The Provost's Learning Innovations Grants (PLIG) program was developed to broaden and enrich the learning experience of RIT students by funding faculty-initiated projects that enhance student learning. More than 200 RIT faculty projects have received funding since the program was initiated in AY 2000-2001. (Examples of previously funded projects are available at the PLIG website, rit.edu/ili/plig).

The launch of the Innovative Learning Institute (ILI) in 2012, and its charge to assist in the creation of exceptional learning experiences for students, led to an evaluation of PLIG and a revitalization of the program to:

- Better support dissemination of individual faculty learning to the wider faculty population
- Provide funding for the implementation of successful pilot projects
- Integrate funding with Institute priorities
- Support the scholarship of teaching and learning

The 2016 Application Form is found on page 3 of this document.

I. ELIGIBILITY

The principal applicant(s) must be tenured or tenure-track RIT faculty. PLIG 2016 projects can include visiting assistant professors, lecturers, adjunct faculty, staff, students, and other contributors.

II. PLIG TYPES

There are two types of grants—Exploration and Focus Grants—for PLIG 2016. Full details are available at rit.edu/ili/plig.

III. USE OF GRANT FUNDS

Provost's Learning Innovations Grants for 2016 may range from $1,000-$5,000.

Examples of the use of PLIG funds include:

- Course release (reasonable, actual replacement costs for full-time, tenure-track or tenured faculty members removed from teaching)
• Development of new technology-based learning tools and/or environments
• Technologies or equipment required by the project that are not normally provided by the department/college
• Resources for research design and consultation, data collection and aggregation, instrument development and/or purchase, secure data storage, data analysis, and report generation
• Travel to support research activity and/or meet with potential funding sources

IV. PLIG TIMELINE
The grant timeline assumes that most recipients will use Summer 2016 to plan and develop their PLIG funded project for delivery or implementation during the Fall 2016 and/or Spring 2017 semester(s). The full timeline is at rit.edu/ili/plig.

V. SELECTION COMMITTEE AND EVALUATION CRITERIA
Applications for PLIG funds are evaluated by the PLIG selection committee according to the following criteria:
• Utility (solves a defined problem, has potential to benefit many courses/faculty)
• Creativity (is a novel approach or application, represents a new paradigm)
• Efficacy (uses an evidence-based approach, impact to student learning and/or the student experience can be demonstrated)

Details on proposal evaluation and selection committee membership is on the website (rit.edu/ili/plig).

VI. QUESTIONS OR COMMENTS
Please email plig@rit.edu with any questions or comments.
PROVOST’S LEARNING INNOVATIONS GRANTS

2016 APPLICATION

INSTRUCTIONS

Complete this form in its entirety and email it to plig@rit.edu no later than January 27, 2016. Please note to save and rename this document substituting your name (in place of “NAME”) in the file name.

Ask your Department Head to complete the Department Head Certification and return the signed copy along with your application. Note: the signed copy may be scanned and emailed.

If you have any questions about completing this application, please email them to plig@rit.edu or call Michael Starenko at 585-475-5035.

APPLICANT INFORMATION

This application is for a:

☐ FOCUS GRANT
☒ EXPLORATION GRANT

Principal Applicant Name: Iris Asllani __________________________________________ Email: icabme@rit.edu

Faculty Title/Assistant Professor __________________________________________ Phone: 917-344-0755

(Full-time, tenured and tenure track only)

College: Engineering ___________________________ Department: Biomedical Engineering ______________________

Department Head name: Steven Day __________________________ Email: swdeme@rit.edu

Proposed Project title: Bringing Cutting Edge Biomedical Instrumentation to the Classroom

Total funds requested (requests of $1,000 to $5,000 will be considered): 5,000.00

Others involved in the project (if any): Itamar Ronen, Professor, Leiden University, Netherlands ; Jianhui Zhong, Professor, University of Rochester ; Alexander Fafard, graduate student, Center for Imaging Science, RIT; (NO BUDGET ASSOCIATED WITH THESE COLLABORATORS FOR THIS PROPOSAL. DATA WILL BE USED FOR AN NSF PROPOSAL NEXT SPRING.)

