

# **Engineering and Technology Industry Council Campus Investment Proposal Biennium from July 1, 2009 to June 30, 2011**

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## **Summary of Proposal:**

SOU proposes a total project of \$639,000 that includes investing \$340,000 to continue improvements to our Computer Science programs and investing \$299,000 to continue the SOU portion of the cooperative Materials Science Bachelor's Degree program offered in partnership with the University of Oregon

## **Vision Statement**

Computer Science and Physics/Engineering/Materials Science programs at SOU prepare students for graduate school, careers in technology, or seamless transfer to Oregon's Colleges of Engineering. We teach students, under the umbrella of the scientific method, teamwork, techniques of engineering solutions to problems and hands-on training in state-of-the-art laboratories. In addition to a comprehensive range of department-based programs, we promote interdisciplinary initiatives in materials science (especially ferroelectrics and metallurgy), biotechnology/health, and environmental studies. We assist our region through a graduate program in computer science and research on novel and advanced materials for engineering applications, thin film technology, computational linguistics, discrete global grids, and computer forensics.

## **Aspirational Peers**

For Materials Science:

Universities our size usually do not have undergraduate programs in materials science. Therefore, we propose to align our program with the Materials Science Institute (MSI) at the University of Oregon (UO) to ensure rigor and seamless transition into their graduate programs as well as other graduate programs in materials science and engineering at Portland State University (PSU) and Oregon State University (OSU). Indicators of our success would be that most, ideally all, of our materials science graduates who apply are accepted into one of the above graduate programs

For Computer Science:

Portland State University: Some CS options at PSU and SOU are similar but serve different populations – they have an urban audience in the north while we serve a rural population in the south. Indicators of our success would be aligning our curriculum content with PSU's graduate program so that one or two SOU

graduates continue to the PSU graduate program in security. We continue to develop a collaborative project that involves students from both campuses. We hope to offer opportunities at our campus sponsored under the umbrella of PSU's NSA certification.

Norwich University, Vermont: It is a small, liberal arts college in a rural location (though it has a military tradition). It has been an early leader in CSIA. It has a model curriculum and an engaged faculty. Indicators of our success would be a 10% increase in major headcount and the beginnings of faculty scholarship and/or grant applications inline with the Norwich model.

## **Long-term Goals**

SOU seeks to increase the number of undergraduate majors and degrees in Computer Science and Materials Science, to increase the number of graduate majors and degrees in Computer Science, and to increase the number of pre-engineering students at SOU. SOU's proposal will ensure that we achieve at least a doubling of degrees granted by AY20 (see metrics table and Results section, below). The proposed investment for 2009-11 will continue the momentum we have achieved in Computer Science over the past three biennia and in Materials Science since this last biennium. In addition to capacity building, our goal is to recruit a diverse population of ECS students to SOU and to help them succeed in ECS programs. If the Materials Science program shows potential for success in 2007-09 as an option under the Physics degree, we plan to propose a stand-alone degree program to the Oregon University System (OUS) during 2011-13.

SOU's ETIC programs are applicable to a number of the potential opportunity areas as defined by the Academic Excellence and Economic Development (AEED) working group of the OUS Board. With past and continuing support, our Computer Science program now has the capacity to make contributions in the areas of Information to knowledge (making sense of complex data) and analog mixed signal (wireless products and services). We also have strengths in the area of computer security that have several health-related applications. The increased teaching, broadening and diversification of research activities in materials science and SOU's internationally known ferroelectrics research program support both workforce development and research in the area of nanotechnology.

## **Investment Description**

### **Computer Science**

We propose to invest \$340,000 during the 2009-11 biennium, a 13% increase over the previous biennium to cover increasing wages and further recruitment efforts with students and industry partners. 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, and build more business and student connections within the southern Oregon region and the State.

Specific investments in Computer Science during 2009-11 will include support for faculty positions (\$200,000 for the biennium); Lab Assistant positions (\$42,000 for the biennium); initiatives for recruitment and retention (\$30,000 for the biennium); lab equipment (\$53,000 for the biennium); and support for graduate assistantships (\$15,000 for the biennium). Funding at the \$340,000 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 have begun established 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 this quarter our instructor and his students will be taking the CCE test to see how well they do in this nationally certified and recognized exam. Currently this field attracts considerable interest from incoming and transfer students and will help us increase CS graduation 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.

### **Role and uses of Support to accomplish plans:**

We offer paid internships from local businesses for students. We have and continue to work on acquiring internships in computer security and forensics with the U.S. Fish and Wildlife Forensics Lab, and local police departments. 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.

