Investment Fund for Core Needs (IFCN)
Entry #97

A. PROPOSAL SUMMARY

Title: Development of an Optics and Electronics Laboratory Course

Project Lead Name: **Zachary Robinson**
Department of Physics
Project Lead email address: zrobinso@brockport.edu

Amount Requested: $22000

Checked

Name of Sponsor 1: Jose Maliekal
Science & Mathematics

Name of Sponsor 2:

Name of Sponsor 3:

A-1. Description of the Initiative

Following the Physics Department's periodic program review (PPR) during the 2015 – 2016 academic year, the department decided to update several of the courses that we offer. In particular, the program reviewers suggested that we modify our upper-division lab courses, specifically to include more optics and electronics. Both topics will give our students useful experimental skills and exposure to important physics, and are generally engaging and well-liked. During the Physics Department's 2-day retreat in January, we decided to incorporate the reviewers' suggestions in our curriculum at the sophomore-level by rebranding our Intermediate Lab as "Optics and Electronics".

One of the primary goals for this course modification is to allow students enough experimental freedom to explore optical and electronic phenomena, with modern equipment similar to what they might find in a research or industrial lab setting. For that reason, we want to avoid purchasing pre-designed or inflexible "kits" that restrict the students' ability to approach each experiment creatively. Therefore, as part of the experimental upgrade, we will need to order enough optics and electronics equipment to allow each group of 2 students to perform the weekly experiments.

We expect the primary benefits for the Department and College to be:

1. Modernization of the equipment used in the Physics curriculum will allow us to more aggressively advertise and market our program. Any resulting increased enrollment will benefit the entire campus, since physics majors and minors tend to be academically quite strong.

2. The Rochester area is well known to be a hub for optics, as has been reflected in New York State's designation of Rochester as the beneficiary of significant amounts of "Photonics" funding. A number of local companies working in the Photonics industry may be interested in hiring our students. Strengthening the optics portion of our curriculum, therefore, will better prepare our students for a potential career in the local photonics industry.

3. For our physics majors, the sophomore year tends to be difficult. While some of the topics in the freshman courses may be familiar to them from high school, the sophomore sequence is filled with new content. The step up in the students' workload, including the challenge to develop their problem-solving skills, makes it difficult to retain students during the sophomore year. We believe that incorporating a high-tech and engaging set of experiments for the sophomores may provide the encouragement they need to succeed.

A-2. Impact Statement: What change will this project deliver in the short term? What are the expected longer term impacts?

Development of an Optics and Electronics course within the physics department is anticipated to have both short and long term benefits for the physics program. One of the most obvious benefits is that it will allow us the opportunity to replace 40+-year-old equipment with modern equipment mimicking what students will encounter in their post-Brockport careers. The modernization of our experimental teaching equipment specifically benefits the physics department, in which faculty research can be related to developing new materials and technologies.

Additionally, having new equipment for teaching will allow us to better prepare our students for their future careers. Whether they pursue graduate school or a high-tech career in the private sector, modern labs are full of digital and computerized equipment. Having similar equipment in the physics department for our optics and electronics course will give them a better start on these paths.

Recruitment, both internal and external, will hopefully also benefit from the equipment upgrade and course development that will result from this proposal. The high-tech nature of modern optics labs lends itself well to tours and marketing, and will give the college ample opportunity to specifically highlight this class in advertising materials. Optics experiments are visually appealing, and we look forward to continuing our work with campus photographer Matt Yeoman in developing materials to advertise our program.

In the longer term, we expect that this upgrade will be the start of a multi-year process that results in more robust student enrollment in our physics program. We are currently in the process of upgrading the lab equipment used in our introductory course sequence through "equipment replacement," and expect those changes to be fully implemented in the next 2 years. Following the development of the Optics and Electronics course, we are planning to develop a "Photonics Engineering" course for the Fall of 2018. We hope that the combined changes we are implementing in our curriculum will allow us to more effectively recruit students to our major.

B. STRATEGIC ALIGNMENT

B-1. To be a Great College at which to Learn

Development of a high-tech and modern optics lab will clearly benefit our students' learning experience while at Brockport. It will give them the skills they need to succeed in the job market and/or graduate school, but will also engage them with our Department and our College. Learning experiences are often motivated by curiosity and interest, and new, sophisticated and modern equipment for our labs will generate both.