____________________________
BUDGET

There is a fillable PDF worksheet to calculate your budget. You can download the worksheet at rit.edu/plig.

- The total shown on this worksheet must match the “Total funds requested” in the Applicant Information section of this application form
- If awarded, additional funds will be provided to cover any benefits and ITS expenses associated with the salary budget requested
- Note that any equipment or other materials purchased with grant funds are the property of your department and revert to the department after your project is completed

TIMELINE

Please indicate any variances to the planned PLIG 2016 schedule and your reasons. If you do not intend to deviate from the schedule, you may leave this section blank.

<table>
<thead>
<tr>
<th>Task</th>
<th>Date</th>
<th>Proposed variance and reason</th>
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</thead>
<tbody>
<tr>
<td>Full project plan submitted</td>
<td>Aug. 24, 2016</td>
<td></td>
</tr>
<tr>
<td>Preliminary findings submitted</td>
<td>Jan. 25, 2017</td>
<td></td>
</tr>
<tr>
<td>Summary of final findings submitted</td>
<td>Aug. 23, 2017</td>
<td></td>
</tr>
<tr>
<td>Final budget accounting submitted</td>
<td>Aug. 23, 2017</td>
<td></td>
</tr>
<tr>
<td>Faculty Teaching and Learning Commons posting (a summary of findings, examples of teaching designs or materials, etc.) due</td>
<td>On or before Oct. 24, 2017</td>
<td></td>
</tr>
<tr>
<td>Participation in Teaching and Learning Services PLIG dissemination event</td>
<td>On or before Nov. 17, 2017</td>
<td></td>
</tr>
</tbody>
</table>
STATEMENT OF UTILITY (two pages maximum)

Using the proposal evaluation criteria outlined in the Evaluation section of the website (rit.edu/ILI/PLIG), please provide an overview of the project you are proposing, including:

- Project objectives
- An explanation of the teaching/learning problem(s) it is designed to address
- An explanation of the significance of the project to student outcomes and/or the student experience.
- A brief description of how the project integrates with activity already underway at RIT in the priority area and/or how this approach has been successfully used at RIT already.

PROBLEM STATEMENT AND OBJECTIVES

A major challenge in teaching biomedical engineers in an institution that is not formally or directly connected to a medical center is the lack of access to biomedical instrumentation. Our students graduate without having the hands-on experience necessary to connect the theoretical foundations of their field with practical applications. This challenge is compounded by the fact that most biomedical instrumentations—X-ray, MRI, nuclear medicine, ultrasound scanners—are too expensive to obtain without the premise of patient imaging or a connection with a clinical center. So, while we prepare students with a solid engineering background, the education is largely abstract in nature and most students graduate without being able to identify biomedical equipment, let alone know how to use them for a given application or troubleshooting. (Recently, I accompanied biomedical engineering students to a hospital that had an ultrasound machine that was malfunctioning; students could not recognize that what they were looking at was an ultrasound scanner even though they could describe very well the basic physics and mathematical principles of ultrasound imaging.)

The motivation for this grant stems from the pressing need to expose our students to real-world hands-on experiences in biomedical instrumentation. To this end, I propose to develop a course that would bring cutting edge biomedical imaging from some of the most renowned centers in the world directly to our classroom at RIT.

The goal of this proposal is: TO DEVELOP A COURSE THAT DELIVERS HANDS-ON EXPERIENCE WITH CUTTING EDGE BIOMEDICAL INSTRUMENTATION VIA REMOTE REAL-TIME VIDEO INTERACTION.

I plan to take advantage of my own research-related access to high-end instrumentation, which I have established through long-standing collaborations with some of the most advanced clinical imaging centers in the world, namely: Columbia University Medical Center in New York, Rochester Center for Brain Imaging at University of Rochester, Martinos Center for Biomedical Research at Harvard University, and Leiden University Medical Center in Netherlands. I have already talked with colleagues in these institutions who enthusiastically support the idea and have offered to lend their time and expertise to implement it.

