

Engineering and Technology Industry Council Campus Investment Proposal Biennium from July 1, 2011 to June 30, 2013

Campus: Southern Oregon University

**Contact Name: Peter Wu, Physics
Greg Pleva, Computer Science**

Date of Submission: Jan 28, 2010

Summary of Proposal:

SOU proposes a total project of \$794,141 that includes investing \$395,000 to continue improvements to our Computer Science programs and investing \$ \$399,141 to continue the SOU portion of the cooperative Materials Science Bachelor's Degree program offered in partnership with the University of Oregon.

Computer Science further proposes an opportunity for collaboration involving the Centers of Excellence strategy.

Vision and Goals Statement

For Computer Science:

Computer Science programs at SOU prepare students for careers in technology, and graduate school. We teach students, under the umbrella of the scientific method, teamwork, techniques of engineering solutions to problems and hands-on training in up-to-date laboratories. In addition to a comprehensive range of department-based programs, we seek interdisciplinary initiatives in math, chemistry and environmental studies. We assist our region through a graduate program in computer science and research on, computational linguistics, discrete global grids, and computer security and forensics.

For Materials Science:

The Physics/Engineering/Materials Science program will serve as an education, resource, and support facility for STEM students interested in Physics, Materials, and Engineering in the Southern Oregon region. High school graduates can begin and complete their baccalaureate at SOU. Community college transfers can complete either their baccalaureate or pre-engineering training at SOU. Pre-engineering graduates can expect a seamless transfer to OSU or PSU. We will work closely with OSU and UO to promote their graduate programs to our students. Establishing articulation agreements, such as those between SOU and the Materials Science Institute (MSI) at UO, will streamline the transfer process.

A Center of Excellence Collaborative Proposal:

Energy Generation, Energy Conservation, Intelligent Energy Management, Water Resourcing and Environmental Sensing all share a common need, to be connected and monitored. Command and control decisions must be made quickly using reliable and authentic data. The data necessary to make those decisions must be protected. SCADA

(Supervisory Control and Data Acquisition) systems are the common, distributed systems which monitor and control entire sites, or complexes spread out over larger areas (anything between a plant and a country). Many of these systems have extensions to their communication protocols that allow them to operate over the Internet and use the TCP/IP protocol. Best practices for Secure Systems is to avoid connecting SCADA and real time systems to the Internet unless their attack surface is reduced. Despite this security advice the increased convenience of end users viewing their processes remotely has introduced increased security considerations. While these considerations are thought to be solved in other sectors of internet services, not all entities responsible for deploying SCADA systems understand their vulnerabilities. The impact of compromised SCADA systems can be devastating, e.g. power grid rendered inoperable, wind farm down.

We will provide hardware and software design to build secure communication devices. These devices will provide SCADA systems with a transparent communication channel and will not require any alteration to the onboard system.

We offer this as an opportunity for collaboration. Because of the importance of secure communication for many of the Sustainable Engineering strategies outlined we feel that our proposal is very relevant and consistent with those strategies.

Our current Security track has a high potential for student interest in this research. Our increasing number of Graduate students will provide opportunities for research assistants to support the development of this device. The network lab we have established with support from ETIC can provide a fertile testing and development environment.

This is an area of major interest from the Federal government. Many studies have come out very recently highlighting the high vulnerability of many of our vital infrastructure components. Expansion of devices like this to not only government entities but private enterprises will provide a strong growth opportunity and high commercial potential.

We could easily benefit Oregon by producing the products in our state.

A rudimentary prototype for a device of this nature already exists here. Funding with the associated research and development may prove its viability.

Investment Description

For Materials Science

The main objectives of the program are to reach the 2X goal by 2020 and to enhance the development and full implementation of SOU's portion of the joint Materials Science degree program with UO. We propose to invest \$399,141 during the 2011-13 biennium, a slight increase over the budget of the 2009-11 biennium plus a new collaboration initiative, \$30,000 per year, between the Center for Advanced Materials Characterization (CAMCOR) at UO. Most of this increase is due to the normal pay increases of the faculty involved in the proposal. Use of the proposed funding during 2011-13 will include:

- Support for the 1.0 FTE faculty position in Materials Science (\$175,015 for the biennium)
- Support for 0.133 FTE faculty position to hire a practicing professional engineer to teach engineering orientation (\$18,934 for the biennium)

- funding for recruitment and retention activities and to support industry partnerships and summer studies at the other campuses (\$33,000 for the biennium)
- Support for supervising undergraduate and high school students' summer research and other duties (\$63,459 for the biennium)
- Purchase of additional equipment for laboratory improvement, teaching, and student research (\$30,000 for the biennium).
- Supply, service, and release for program coordination (\$10,000 for the biennium)
- The new initiative is to support SOU students to take a course on Materials Characterization using the facility at CAMCOR. The budget includes travel, room and board, as well as tuition for the month long course.

