

Engineering Student Technology Committee

<http://www.engr.colostate.edu/ESTC>

College of Engineering

Colorado State University

The Engineering Student Technology Committee (ESTC) invites proposals from students, faculty, and staff for technology related equipment to enhance the student educational environment in the College of Engineering at CSU. Each year, the ESTC allocates funding for strategic projects that will have a near-term benefit to students. This year, the committee is soliciting proposals in the \$5K - \$40K range. Proposals must be primarily for equipment and have a direct benefit to the educational mission of the college. Please review the Charge for Technology (CFT) manual for permissible use of CFT funds:

<http://ucft.colostate.edu.aspx/www.ucft/pdf/cftmanual.pdf>.

The ESTC is particularly interested in intra-departmental proposals or proposals that benefit a large cross-section of students. Partnerships with the ESTC that fund projects beyond the limitations of the CFT are especially compelling. Note that the committee is not, in general, interested in funding projects that are specific to a particular research group or that affect only a small number of students. To submit a project proposal, please complete this form and send it as an e-mail attachment to estc@engr.colostate.edu by April 30 for full consideration.

1. Title of Proposal: Materials Microstructure Evaluation Equipment for Mechanical Engineering Undergraduate Teaching Laboratory

2. Proposal Participants:

Primary Contact for Proposal

Name: Dr. Donald Radford; E-Mail: Donald.Radford@colostate.edu _____

Department/Major: Mechanical Engineering _____

Circle One: **Faculty**

Additional proposal participants

3. Proposal Abstract (limit to 100 words):

Mechanical Engineering needs to enhance and increase the number of microscopes and hardness testers in the Materials teaching lab which have become unserviceable over the past 7 years. This equipment supports a Laboratory required by all Mechanical Engineering majors.

4. Proposal Budget

List of items to be purchased and cost

3 – Inverted Stage Metallographic microscopes - \$2300 ea	\$6,900
5 – 100x objective lenses - \$250 ea	\$1,250
5 – 5MP USB microscope cameras and associated imaging software - \$1,500 ea	\$7,500
5 – PC computers and 24” displays to display, measure and capture images - \$1,200 ea	\$6,000
2 – Rockwell hardness testers - \$4,850 ea	\$9,700

TOTAL: \$31,400

Dollar or percentage amount requested from ESTC: 50% (\$15,700) in one-time funding

5. Full description of proposal:

The Materials Engineering Laboratory, a 1 credit portion of MECH331, is a required component of the Mechanical Engineering undergraduate degree, and thus, all Mechanical Engineering undergraduates are served by this Lab. This Laboratory is currently an emphasis area of the Department and efforts have been underway for the past 2 years to significantly improve the educational experience provided by the Laboratory. The two functioning microscopes and single functioning hardness tester that have been in the Laboratory for approximately 7 years have failed to perform to expectations this semester. The digital imaging portion of the microscope systems failed altogether this semester. Further, as class sizes have grown, 2 microscopes and 1 hardness tester have become a significant bottleneck in the Laboratory, which now has a minimum of 5 groups in each of 4 sections. This class size is projected to continue to grow, and there is already a consideration of additional Laboratory sections for Fall 2012.

To enhance the experience for all students in the laboratory class (and thus, all Mechanical Engineering undergrads) this proposal requests the purchase of 3 microscopes to result in 5 functioning microscopes and the purchase of the corresponding required camera and computer hardware and software to support metallurgical digital image capture and manipulation using the resulting 5 microscopes. Within the Laboratory class the ability for the undergraduate groups to be able to view, capture and analyze highly magnified images of material microstructure is a key element of the laboratory experience. To then understand how the changing microstructure, which can be viewed with the imaging system, affects the material properties, the hardness of each specimen is measured.

To currently measure the hardness, all 5 groups need to wait for the availability of a single hardness tester. To improve the flow through the Laboratory, and give each student more time to be involved in the evaluation of the material hardness, it is further proposed to purchase an additional 2 hardness testers. 3 total hardness testers should thus alleviate the significant bottleneck in the current laboratories and with an imaging system for each laboratory group, the students will be able to spend more time viewing and understanding the necessary content of the course.



Metallographic Microscope with Camera



Benchtop Hardness Tester

Thus, upon successful acquisition of this Materials Microstructure Evaluation equipment, the undergraduate Laboratory groups will have substantially more access to testing and evaluation critical to the understanding of the fundamental concepts being covered in the Laboratory and the associated lecture portion of the class.