The grant will be implemented in 3 parts:

PART 1: During Summer of 2016 we will record 10 videos, 30 minutes each, of experts using a medical equipment that will be shown during class in the fall. For example, we will record how to set up a 7 Tesla MRI scanner (which only a handful of institutions in the United States have available). This MRI-dedicated video-set will cover all aspects of MR imaging, from putting a patient in the scanner, to setting the RF coil parameters, to running various imaging protocols, all the way to the visualization of MR images. The same will be done for X-ray, Ultrasound, and Nuclear Medicine (PET) scanners.

PART 2: During Fall 2016, I will develop/teach a course that includes Interactive Video conferencing with the Gorter Center for High Field MRI in Netherlands (professor: Itamar Ronen), Biomedical Engineering Department at Columbia University (professors: Elisa Konafagu and Randy Marshall), and the Rochester Center for Brain Imaging at University of Rochester (professor: Jianhui Zhong). During these interactive classes, students will interact directly via real-time video with the engineers, scientists, and clinicians running the biomedical devices.
PART 3: Students will be tested on practical aspects of operating the biomedical instrumentation covered in during PART 2. We will start by testing them on how to use MRI, PET, and ultrasound scanners. Students will interact with experts in situ who will apply students’ answers to operating a given instrument in real time. Allowing students to see the results of their decisions in an educational setting and to gain experience in how their theoretical understanding of a phenomenon translates into a practical application will be highly beneficial. This is the closest students can come to operating high-end biomedical equipment directly without leaving the campus.

EXPECTED LEARNING OUTCOMES

Students will be able to:

(1) identify biomedical equipment and their main application.
(2) develop practical skills needed to operate biomedical equipment (MRI, ultrasound, PET)
(3) integrate theoretical principles of biomedical imaging with practical applications
(4) determine source of operational artifacts, such as those related to hardware malfunction and system noise
(5) predict equipment performance based on user input

PROPOSAL OUTCOMES

(1) Students will obtain hands-on experience with high-end biomedical instrumentation, which is currently missing in our undergraduate training of biomedical engineering.
(2) Students will be exposed to the dynamics of networking and will learn how to interact with engineers, clinicians, and scientists in cross-disciplinary areas.
(3) Students will obtain a set of practical skills that could be used to expand the spectrum of Co-op opportunities.

PROJECT INTEGRATION WITH CURRENT ACTIVITIES AND PRIORITY AREAS

The execution of the proposal relies on RIT’s already advanced application of online learning. While this course is not an online learning course per se (it has the potential to develop in one in the near future), it is in a sense a hybrid course. We will take advantage of RIT’s experience with online course development tools and will seek advice and help across campus for implementation. For example, we will work with colleagues and students in the Motion Picture Science at RIT to compile and streamline the videos.

In addition to increasing Co-op opportunities for students, the course will also introduce them to some of the best research facilities in biomedical engineering. Students will get a sense of large-scale research centers and the dynamics of networking with large teams of researchers working under the same umbrella.
STATEMENT OF CREATIVITY (three paragraphs maximum)

Provide a brief description of how this is a novel approach, or a new application of an existing mode or model of teaching and learning, and/or research about how teaching and learning represents an entirely new paradigm. (Please note that special consideration will be given to proposals that demonstrate a new use/application of a model, system, or technology already in use at RIT.)

The approach proposed here is novel and represents a paradigm shift in the way we educate biomedical engineering students in institutions like RIT that do not have a formal connection with a medical center and therefore lack access to high-end biomedical instrumentation and equipment.

In addition to facilitating access and providing hands-on experience with cutting-edge biotechnology, this approach intersects classroom education with research experience, which is also a new learning paradigm for undergraduate education. The proposal seeks to bridge theoretical foundations of undergraduate training with real-life hands-on experience and research applications, something that it is hard to do without having access to large research centers within the institutions, which only few universities can afford to have.