The new initiative aims to raise the education level of our graduates, increase collaboration with UO, and improve retention. We believe that with training in using state of the art characterization techniques and have a chance to observe first hand how their training can be applied can motivate our students to stay in the field of Materials Science and improves the job prospect of our students. It will also be beneficial to them if they decided to go to graduate school, such as the Master in Materials Science program at MSI.

To achieve the 2X goal and to sustain the Materials Science initiative, recruitment remains one of the most important components. Funding is requested for continuing our recruiting activities aimed at pre-college and community college students. These funds will cover recruitment trips, literature and promotional materials, time and resources for development of hands-on workshops, courses, and demonstrations for high schools and community colleges.

As part of our recruitment drive, in the fall of 2008, Dr. Quainoo organized a session and gave a presentation titled “Materials Science, a Growing and Promising Discipline” at the National Science Teachers Association Portland Area Conference. The audience was mostly high school science teachers from Oregon. For recruitment within SOU a series of introductory courses has been initiated to attract freshmen as proposed in the 09-11 proposal:

ENGR/PH 175: The Science and Technology of Nanoparticles- offered 08-09

ENGR/PH 174: Digital Systems and Robotics - offered 09-10

ENGR/PH 176: The Science and Technology of Materials- scheduled 10-11

The series has been accepted by SOU to fulfill the general education science requirement, i.e. the exploration component.

In addition to recruiting new students from within the University, these courses also serve an important role in student retention. The mathematics preparedness of our incoming class is dropping every year, e.g. some of the freshmen expressing interest in STEM fields need to start with Algebra. These students will not start their STEM curriculum until they take the first course in Calculus. This can mean two years after they arrived at the SOU. These introductory courses are designed to expose them to different interesting

developments in engineering and technology to maintain their interest in STEM areas and maintain contact with them during this remediation period.

In terms of the upper division Materials Science courses, initiated in 2007-2008, we will add:

ENGR462: Materials Selections in Design

The initial offering of ENGR 475: Nanoparticles and Nanoparticle Technology was in 08-09. All the courses required for the Materials Science degree option are currently part of the course rotation (2 year cycle) in our curriculum, and we anticipate that the growing demand for the new degree option will require that they be offered more frequently.

In collaboration with SOU's Admissions Office, Dr. Siem will be released for 3 ELU in Spring 10 to do recruitment throughout the region.

Portable Materials Science demonstrations for recruitment purposes are currently under development by Dr. Siem, Dr. Quainoo, and Dr. Wu. These will be used for recruitment trips to high schools as well as community colleges.

Dr. Wu, in collaboration with instructors John Salinas and Dusty Rittenbacher at Rogue Community College (RCC), will promote the Materials Science program in RCC's General Chemistry and General Physics classes on both the Medford and Grants Pass campuses. He is also working to establish admission articulation for direct transfer of RCC graduates to this program

In line with the strategy of collaboration with Centers of Excellence and for producing graduates that will be prepared to meet anticipated industrial needs for effective researchers/problem solvers in areas such as microelectronics and the polymer/coatings industry and in the growing nanotechnology sector, we have focused our collaborations with the MSI program at UO and the Engineering Departments at OSU and PSU.

We work hard to channel graduates to enter the Materials Science master's program at the UO. We market the SOU B.S. program as the initial component of a 4+1 master's degree. An articulation with the MSI at UO automatically admits our graduates with a GPA of 3.0 or higher to their program. This has been a very popular program with our SOU graduates. Last year, SOU graduate Jeremiah Lewman completed this program, while two of our graduates, Bram van Cleave and Jenn Brown continued their graduate training in this program. We work closely with Chris Larson and Dave Johnson at UO to ensure our graduates a smooth transition to UO.

