# **Tech Initiatives Proposal Form**

Student Technology Fee – AY 2024

**Employee Due Date: March 22, 2024** (revised from March 29)

**Student Due Date: March 22, 2024**  (revised from March 29)

## **Key Proposal Information**

Note: Enter information in the expandable fields directly after the information requested.

## **Project Title:** Signal Processing Modules for Physics Junior Labs

## **Briefly explain what you are requesting (400 characters max):** We would like to purchase a set of signal processing modules for a new cosmic ray experiment in our department's Junior Lab course, 391. Although 391 has many experiments, this experiment is one of the very few that are directly related to Astronomy. The modules could also be used to greatly expand the scope of 5 other major experiments in 391. Over the lifetime of the modules, several hundred students would be positively impacted by the project.

### **Principal Applicant**

Name: Milton From

Email: from@wwu.edu

Phone: 3606506593

Dept/Org Affiliation (Enter “student,” “faculty,” or “staff”): Physics&Astronomy Department faculty

### **Secondary Applicant**

Name:

Email:

Phone:

Dept/Org Affiliation (Enter “student,” “faculty,” or “staff”):

## **Important Proposal Notes**

1. Student Technology Fee Mission:

The Student Technology Fee (STF) provides Western students with adequate and innovative technology experiences by:

1. Broadening/enhancing the quality of the academic experience.
2. Providing additional student access to technology.
3. Increasing integration of technology into the curriculum.
4. The STF Committee will accept only complete proposals by the announced deadline. Every section (I-VIII) and all items of this proposal form must be addressed.
5. Disallowed items: The following five items generally **do not qualify** for STF Tech Initiatives funding:
6. Computer lab upgrades. (Existing computer labs are upgraded on a rolling schedule with a separate allocation of STF funds.)
7. Software related to maintenance and/or serial payments.
8. Maintenance contracts on equipment or software.
9. Expendable supplies.
10. Equipment that will not be used directly by students, and/or non-computer equipment or furnishings that are part of the typical classroom environment (such as lighting, portable and fixed media equipment, furniture, chairs, etc.).

## **Proposal Instructions**

### **I. Relationship to STF Objectives / Impact on Student Academic Experience**

1. The STF Committee uses as its primary assessment criteria the three objectives—**quality, access, and integration**—defined in the STF mission (“Note 1” above). Given these criteria, explain how the project would provide positive benefits to students. Focus on what students would gain from the project. Specifically, answer at least one of items a, b, or c below:
2. How would this project *broaden or enhance the quality* of the student’s academic experience through the proposed technology?

The Junior Lab lab course, 391, is one the core courses in the WWU Physics Major program. It presents students with a catalog of 40 different modern physics experiments of which students chose four to do during the quarter. Roughly 25% of these experiments use signal processing modules that are, in some cases, 40 years old. These modules do not have the full range of features that modern modules do, and they often break down, causing students to lose time in troubleshooting and repair attempts.

The state-of-the-art modules we propose purchasing would have features that are greatly enhanced over the current modules. The modules would allow us to broaden our offerings with a new Cosmic Rays experiment. Such an experiment would be especially beneficial for our Astronomy Minors who currently only have a very few Junior Lab experiments related directly to Astronomy. Furthermore, the modules, when not being used in the Cosmic Rays experiment could be used in 5 other major experiments in the lab, allowing student experiments to be better controlled and to collect more accurate data.

1. How would this project *provide additional student access* to technological resources?

We currently have enough equipment in the junior Lab for just two module-based experiments to be done simultaneously at any given time. These types of experiments typically run 24 hours a day for several days at a time. Thus we can only squeeze a certain number of instances of the experiment into a given quarter. Student access to these types of technological resources is limited by the amount of equipment we have. We can't simply add more lab sections to increase access.

Adding the proposed 10 new modules to the lab would roughly double direct student access to this type of experiment.

1. How would this project *increase integration* of technology into coursework?

High energy/nuclear physics is currently a weak spot in our department’s curriculum, with no dedicated lecture courses being offered and very little coverage in existing courses. Virtually the only exposure our majors get to this field is through the Junior lab which is intrinsically technology based. The project will help integrate the technology behind high energy/nuclear physics into what is currently a somewhat neglected part of our curriculum. Furthermore, experience with High Energy/Nuclear Physics laboratory equipment will allow students to engage more fully with these topics in the very few department lecture courses that touch on these topics (Modern Physics, 224 and 225).