Successful accomplishment of the aims of this proposal in addition to proving beneficial to the biomedical engineering students will also pave the way for more courses that are built on the interaction of classroom learning with real-time application. In other words, it will pave the way for building virtual laboratories that are integrated into the classroom learning rather than being separate entities in time and space.

UTILITY

-- An opportunity for students to be exposed to and interact with technologies that are currently being presented only within a theoretical framework.

-- Students will acquire a set of useful skills that are currently not feasible through conventional courses.

CREATIVITY

-- We propose a novel approach to educate students on modern techniques without costly overhead and prohibitive expenses associated with running biomedical instrumentation.

-- In addition to being innovative in and of itself, the current proposed method will provide the framework for future expansion of the idea into including augmented reality, and eventually 3D Virtual Reality classroom (stereoscopic or polyscopic imaging technology.)

EFFICACY

-- Student experience will be easily demonstrated via their ability to use biomedical instrumentation and to troubleshoot and identify main artifacts
STATEMENT OF EFFICACY (two pages maximum)

Provide a brief description of the experiment/research design, methodology, and methods of data collection you will use to gauge efficacy.

METHODS

PART 1: Summer 2016 - Media preparation

A set of 10 30-minute videos will be collected at: (1) Gorter Center for High Field MRI, Leiden University Medical Center (LUMC); (2) Ultrasound Elasticity Imaging Laboratory, Columbia University; (3) Rochester Center for Brain Imaging, University of Rochester; (4) Martinos Center for Biomedical Imaging, Harvard University; and (5) Stroke Center, Columbia University Medical Center.

The list of topics and instrumentations covered:

1. RF coil design and testing (LUMC)
2. MRI scanning procedures at 3T (LUMC)
3. MRI parametric setting at 3T (LUMC)
4. High field MRI scanning, theoretical and practical challenges, (LUMC and Martinos Center)
5. Experimental Elastography, Ultrasound Lab, Columbia U
6. Ultrasound imaging for research, Ultrasound Lab, Columbia U
7. Ultrasound imaging for clinical applications, Ultrasound Lab, University of Rochester
8. Functional MRI (fMRI) protocol and experimental setting, RCBI, University of Rochester,
9. EEG fMRI, Stroke Center, Columbia U
10. PET imaging, Stroke Center, Columbia U

Feasibility: I have long standing collaborations with these laboratories and visit them throughout the year as part of data collection for my research. The editing, compiling, and media preparation will be done on RIT campus throughout the summer.

PART 2: Real-Time Video-conferencing

During the Fall 2016 Biomedical Instrumentation course, the 30-lectures distributed over 15 weeks of class will be structured as follows: (1) Ten lectures will be based on real-time video-conferencing with one of the centers as described above. One of the experts on-site will be showing the equipment and how to use it. Students will be able to see the control panels of the instrumentation and learn how to set-up and optimize a given protocol. For example, for the 7T MRI, students will see how the patient bed is controlled and monitored, how the coil is positioned, and how the MRI scanner is run to acquire certain images. (2) The syllabus will interleave theory with these practical video-conferencing sessions. For example, for a Tuesday/Thursday course, Tuesday we will cover the math and physics underlying the basic principle of say the MRI scanner. On the next lecture, i.e., Thursday, students will connect to LUMC for a real-time presentation of the principle. (3) The last 10 sessions will be dedicated to students remotely running the instruments themselves. The 'practical skills' testing will occur during this time as described in PART 3 section below.

Feasibility: At the moment, I have arranged for professors at LUMC and UofR to be part of this project. If successful, the hope is to extend it to the other labs and include more researchers.
PART 3: Student Testing

This part is similar to PART 2, except that students will be leading and applying what they have learned by setting up the equipment (remotely) and basically running the instrumentation via video-conferencing on to the lab where the instrumentation resides.

Feasibility: This part has also been pre-arranged with colleagues at LUMC who will be available to run the high field MRI scanner remotely as per students’ instruction. The goal is to dedicate the last 2 weeks of class (15 minutes/student). For Fall 2016, we will focus on the MRI and the LUMC site. If successful, will extend to other modalities/sites.