To strengthen our collaboration with UO and OSU, we budgeted funds to assist students with the cost of commuting to these campuses, for example, summer workshops at the UO or Research Experiences for Undergraduates (REU) programs at OSU and UO if needed. These financial incentives help with retention and strengthen the collaboration among SOU, UO, and OSU.

We work closely with Brett McFarland at OSU to ensure our pre-engineering graduates a smooth transition to OSU's professional engineering programs and graduate programs. Dr. Wu attends the annual Transfer Workshop at OSU regularly to identify changes to admissions requirements for various engineering programs.

To ensure smooth student transfer between different campuses, we work hard to keep in contact with key personnel at the different campuses and in collaboration with SOU's Enrolment Services office. In addition, we have established an exhaustive course articulation list covering most of the Community Colleges in the Pacific Northwest to facilitate transfer to our pre-Engineering program, and in turn, to Oregon's Colleges of Engineering.

The support for research during the academic year and summer research are an integral part of our strategy to promote our program, raise our academic standard, involve students in research, and secure external funding for various projects. We have established a strong record of supporting local teachers and students, as exemplified by the following:

- Over the past eight years, we have mentored a science teacher from North Medford (Robert Black) through the Partners in Science Program (sponsored by M. J. Murdock Trust) and eight pre-college youths (sponsored by the Apprenticeships in Science and Engineering, PSU-NSF program). We have also supervised five high school senior projects.
- We were successful in submitting a joint proposal to NASA's reduced gravity program (in collaboration with OIT and Seattle Central Community College). This project is sponsored in part by Umpqua Research Co.; the participation of our majors and a pre-college student is sponsored by local gifts to SOU's Physics/Engineering Department.
- We have collaborated with the local ScienceWorks museum to develop a high-altitude balloon launch project supported by Oregon Space Grant. Balloons have reached over 100,000 ft with payloads that include cameras, temperature probes, humidity probes, magnetic field probes, and other experiments created by middle and high school students. Over the past three years, thirteen middle and high school students as well as three undergraduate students have been involved in the balloon project. Photographs taken from this project can be viewed at <http://tech.groups.yahoo.com/group/BalloonSat/>. This project has evolved into a glider launching projects; thus far we have 3 high school students and two of our graduates involved in the project.
- In 2007 and 2008, we organized a weekend Materials Science "Hands-On-Workshop" for approximately 20 local high school and community college students. Participants investigated various materials phenomena with sophisticated experimental tools and received a certificate of completion at the end of the workshop. We anticipate that this will be an annual event.
- We continue to support the SOU Robotics Club, which has ten active members, including four pre-college students. With the offering of Engr174: Digital Systems and Robotics, several students have expressed interest in joining the club to learn more about building robots.

Dr. Quainoo continues to develop collaborative opportunities with the UO Materials Research Center and other researchers and companies in the region. He will be taking advantage of the SEM and TEM facilities at the UO Materials Research Center in the coming year. Universities and companies in Oregon include PSU, and Alumaweld Boats. Private and public Institutions outside Oregon include the Department of Mechanical Engineering, University of Saskatchewan, Canada; School of Engineering, UBC Okanagan, Kelowna, Canada; Novelis Global Technology Inc. (Formally Alcan R & D Center), Ontario, Canada; and Boeing, Seattle, Washington

Dr. Quainoo and Dr. Wu initiated contact between SOU and ProTools – manufacturer of Drill Doctor and Work Sharp and Katherine Inc, manufacturers of communication antennas, for collaboration with analyzing samples using our using our materials characterization facilities. This cooperation will involve our students in applied research on commercial product and may create job opportunities for them.

Dr. Ellen Siem, a condensed matter/materials science theorist, complements the current expertise in the Physics Department and contributes directly to the Materials Science Degree and the State's nanotechnology initiative. In collaboration with Dr. Wu, and with assistance from Dr. J. Tate at OSU, Dr. Siem is reviewing the Physics curriculum to identify areas for improvement.

Dr. Wu continues with his long time collaboration with the Naval Research Laboratory in Washington DC and is working to establish his laser deposition capability at SOU.