1. Would other departments be involved with this project? Enter “No “ or “Yes”. No

IF “Yes,” describe. IF “No,” enter “N/A”.

No

1. Has any part of this proposed project previously been funded by the Student Technology Fee? Enter “No” or “Yes”. No

IF “Yes,” describe. IF “No,” enter “N/A”.

No

1. Is the proposed project a pilot project? Enter “No” or “Yes”. No

IF “Yes,” describe. IF “No,” enter “N/A”.

No

### **II. Utilization**

List the anticipated number of times and duration per each use—per quarter or per academic year—that students would use the proposed technology, along with the impact of that proposed technology on students. Note: Proposals are funded after careful consideration of both the number of students that will be impacted by the technology and by the quality of that impact.

The cosmic rays experiment that the modules are being purchase for is an experiment that requires very long data collection times; the modules operate continually (24 hours/day including weekends) for the two-week duration of one group's experiment, then another group takes over the apparatus and runs their experiment for two weeks, and so on. All told, a typical year in Junior Lab would see eight different lab groups, of 1-2 students each, using the modules for a total of about 3400 hours. If for some reason the Cosmic ray experiment was not being done, the modules would more than likely be used in other nuclear module-based experiments leaving the above usage estimate unchanged. In the past, students have also worked on nuclear-module based independent Student Research Projects (Physics 491) outside of the quarters when junior Lab runs. This potentially adds another 100 to 1000 hours of usage per year. The modules in this proposal are very robust, and are strictly analog, not requiring connection to computers or usage of software. We envisage them being used in the Junior Lab for easily 20 years or more. Thus, the total number of students benefiting from the project, over the lifetime of the modules, would be in the hundreds.

The quality of the student impact would be very high: as stated above, nuclear module experiments expose students to an important branch of physics that is only briefly covered in our current curriculum. Furthermore, the Cosmic Rays experiment is virtually the only experiment in the Junior Lab course that connects directly with astronomy, and hence it is of singular interest and importance to our astronomy minors. The nuclear modules in the project feature up to date electronics and are therefore sure to yield top-notch data. In the past, student attempts to use old equipment have been met with long hours of troubleshooting and disappointing results. Student satisfaction with the new equipment will no-doubt be high, and lead to a better learning experience for the students and overall a broadened exposure to experimental physics.

### **III. Impact on Existing Resources**

Your proposal must address the project’s potential impact on existing resources. Give special attention to the impact on data transmission networks (e.g., sources accessed, networking equipment, etc.) and personnel (e.g., staffing, administrative support, faculty support, etc.).

1. Describe how existing equipment is used. Contrast this to projected use, if your proposal were funded.

We currently attempt to implement nuclear physics experiments in the Junior Lab with electronics that is, in some cases, 40 years old. Old electronics like this do not have the full range of features that modern modules do, and they often break down, causing students to lose time in troubleshooting and repair attempts. Furthermore, some of the older equipment produces spurious voltages which can damage other apparatus in the experiment. These problems have, over time, led to a steady decrease in the number of nuclear physics experiments being done in the Junior Lab course.

The state-of-the-art modules we propose purchasing would have features that are greatly enhanced over the current modules. High quality modules like this will be much more satisfying to use, and will be sure to spur students on to doing more Nuclear Physics experiments. The modules we are proposing are specifically intended for the new Cosmic Rays experiment however they could also be used, to much advantage, in 5 other major experiments in the lab, allowing student experiments to be better controlled and to collect more accurate data.

1. Is similar equipment or technology available elsewhere on campus—such as with the Student Technology Center, Classroom Services, Video Services, Western Libraries, a college lab? Enter “No or “Yes”. No

IF “Yes, describe why existing equipment does not meet the needs outlined in this proposal. IF “No,” enter “N/A”.

N/A

1. IF this project would involve the replacement of equipment, including computers:
2. Describe the “before and after” configuration changes. (A spreadsheet reflecting these changes may be attached.) Or enter “N/A”.

N/A

1. Describe the costs and benefits of replacing vs. upgrading. Or enter “N/A”.

N/A

1. Would this equipment be available to students outside of your department? Enter “No” or “Yes”. Yes

IF “Yes,” describe the following (in the field below the a-d list). IF “No,” enter “N/A”.

1. How students would gain access.
2. How equipment availability would be publicized.
3. The hours per week when equipment would be available.
4. Any costs that would result from a-c.