ASSESSMENT and DATA COLLECTION

As mentioned in PART 3 of the proposal implementation, students will be tested in real-time via video-conferencing on three aspects: (1) ability to identify biomedical equipment and its parts, (2) operational skills, and (3) ability to determine source of artifacts and equipment malfunction.

Data collection will include comparison of evaluation of students’ performance during practical application with the evaluation of theoretical foundations.
DISSEMINATION PLAN (optional)

Provide details about the journal, conference, show, or other external vehicle with strong potential for dissemination of your results. Include supporting documentation, such as preliminary interest or acceptance, with your application, if available. *(Please note that special consideration will be given to proposals that have a defined opportunity for external dissemination, such as an academic journal or professional conference.)*

ILI will arrange channels for disseminating results within RIT.

(1) Methods and Results will be presented at the annual conference of The American Society for Engineering Education.

(2) The goal is to use the methodology developed and the results obtained as preliminary data to apply for an NSF grant. The goal of the grant will be to expand the proposal to include 3D virtual-reality classroom environment.
ADDITIONAL CONSIDERATIONS

Please address these questions, if needed.

Will your project require assistance for extensive or unusual media, multimedia, simulation, and/or software development? If so, please explain?

NA

All courses offered by RIT must be accessible to students with disabilities, according to Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act of 1990 (rit.edu/studentaffairs/disabilityservices/info). Is your proposed teaching approach accessible to all students, with reasonable accommodation? If not, please explain.

NA

RIT abides by the Family Educational Rights and Privacy Act of 1974 (FERPA), which prohibits instructors from making students' identities, course work, and educational records public without their consent (rit.edu/xVzNE). Will any data gathering or sharing for your project raise any FERPA issues? If so, please explain.

NA
DISSEMINATION AGREEMENT

By completing this grant application, I agree to provide the materials described here, in support of disseminating what is learned from this project to other faculty at RIT.

I also agree to return all/a portion of the funds that I receive for this project to RIT if I fail to complete or provide the materials described here.

- Full project plan (including roles and responsibilities, milestone dates, and pertinent project details)
- Overview of preliminary findings (may include experiment/study design, lessons learned, initial data collection, and/or literature review summary)
- Final project summary (including data collection, lessons learned, implications for further study, and which may be in the form of an article abstract, conference presentation outline, or short report)
- Teaching and Learning Commons posting (a summary of findings and examples of teaching designs or materials)
- Participation in a faculty dissemination event
- Final budget accounting (reconciliation of budget provided with your application and the actual project expenses)

By submitting this application, I accept this agreement. IA (Applicants initials)
DEPARTMENT HEAD CERTIFICATION

I support this PLIG application and budget, and verify that the principal applicant ____________________________ is a full-time, tenured or tenure-track faculty member in good standing in my department.

Department Head Name (PRINT): Steven Day Email: Steven.Day@rit.edu

Department Head Signature: Steven w Day Date: 2-8-16
## PLIG Budget Worksheet

### Applicant's Name:

**Aslani, Iris**

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Purpose/Justification</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Time Faculty/Staff</td>
<td>DEVELOP VIDEO CONTENT, COORDINATE WITH EXPERTS ON-SITE, AND OVERALL SUPERVISION</td>
<td>$1000</td>
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<tr>
<td>Adjuncts, Part-Time Faculty/Staff, Summer Salary</td>
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<tr>
<td>Student Workers, Graduate Assistants</td>
<td>SUMMER SALARY FOR ONE UNDERGRADUATE STUDENT WHO WILL COMPILIE VIDEOS</td>
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**Personnel Total** | **$3500**

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<tbody>
<tr>
<td>3-D MONITOR, SONY</td>
<td>VIDEO PRESENTATION</td>
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<tr>
<td>VIDEO PROCESSING FEE</td>
<td>PROFESSIONAL VIDEO PROCESSING (MOTION PICTURE SCIENCE @ RIT)</td>
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**Equipment Total** | **$2500**

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**Travel Total** | **0**

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**Other Expenses Total** | **$5000**

**Total Award Request**