Computer Science

We propose to invest \$ 395,000 during the 2011-13 biennium, an increase of 16% from the previous biennium. Past ETIC funding has built a critical mass of faculty and supported the development of new degree options in Computer Science and Multimedia (CMM) and Computer Security and Information Assurance (CSIA) as well as new courses that offer students the opportunity to experience relevant, in-demand technology. Continued funding will allow SOU to refine and enhance its curricula, upgrade its teaching and research labs, create a student work and study area and build more business and student connections within the southern Oregon region and the State.

Specific investments in Computer Science during 2011-13 will include support for faculty positions (1.5 FTE @ \$262,522 for the biennium); Lab Assistant positions (\$20,000 for the biennium); initiatives for recruitment and retention (\$30,000 for the biennium); lab equipment (\$40,000 for the biennium); and support for graduate assistantships (\$40,000 for the biennium). Funding at the \$395,000 level will support expansion of program capacity so as to be in line with targets for program growth. Lab equipment that is state of the art and instructors that are up with current ideas and concepts are what will both attract and retain students to SOU and that is what we hope to accomplish. The proposed funding will further sustain our efforts to develop curricula and research aligned with the economic development goals for higher education in Oregon as described below.

Cyber Security: We have established the computer security curriculum and continue collaborations on computer forensics with the SOU Criminology department, the SOU Chemistry department, the US Fish and Wildlife Forensics Lab, and local police departments. We are completing the implementation of curricula that leads students to acquire the Certified Computer Examiner certificate. During the last year our instructor and some of his students took the CCE test and achieved this national certification. Currently this field attracts considerable interest from incoming and transfer students and will help us increase CS graduate production.

Education: An SOU faculty member, whose specialty is computational linguistics, created a program to help preserve endangered languages, focused on the Native American tribes. This project involves adults to record lessons and youth to study them. Many tribal members have a strong motivation to participate in a truly historic mission. At the same time young Native Americans are engaged in working with technology. The project involves visits to reservations affording us the opportunity to present computer science at SOU as a target of study for Native American students. We plan to coordinate with our high school recruitment efforts and sponsor summer workshops to further involve them with our program.

Software: A faculty member has been funded by the European Space Agency to research and develop methods of storing very large spatial datasets. He is also employed by a Canadian company, Grids Ltd., to produce a product using a new global referencing system based on a Geospatial data structure he has been involved in designing and developing. He is currently on target to be partially funded by the EPA to provide support in implementing his global referencing system in Super Fund site identification and delineation.

Private Support

Dr. Quainoo and Dr. Wu initiated contacts between SOU and ProTools – manufacturer of Drill Doctor and Work Sharp and Katherine Inc, manufacturers of communication antennas, for collaboration in research on analyzing samples using our materials characterization facilities. Some of this research will serve as capstone projects for our students and better prepare them for Oregon’s job market.

Pro-Weld (<http://www.pro-weld.com/>), in White City, Oregon, agreed to accept qualified students to intern at their new plant. By applying their knowledge, students gain hands-on experience. Their success stories serve as a significant and effective recruiting tool among their peers. We intend to continue working through our established partnerships with industries to identify pertinent problems and develop meaningful and mutually beneficial collaborations.

Dr. Photinos, principal researcher for the Ferroelectric project, submitted a proposal to continue our Ferroelectric Materials research. The grant proposal (\$227,000 for 3 years) currently under review by the National Science Foundation.

Dr. Wu submitted a research proposal for prospecting electrochemically activated bacteria in mines around the region to the Office of Naval Research. The proposal (\$50,000 for the first year) is currently under review.

Leveraging the ETIC support of the Materials Science initiative, we have successfully secured external funds in support of our Materials Science instructional and research capabilities over the last few years, including a National Science Foundation grant to acquire a x-ray diffractometer (\$157,000) and a grant from the M. J. Murdock Charitable Trust (\$217,000) to acquire a thin film deposition system and equipment to establish the materials testing instructional laboratories. The Pulsed Laser Deposition system and Bio LP system should be on-line by the end of this year. Dr. Wu secured funding (\$25,000) from Oregon Space Grant for a Balloon-Launched High-Altitude Glider. Both undergraduate and high school students are involved in this project. Details on Robotics/NASA reduced gravity/Ferroelectrics are listed on <http://www.sou.edu/physics>

Computer Science is in the final stages of implementing a Professional Science Masters (PSM) program to replace our current Masters degree. This program has National backing and industry support. For our area, local business and government entities have been contacted and are participating as a resource board for curriculum development and have agreed to provide internships for the graduate students in the program. Our contacts with the U.S. Fish and Wildlife forensics lab and the Central Point Police Department as well as local businesses have given students many hours of experience as interns working in real-life situations and investigations.

