UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Implementation of Virfac® (Virtual Factory) Software Package

Title

Jonathan Raush

Name of Submitter
(Faculty or Staff Only)

Department of Mechanical Engineering

Organization

Title: Assistant Professor Date: July 7, 2017
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Department/College/Org: Dept. of Mechanical Engineering/College of Engineering

ABSTRACT (250 words or less):

This proposal is being submitted to improve the available manufacturing processes training resources in the College of Engineering by implementing the Virfac® software package into manufacturing processes and design courses. The manufacturing and design courses offered by the Mechanical Engineering, Industrial Technology, and Civil Engineering Departments affect over 1800 students on campus. Funding this project will provide this large pool of students access to state of the art tools intended to improve their instruction and exposure to the necessary skills and knowledge needed to be competitive in the workplace. The project will fill a void in college resources where little content is currently available in the simulation and design of these critical processes. Currently, students receive no training in the design simulation of parts that includes the standard manufacturing processes available to them (welding, machining, heat treating). Additionally, students will receive training in new and revolutionary processes (3D printing, friction-stir welding) that will become more prevalent in the factory of the future and is necessary to remain competitive and relevant.

Instruction Sheet:

1. Complete the cover page.
2. Complete the abstract page.
3. Give a description of your proposal in 12 pt. font, single spaced, addressing the following points:
    a. Purpose of grant and impact to student body as a whole
    b. Projected lifetime of enhancement
    c. Person(s) responsible for
        i. Implementation
        ii. Installation
        iii. Maintenance
        iv. Operation
        v. Training (with qualifications)
    d. The narrative of the proposal must include the purpose and justification for each of the items listed in the Budget Proposal.
4. Complete the Budget Proposal form.
5. Include any additional information relevant to your application.
6. Discuss all previous funded STEP projects (if any).

ONE ELECTRONIC COPY (Microsoft Word or Adobe PDF) OF PROPOSAL SHOULD BE EMAILED TO stepproposal@louisiana.edu BY DEADLINE DATE.

For additional submission instructions and deadlines, please visit http://cio.louisiana.edu/step-process

NO HARD COPY SUBMISSIONS WILL BE ACCEPTED!

A. Purpose of Grant

A critical and often neglected component of engineering design is the proficient design of the manufacturing processes for the part under consideration. Poor design of the manufacturing process can lead to a failed component or part. This consideration affects students in mechanical engineering, civil engineering, and industrial technology. Currently, these Departments cover this as a limited discussion of conventional techniques (machining and welding) within the context of several courses, including some training in the physical processes. However, there are currently no design tools available for training students in the use of these manufacturing design concepts and the analysis of the effects, such as residual stresses, distortions, and fatigue, which can have huge consequences on the part usage.

Additionally, there is currently no course offering which includes new advanced manufacturing techniques such as additive manufacturing (3D printing) or friction stir welding. The market for 3D printing and advanced manufacturing is rapidly evolving. Recently Goldman Sachs predicted that the current 3D printing industry was a $2.2 billion market, and its revenues would reach $10.8 billion by 2021. Advanced manufacturing applications in aerospace, automotive, healthcare, and consumer product sectors are forecasted for 20-30% annual revenue growth. In order to utilize 3D printing and advanced manufacturing to its fullest potential, engineers and designers must be trained. Such courses are offered by top universities. For example, MIT will offer a 2017 course entitled "Additive Manufacturing: From 3D Printing to the Factory Floor". The goal of this project is to provide UL students the opportunity to receive proper training in conventional as well as the emerging fields of advanced manufacturing.

The purpose of this grant is therefore the acquisition and implementation of the Virfac simulation environment. The commercial package Virfac® is used by engineers around the world to simulate welding, additive manufacturing, machining, heat treatment and damage resistance in various industries including aeronautics, automotive, naval and nuclear. Virfac® Additive Manufacturing is a new latest software addition and has the capability to compute both the SLM (Selective Laser Melting) as well as the LMD (Laser Metal Deposition) processes efficiently. It is based on a multiphysics and multiscale approach, providing the user with highly accurate distortions & residual stresses within a very short time. With the help of Virfac® Additive Manufacturing, our students will be able to optimize the build-up orientation, the support configuration and verify the influence of operating conditions on the distortions, plastic strains and residual stresses. The proposed software can be implemented into current manufacturing processes and design courses to expose students to the effects of processes on the design of parts and systems. The successful implementation of this training will prepare UL engineering students for the workplaces of the twenty-first century. In addition, this training could eventually affect ABET accreditation.

Impact on Student Body

This initiative will impact students in the following ways:

1. Improvement of the current offering of manufacturing related software to more fully represent today's engineering workplace. The many departments within the College of Engineering that utilize this training will benefit from the improvement.
2. Students currently have limited experience with several manufacturing processes and none with others (3D printing, friction stir welding). The students have limited interaction with CNC simulation, but no experience with software design involving many manufacturing processes including 3D printing,

welding, heat treating, etc.

3. Students will be expected to have a level of proficiency in the workplace when entering with an engineering degree. They need the exposure to the tools of the future workplace, especially with developing and game-changing tools such as 3D printing.

4. The university doesn't currently have the resources to acquire a 3D printer in the metals area, this software will provide the exposure the students need to understand the process and its limitations and advantages.

5. Students will have an advantage over those from other colleges when entering the workplace, making them more competitive for future advanced manufacturing jobs

6. Students will value leaving a program having experienced cutting edge technologies which they can bring to businesses and other educators.

B. The Projected Lifetime of Enhancement

These upgrades are expected to last for at least 10 years, as the proposed package represents an industry standard in virtual manufacturing that ensures the software will remain current and relevant for the foreseeable future.