B-2. To be a College engaged with its Community

Admittedly, the scope of the work that we hope to accomplish with this equipment is beyond what we could do within the community. However, we would certainly be happy to give tours of our lab, once it is built, to generate interest in our program.

B-3. To be a Sustainable Institution for the 21st Century

As a Physics Department in the 21st century, the need for equipment from the 21st century is straightforward. We will continue to struggle to recruit students as long as our program maintains labs with equipment from decades ago. The development of an Optics and Electronics course within the major will be a good step towards updating and modernizing some of our course offerings.

B-4. To be a Great College at which to Work

As a new professor in the Physics Department, I am excited about the opportunity to start teaching with the same sort of equipment that I have spent years doing research with. Troubleshooting and fixing old equipment is certainly not an efficient way for me to spend my time, so the upgrade will improve both my work experience and the experience of other faculty and student assistants within the department.

C. IMPLEMENTATION PLAN AND BUDGET

C-1. Identify the specific activities to be funded from the Investment Fund, estimated time-line for implementation, and for activities anticipated to be ongoing, plans for continued funding.

Item 1: Light Sources (laser, LED and broadband) and light detection sensors (Si photodiodes, and accessories)

Item 1 Amount: $4000

Item 2: Optical components: Beamsplitters, diffraction gratings, mirrors, kinematic translation stages

Item 2 Amount: $10000

Item 3: Electronics equipment (breadboards, power supplies, resistors, switches, capacitors, etc.)

Item 3 Amount: $5000

Item 4: Personnel (Course development, summer 2017)

Item 4 Amount: $3000

Item 5:

Item 5 Amount: $

Item 6:

Item 6 Amount: $

Item 7:

Item 7 Amount: $

Item 8:

Item 8 Amount: $

Item 9:

Item 9 Amount: $

Item 10:

Item 10 Amount: $

TOTAL EXPENSES, ALL ITEMS: $22000

Matching Fund: $9300

In-Kind Services: Provide FTE and name of personnel who have committed to in-kind services. Checked

D. ASSESSMENT PLAN:

D-1. What are the anticipated outcomes and specific measurements for success?

There are 2 primary goals for this project. First, we expect that upgrading our equipment and modernizing our laboratory offerings will result in more robust enrollment and retention in the sophomore-level physics courses (which are taken by both majors and minors). Assessing this goal will be relatively straightforward: Improved recruitment abilities should result in larger numbers of students taking the course. Nonetheless, the small number of students involved suggests that improvements in enrollment may not be obvious for several years. We will continue to monitor the enrollment numbers in the course, and develop a marketing strategy that includes highlighting the course that will be developed from this work.

The second goal is harder to assess: Improved preparedness for our students once they finish their degree at Brockport and enter either the job market or graduate school. We maintain a close relationship with most of our alumni, and regularly invite them back to Brockport to give colloquia and meet with our current students. Their level of preparedness has always been excellent, and we expect that to be continued as we upgrade and modernize our course offerings.

E. ADDITIONAL INFORMATION

E-1. Please provide any additional information to assist in the review of the proposal, including why the initiative cannot be funded from divisional resources.

The materials that need to be purchased under this proposal cannot be funded by departmental or school resources because they are simply too expensive. Some cost sharing has already been incorporated with our school's "equipment replacement" process ($9300, noted above), so that the basic infrastructure for this course is already in place. The 1-time purchase of equipment that will be enabled by this proposal will allow us to begin development of the optics and electronics course during the Summer of 2017, for partial implementation this coming Fall.

As an additional cost-saving measure, we have applied for a 10% "New Lab" discount, offered by the company ThorLabs for development of new experiments at colleges or universities. The 10% discount is applied to all of our purchases for a 1-year period. ThorLabs is an industry leader in terms of cost-effective optics equipment for research and educational purposes, and their equipment can be found in labs all over the world.

Upload up to three supplemental files here (not required): [On file]

Signature of Project Lead: [on file]
Email: zrobinso@brockport.edu

Signatures of sponsors are on file in the Administration and Finance Division.

Sponsor 1 Comments: I wholeheartedly support this proposal and thank Zak Robinson for preparing it.

Sponsor 2 comments:

Sponsor 3 Comments:

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