For private match, we will look for financial support and in-kind grants of software such as Encase by Guidance Software, Forensics Toolkit by Axion Software, Claims Manager and EDIWorks from Plexis, and SourceForge from VA Software. These software packages will provide our students with hands-on training using real-world products and will provide a variety of capstone projects where students need to configure, add-on, or integrate packages. We will be applying for several NSF grants for the Native American language project: Broadening Participation in Computing, Preserving Endangered Languages, and Computational Linguistics. We have begun working with the Tolowa, Karuk, Hoopa, and Yakima tribes and will pursue private funding in language restoration as opportunities present themselves.

Results and Benefits

Short-term

Material Science:

Universities our size usually do not have undergraduate programs in materials science. For this reason, we aligned our program with the MSI to ensure rigor and seamless transitions into their graduate programs as well as other graduate programs in materials science and engineering at PSU and OSU. The short term benefit of this funding will be to establish the full Materials Science curriculum at SOU to graduate students with the tools they need to excel in the workplace. We will continue to expand the number of

graduates from this program through recruitment, a high quality education, and a comprehensive support structure.

We will continue to supply high quality students to the MSI program at UO as well as other graduate programs at UO, OSU, and PSU. This is completely in line with the goal of partnership with other campuses.

We will continue to produce high quality pre-engineering students to the engineering programs at PSU and OSU.

Computer Science:

Continued funding from ETIC will aid us in giving the increasing number of students, both undergraduate and graduate, a technical degree in order to provide them with skills necessary to find employment in this current workforce retraction. Our graduate numbers have increased dramatically, currently 12 and many more seeking information about the program, from an average of 3 in past years. In the short term, ETIC support will help us provide courses and tracks that are kept current and relevant. It will further allow us to research other areas of interest to not only students but faculty as well.

Medium-term

Material Science:

We expect the graduation rate to continue to grow as the program becomes more established and the partnerships with the other campus strengthened.

One major goal is to establish a good partnership with community colleges. We believe SOU is an excellent next step for graduates from community colleges such as RCC. They do not have to relocate, and they can complete either their baccalaureate training at SOU or their pre-engineering work at SOU before transferring to OSU or PSU.

SOU can thus be a good bridge between community college graduates and the workplace or other campuses such as UO, OSU, or PSU. Through many years of collaboration, we have established a very good working relationship with UO and OSU. We are in the process of establishing the same type of relationship with PSU through our Admissions office.

Computer Science:

We will continue to expand our Masters program to include more businesses in the area. Hiring additional faculty is certainly a necessity as there are retirements in the future. ETIC support will help our department establish a reputation that will attract the kind of faculty needed to not only support current activities but bring new energy and ideas so as to continue with innovation and invention.

Future Plans & Resources

Material Science:

Because of the current financial status of the Oregon economy, we expect continued support for the faculty salaries will be needed beyond 2013 to sustain this program.

Some of the recruitment and travel cost can be lowered through an alignment with SOU's regular recruitment activities.

With reasonable investment, the infrastructure of the program should be reasonably well-established by 2013 and require only regular upgrades and maintenance. This will lower our financial needs.

Funds for students' summer research and partnership, e.g. with UO, will need to be continually supported outside the regular SOU internal funding. Some summer research student salary can be covered with research grants. However, student support cannot be covered with research grants.

It is our hope that the new Materials Science faculty position will eventually become part of the University permanent staff and the associated salary will be paid by the SOU general funding.

Computer Science:

The need to replace retiring faculty is certainly a necessity. Integration of the current faculty supported by ETIC into the general fund would release monies for use in supporting research and course development. Increasing numbers in our graduate program will provide more opportunities for aiding faculty by involving graduates in research. Released ETIC funds, or increases in that funding, will support having more graduate assistantships and stipends as well as some tuition assistance for students showing promise but lacking in monetary support.

