also work with the Chamber and Workforce Development Office to showcase the project within their outreach activities to enhance connectivity to students, employers, and community leadership. Within 6 months of project operation, data will be put on the newly created PSC Creative Precision Systems websites as Excel files (where appropriate) or multimedia files which will include metadata information. We will repeat this process semi-annually throughout the project period. Within a 1-year period of collection, data can be transferred to any emerging project partners for further public dissemination. Results of the evaluation will be available on a PSC webpage dedicated to the project. The multidisciplinary faculty team for this project will share project progress updates and deliverables with colleagues in the different departments at PSC.

EVALUATION PLAN

The project will utilize guidance provided in the 2010 User-Friendly Handbook for Project Evaluation (NSF) and the EvaluATE Resource Hub at Western Michigan and will ensure completion of the ATE Annual Survey. Utilizing a system thinking approach, the evaluation plan is appropriate for the proposed NSF ATE grant project and includes qualitative and quantitative methods. Quantitative evaluation includes curriculum materials and syllabi, student data (including course success, program completion, and employment), measuring the contact time and interactivity with students' made objects. Qualitative evaluation methods include observations and short post-visit interviews.

At the submission time of PSC's proposal, we were unable to secure an evaluator in advance of this application preparation. If successfully awarded, 10 percent of the budget has been allocated for evaluation services. The College's Purchasing Department will provide substantive support for following established procedures to procure an external evaluator:

- Assemble RFP (Request for Proposal) documents using similar solicitations
- Post Final RFP documents to our PSC Website page for solicitations; submit to other appropriate websites
- Advertise the RFP in our local newspaper, Pensacola News Journal, for 3 consecutive weeks
- Allow for Questions and/or Clarifications from prospective bidders
- All questions received, along with the answers provided, are posted as an Addendum to the RFP, within one week (no questions were received for this RFP)
- The RFP due date is set at least one week after the last Addendum is posted
- The Meeting for Review of Proposals received is calendared. Proposals would have been evaluated and ranked. The Review Committee would determine how many of the respondents would be selected for interview/presentation, if appropriate.
- Presentations, if appropriate, would have been scheduled for early in the next week, and based upon those, an award recommendation would be made.
- The Award Recommendation would be presented to the Board of Trustees at the next scheduled Board Meeting.
- With Board Approval, the College would initiate a contract for services, as described in the RFP, with the recommended awardee.

Formative evaluation will be used and ongoing and will be employed to monitor the implementation process and provide feedback to inform project staff of progress and problems requiring adjustments, and to assist in decision-making. *Summative* evaluation will also be conducted annually and consists of an analysis of the extent to which the project achieved its objectives for the project period.

1. Using the progression from awareness/knowledge building to engagement to extended engagement, the evaluation will address questions at each stage for awareness and knowledge progression.
    a. *Measure*: example questions on engagement; do students continue to access information regarding their made time object or do students formulate questions about the made object, and do students refer others to class for making of time objects.
2. Was the course developed and integrated into the program of study at PSC?
    a. *Measure*: Verification of approval by the PSC Curriculum Council
3. Did the project partner with local industry to assess that the course meets demands of the employers?
    a. *Measure*: Focus group, Workforce Development Board collaboration or Advisory Committee minutes
4. Does the project partner with at least two local employees to provide hands-on experience and potential internship opportunities?
    a. *Measure*: Letters of Commitment from employers, student attendance records
5. Did the course have successful enrollments/completers?
    a. *Measure*: PSC Student Record System enrollment report

Evaluation Plan Outline					
Activity	**Data Source**	**Data Collection Method**	**Responsible Party**	**Timeline**	**Analysis Plan**
Awareness/Knowledge building	Student Surveys and Observations	Interview notes, surveys	PI and Evaluator	Year 1 – months 3-18	Data verification
Course curriculum aligns with demands of employers	Industry partners	Interview notes, surveys, focus groups notes	PI and Evaluator	Year 1 – months 3-6	Data verification
	Program Advisory Committee	Meeting minutes			
Partnerships established with at least two local employers to provide students with hands-on work experience	Letters of Commitment	Letters collected, included in report	PI to Evaluator	Year 1 – months 1-6	Data verification and review
	Student attendance records	Work experience reports		Years 1-3 – each term	

Evaluation Plan Outline					
Activity	**Data Source**	**Data Collection Method**	**Responsible Party**	**Timeline**	**Analysis Plan**
Course has enrollments	PSC Student Record System	PSC Student Record System reports	PI to Evaluator	Years 1-3 – each term	Data verification
75% of students enrolled in the course complete successfully	PSC Student Record System	PSC Student Record System reports	PI to Evaluator	Years 1-3 – each term	Data verification

Figure 3. **Logic Model**