The equipment asked for in the proposal is quite specialized and so I don't think that other departments would be much interested in it. However, there have been cases in the past where students from other departments have done student research projects with physics faculty. In cases like this, or where the project has some kind of interdisciplinary connection to Physics, outside usage would certainly be welcome. Basically, students from other departments would be welcome to use the equipment as long as this didn't conflict with Junior Lab usage (Winter and Spring quarters) and as long as the students agreed to keep physics Junior Lab faculty apprised of how they were using the equipment.

(a) Students would gain access via a lockbox outside the lab room, CF010. Equipment would need to remain in CF010; it would be impractical to move the modules to other rooms/buildings.

(b) Equipment would be publicized by word of mouth between Physics Junior Lab faculty and faculty in the outside department. The equipment is so specialized that a broader publicization would probably not result in more users.

(c) The equipment would not be available during Winter and Spring terms, when Junior lab is offered. Access to equipment would be available during building hours in Fall and Summer quarters unless a student research project was already using it.

(d) Using the modules would not entail any cost. Costs for other apparatus/materials required by the project would be borne by the outside department.

1. Would this project involve the check-out of equipment to students? Enter “No” or “Yes”. no

IF “Yes,” discuss whether the Student Technology Center/ATUS Loan Pool could be assigned this task. IF “No,” enter “N/A”.

N/A

1. Does the department have adequate operating funds to provide ongoing maintenance and support? Enter “No” or “Yes”. yes

IF “No,” describe the funding situation. IF “Yes,” enter “N/A”.

N/A

1. Does the department have adequate personnel to provide ongoing staff support for the project? Enter “No” or “Yes”. Yes

IF “No,” describe the staffing situation. IF “Yes,” enter “N/A”.

N/A

### **IV. Space and Site Information**

1. What is the location for installation of equipment or technology? Be as specific as possible.

CF010

1. Is this space/location currently assigned to your department or unit? Enter “Yes” or “No”. Yes

IF “No,” describe the current control of the space. IF “Yes,” enter “N/A”.

N/A

1. Would site modification be required? Enter “No” or “Yes”. No
Note: “Site modification” addresses site alteration—beyond specific equipment installation addressed in section V, Budget Estimate Table, line 13. Site modification significantly impacts infrastructure. This could include addition/integration of other systems required by the equipment install, such as electrical, air, lighting, security, network access, etc.; conversion of a lab or office; etc.

IF “Yes,” describe the site modification required. IF “No,” enter “N/A”.

N/A

1. Conditional Step 4: If you answered “no” to #2 above, or “yes” to #3 above:

You *may* need to submit a [Space Modification Request](https://app.e-builder.net/public/Processes/StartProcess.aspx?ProcessID=849829b0be0d47c4b6e270345a265b73&PortalTypeID=7) to Capital Planning and Development. The STF Committee will determine if this is necessary during proposal review, and will let you know. The results of the Space Modification Request form would affect lines #15 and #18 of the Budget Estimate Table.

### **V. Project Budget Estimate**

This section details the estimated cost of the project.

Budget Estimate Notes:

1. The STF Committee recognizes your proposed budget as an estimate. Final funding for successful projects will be established after thorough technical review. Some costs may need adjusting due to price changes.
2. The STF Committee may impose special conditions on a proposal before approval. (If interested, see *STF Tech Initiatives Proposal Guidelines, section V, Proposal Modifications*. This document is on the STF website.)
3. Funding is not provided directly to departments for purchases. All purchasing is done via the Office of the VPIT/CIO, and savings are retained in the Student Technology Fee fund.
4. For assistance in preparing your budget, please consult with relevant campus support departments. Four are listed here:
* Academic Technology & User Services (Director), 650-6538
* Budget and Financial Planning Office, 650-4762
* Space Planning and Administration Program Manager, 650-3935
* Purchasing, 650-3340, [Getting Started in the Western Marketplace](https://www.wwu.edu/bservices/purchasing/software.shtml)
1. What funding or contributions are available from your department or other sources? Enter dollar amount, or “N/A”. $3000

Note: The STF Committee encourages matching funds/funding support. “Contribution” is defined as a monetary contribution. For example, a vendor discount is not considered a contribution.

1. *IF you have more than seven line-item expenses,* create a separate spreadsheet of items to purchase, with a subtotal. (You will attach the spreadsheet to this form later, before submitting.)
2. Complete the **Budget Estimate Table** below.