Proposed Investment and Private Support Forecast (\$M)

		2011-2013 Biennium
1	Sources of funds	
2	Base budget for ETIC-related programs – all sources except ETIC allocation & private support	1.000
3	Proposed allocation from ETIC budget (\$M) (3)	0.795
4	Expected private support (\$M) (4)	0.272
5	Total (\$M)	2.067
6	Personnel supported (FTE) (5)	
7	Existing faculty (1)	2.500
8	New faculty(2)	
9	Existing staff (1)	
10	New staff(2)	
11	Total	2.500
12	New positions created (6)	
13	Faculty (2)	
14	Staff (2)	
15	Total	0.000
16	Uses of ETIC funds in line 3	
17	New facilities	
18	Improvements to facilities (7)	
19	Laboratory equipment (7)	0.070
20	Other equipment (7)	
21	Other one-time expenses	
22	Existing faculty salaries & benefits (1)	0.525
23	New faculty salaries & benefits (2)	
24	Existing staff salaries & benefits (1)	
25	New staff salaries & benefits (2)	
26	Services & supplies	0.007
27	Other	0.193
28	Total (8)	0.795
	Instructions. (Replace with your own notes in the document you submit.)	
	(1) Hired through June 2011 that will be supported by ETIC funds during 2011-13	
	(2) To be hired with ETIC funds during 2011-2013 biennium.	
	(3) Include any Certificates of Participation to be issued during 2009-2011	
	(4) Consistent with ETIC Private Support Policy dated 1-23-02.	
	(5) FTE expressed as percent of full time over 2 years of biennium. For instance, a new full-time faculty member hired on 7/1/12 would be counted as 0.5 because he/she joined half way through the biennium.	
	(6) FTE on an ongoing basis. For instance, if a new half-time position is created but not expected to be filled until the last month of the biennium, it would still be counted as 0.5.	
	(7) Include improvements and equipment to be purchased with ETIC funds and any Certificates of Participation to be issued during the biennium.	
	(8) Totals on line 3 and line 28 should match.	

Metrics Forecast (for programs/departments receiving ETIC funding):

	Actuals (1)		Projected (2)		
	AY 99	AY09	AY13	AY15	AY20
Undergraduate student credit hours	7389	7119	10000	12500	15000
Graduate student credit hours	128	115	425	550	675
Graduation rate, 6-year (3)					
Bachelor's degrees granted	43	34	60	72	87
Master's degrees granted	4	1	8	10	12
PhD degrees granted	n/a	n/a	n/a	n/a	n/a
Women graduating (4)		8			
Minorities graduating (5)		4			
Externally-funded research expenditures (6)	100,000	150,000	200,000	250,000	300,000
Invention disclosures (7)	n/a	n/a	n/a	n/a	n/a
License/options (8)	n/a	n/a	n/a	n/a	n/a
License income received (9)	n/a	n/a	n/a	n/a	n/a
Spin-off Companies (10)	n/a	n/a	n/a	n/a	n/a
National ranking of <program or department> (11)					
National ranking of <college>					
(12)					
Notes/instructions. (Delete these notes and replace with your own in the document you submit.)					
(1) Actuals for 12-month period ending in June of the year shown.					
(2) Forecast for the 12-month period ending in June of the year shown.					
(3) Percentage of undergraduate students who started ETIC-Supported program as freshmen six years earlier who have completed bachelor's degree in an ETIC-supported degree.					
(4) From engineering, computer science, and other programs directly benefiting from ETIC funding, stated as percent of all those graduating.					
(5) Racial and ethnic minorities who are US citizens or permanent residents, stated percent of US citizens or permanent residents graduating.					
(6) Total external dollars spent by ETIC-related departments towards research during academic year.					
(7) See Association of University Technology Managers (AUTM) survey definitions.					
(8) Number of license or option agreements executed during the year. See AUTM survey definitions.					
(9) License issue fees, payments under options, annual minimums, running royalties, termination payments, the amount of equity received when cashed in, and software end-user license fees equal to \$1000 or more, but not research funding, patent expense reimbursement, valuation of equity not cashed-in, or end-user license fees less than \$1000. See AUTM survey definitions.					
(10) New companies that were dependent on the licensing of your program's technology for their initiation. See AUTM survey definitions.					
(11) Forecasts for multiple programs and departments are encouraged. Each ranking should be footnoted with the ranking body or ranking methodology.					
(12) Add additional metrics as appropriate.					