C. Person(s) Responsible for Project

a. Implementation: Jonathan Raush, College of Engineering
b. Installation: Harvey Ozbirn, College of Engineering
c. Maintenance: Harvey Ozbirn, College of Engineering
d. Operation: Jonathan Raush, College of Engineering
e. Training: Jonathan Raush, College of Engineering

Qualifications:

Jonathan Raush is currently an Assistant Professor in the Department of Mechanical Engineering. He holds a Ph.D. from Louisiana State University in Mechanical Engineering. He specializes in additive manufacturing of metal alloys and materials design.

Harvey Ozbirn is currently the computer systems manager for the College of Engineering. He has held this position since 1999. He holds a Master's degree in Business Administration from the University of Southwestern Louisiana & a Master of Science in Engineering Technology & Management from the University of Louisiana at Lafayette.

Budget Proposal

1.	**Equipment**	**$0**
2.	**Software**	**$27,000**
3.	**Supplies**	**$0**
4.	**Maintenance**	**$0**
5.	**Personnel**	**$0**
6.	**Other**	**$0**
TOTAL:		**$27,000**

Timeline:

Year 1:

Order software site license.

Install software, implement into course modules in MCHE, ITECH, CIVE

Year 2:

Further implement into course modules

Year 3:

Maintenance

Year 4:

Maintenance

Previously Funded STEP Grants

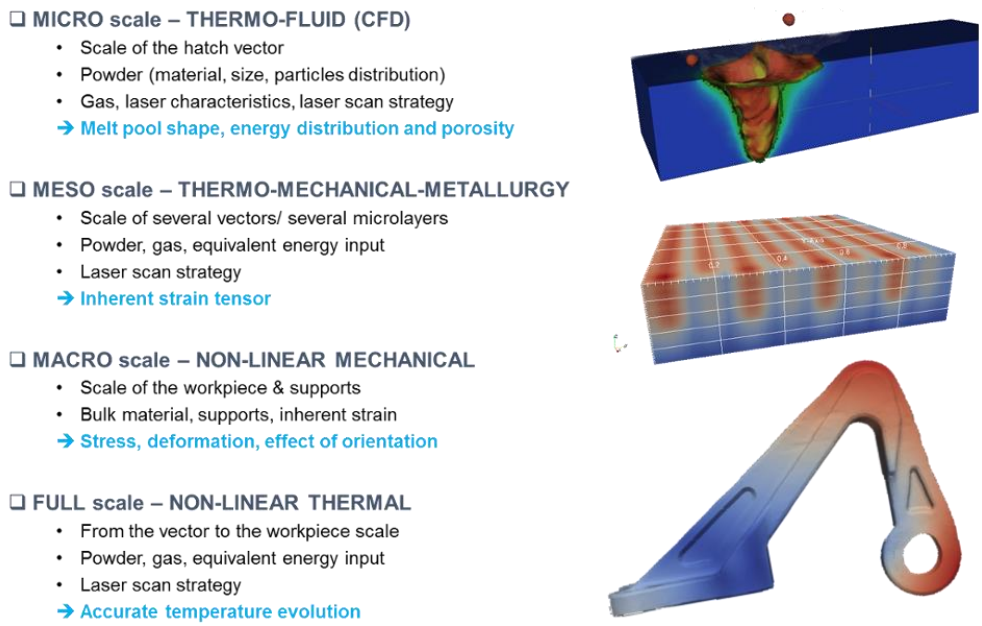
Jonathan Raush has not proposed any previous STEP grant funded projects.

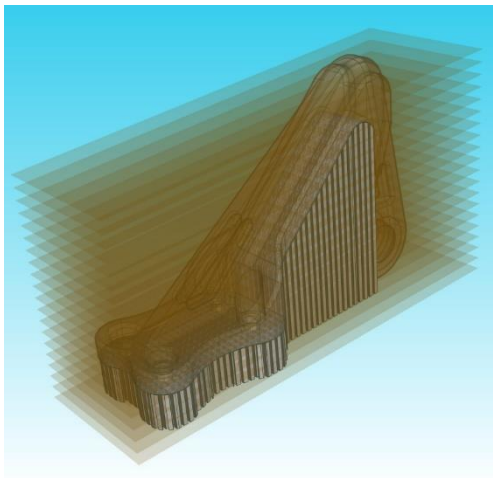
Budget Proposal

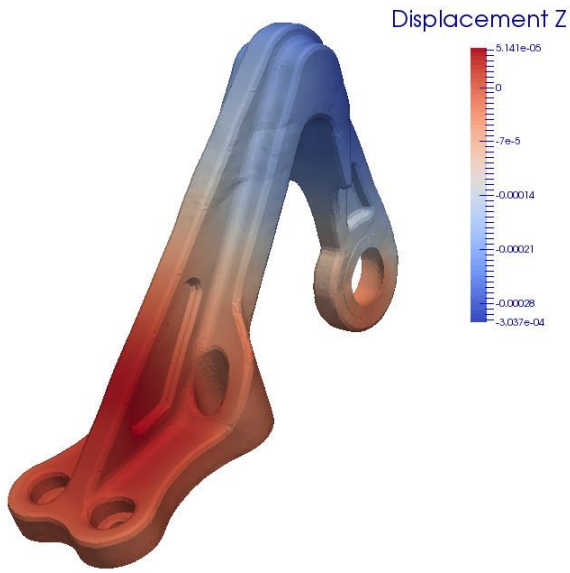
Length of Implementation (In years)	1	2	3	4
1. Equipment	$0	$0	$0	$0
2. Software	$27,000	$0	$0	$0
3. Supplies	$0	$0	$0	$0
TOTAL:	$27,000	$0	$0	$0

D. Software Images

www.geonx.com



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