**IMPORTANT:** To complete the Budget Estimate Table (an Excel sheet) within this form, follow these substeps:

1. Double-click anywhere in the table:
	1. For Macs, the table will open in a new window.
	2. For PCs, the table will open in place.
2. Complete the blue-shaded areas only. The remainder of the form will autofill.
3. *IF you have more than seven line-item expenses*, key the “Items to Purchase” area of *this* Budget Estimate Table as follows:
	1. Item to Purchase: “Subtotal from attached spreadsheet”
	2. Quantity: “1”
	3. Item Cost: [the subtotal from the attached spreadsheet]
4. To exit the table area of this form, single-click anywhere outside of the table.



1. Could this project be divided into discrete elements that could be funded separately? Enter “No” or “Yes”. Yes

IF “Yes,” summarize and prioritize project elements with a cost estimate for each. IF “No,” enter “N/A”.

1.) Highest Priority Element: Signal processing (Ortec modules),

Approximate cost: $15000

Funding just this part of the project would not allow the complete Cosmic Rays experiment to be built. However, it would greatly improve student experience with 5 other existing nuclear experiments.

2.) Next highest Priority Element: 5 kV power supplies (SRS),

Approximate cost: $7200

Funding of 1 and 2 would not allow the complete Cosmic Rays experiment to be built. However, it would allow 4 of the the 5 other existing nuclear experiments to be done simultaneously, greatly increasing student access to nuclear physics experiments.

3.) Next highest Priority Element: Phototubes (Hamamatsu) and Scintillators (Eljen),

Approximate cost: $2800

Funding of 1, 2, and 3 would allow a new Cosmic Rays experiment to be added to Junior Lab. If this new experiment was not in continual use, the project equipment could also be used to improve student experience and access to 5 other existing nuclear experiments.

Note: A “no” response to question 3 creates an “all or nothing” proposal. That is, if the STF Committee decides not to fund your entire proposal, it will not consider any elements for partial funding. If elements could be funded separately, the applicant is responsible for prioritizing them before submitting the proposal.

1. Are course or lab fees charged for any of the courses that will use this equipment? Enter “No” or “Yes”. Yes
Note: The total funding requested from the Student Technology Fee must consider the amount collected from course fees for equipment replacement and/or equipment acquisition.

IF “Yes,” describe the course fees. IF “No,” enter “N/A”.

The course fees for Junior Lab are $67.43 per student. Enrolment in Junior Lab is typically 16-20 students per academic year, leading to between $1000 and $1500 in collected fees. These fees are usually just enough to cover regular lab expenses including, software licenses, chemical consumables, parts for repairs of lab equipment, and benchtop equipment maintenance and repair. Our department considers it important to keep lab fees as low as possible, subsidizing the Junior Lab course, when necessary, with funds from donations to the department. Our department lists our two potential targets for Give Day donations as Junior Lab and Student Scholarships.

### **VI. Project Schedule**

Describe your overall implementation schedule. Note that project awards are announced during spring quarter (usually May), and that projects are to be substantially completed by the end of the calendar year.
IF any site modifications are determined to be involved (see section IV, Space and Site Information), your project schedule will be aligned with the schedule provided by Capital Planning and Development.

If the project is approved, we will immediately order the modules. A rough timeline for implementation is given below:

June 2024: Order modules; estimated delivery time is 4 weeks.

July 2024: test modules, ensure that everything is working.

Early August 2024: Cut scintillators to correct shape. Mount on plywood base. (Small amount of machine shop work done in the Physics&Astronomy shop by Milton From and Lab Tech Geordon Brewer.)

September 2024: Assemble entire experiment and try it out. Modify experiment guide sheets and operating manuals that will be given to students. Experiment ready to go.

Jaunuary 2025: First operation of the new experiment by Junior Lab students.

### **VII. Constraints**

List or describe any external or internal factors/constraints that could affect your project schedule, project objectives, or the project budget (e.g., if external approval is required for curricular changes, or if funding must be received by a certain date.)

The quotes obtained from most of our suppliers are valid until mid-May 2024. If we wait until much after that date to purchase equipment there could be price increases. Delivery times for two of the suppliers are specified on the quotes as being 4 weeks. Supply chain issues might delay some of the equipment's arrival. However Junior Lab is not offered during fall quarter, leaving plenty of time to get the equipment assembled and ready before the first offering in January 2025.

### **VIII. Submitting the Proposal / Routing Instructions**

1. Access the e-form [Student Tech Fee Proposals: Routing Form](https://esign.wwu.edu/forms/CIO/_student_tech_fee_proposals_routing_1.aspx) and complete the form as instructed.
2. Attach this completed proposal form to the completed e-form.
3. Attach any supporting materials for your proposal to the e-form.
4. Route the e-form as instructed.