We acknowledge past inability to reach progress goals based on previous plans. This situation was a consequence in large part from a significant downturn in the job market for computer science graduates after the .com crash which resulted in at least a 40% drop in undergraduate admissions to CS programs across the country. We were highly reflective of this situation. Currently, admissions are on the rise and there is a sense that the discipline is maturing and has “bottomed out” as far as number of majors and

interest in computer science as a career. Our goal is being prepared to offer this new generation of majors the technology, training and support they require to be successful.

## **Private Support**

During the upcoming summer of 2008 two senior faculty members will be establishing a consortium of local business. These business partners will provide input regarding necessary and desired skills for graduating seniors. We are very hopeful that they will provide material support as well, be that equipment, software or monies to enable us to more fully attain their suggested skill levels for our graduates.

## **Materials Science**

To enhance the development and full implementation of SOU's portion of the joint Materials Science degree program, we propose to invest \$299,000 during the 2009-11 biennium, a moderate increase over the budget of the 2007-09 biennium. This is mainly due to the normal pay increases of the faculty involved in the proposal. Use of the proposed funding during 2009-11 will include:

- support for the 1.0 FTE faculty position in Materials Science (\$170,000 for the biennium)
- support for 0.133 FTE faculty position to hire a practicing professional engineer to teach engineering orientation (\$12,500 for the biennium)
- funding for recruitment and retention activities and to support industry partnerships and summer studies at the other campuses (\$30,000 for the biennium)
- support for supervising undergraduate and high school students' summer research (\$62,000 for the biennium)
- purchase of additional equipment for teaching and student research (\$20,000 for the biennium).

A key component of the proposal is recruitment. Funding is requested for continuing our recruiting activities aimed at pre-college and community college students. These include recruitment trips, literature and promotional materials, development of hands-on workshops and shows for high schools and community colleges. For recruitment within SOU, funds will be used to develop an introductory course series to attract freshmen. For retention purposes, we budgeted some stipend monies for students involved in research and assistance for students with the cost of commuting to the other campuses, for example, workshops at the University of Oregon (UO).

The introductory course series that we will use to attract students from the freshman class are:

ENGR/PH 174: Digital Systems and Robotics  
ENGR/PH 175: The Science and Technology of Nanoparticles  
ENGR/PH 176: The Science and Technology of Materials

The series is intended as an option for fulfilling the general education science requirement. The Nanoparticles course is presently offered, on a trial basis, to students enrolled in the honours program at SOU. The Science and Technology of Materials courses are scheduled for summer 08, and will be marketed to high school students.

In terms of the upper division Materials Science courses, initiated in 2007-2008, we have added to the original list:

ENGR/PH 475: Nanoparticles and Nanoparticle Technology  
ENGR 474: Kinetics in Materials

Next year, we will introduce an upper division course on Bio-Nanotechnology, which is presently scheduled as a seminar for spring 2008.

In terms of curriculum, all the courses required for the Materials Science degree option are currently offered at SOU and the UO, and we anticipate that the growing demand for the new degree option will require that they be offered more frequently.

The main objective of the program is to produce graduates that will be prepared to meet anticipated industrial needs for effective researchers/problem solvers in the microelectronics and the polymer/coatings industry and in the growing nanotechnology sector. Many graduates will enter the Materials Science master's program at the UO. We market the B.S. program as the initial component of a 4+1 master's degree in which students who earn their undergraduate degree, with the necessary GPA and recommendations from faculty, could complete the Master's component at the UO in one additional year.

Central to our recruiting efforts is outreach to local schools and community colleges. Dr. George Quainoo made multiple presentations on the Materials Science degree option at high schools, such as Phoenix and Klamath Union. Dr. Quainoo also made recruitment presentations at Linn-Benton Community College and Lane Community College, and he advertised the Materials Science program to physics teachers in the region through talks at recent ORAAPT meetings (2006 fall and 2007 spring ORAAPT).

Dr. Siem has also worked to advertise the program, with recent presentations on Nanotechnology (2007 spring ORAAPT meeting) and Materials Science (2007 fall colloquium, Lewis and Clark University).

A traveling Materials Science Demonstration and Recruitment show is being developed by Dr. Quainoo and Dr. Siem, for use as a recruitment tool. In collaboration with SOU's Admissions Office, further recruitment activities are planned throughout the Rogue Valley. In addition, in collaboration with SOU's Enrollment Services office, 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

We have a strong record of supporting local teachers and students, as exemplified by the following:

- Over the past six 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 five pre-college youths (sponsored by the Apprenticeships in Science and Engineering, PSU-NSF program). We have also supervised three 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. and 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 payload 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/>.

- In 2007, 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 Southern Oregon University Robotics Club, which has ten active members, including four pre-college students.

Dr. Quainoo continues to develop collaborative opportunities with other researchers and companies in the region. Universities and companies in Oregon include the MSI, 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

As further evidence of SOU’s commitment to Materials Science, Professor Quainoo’s position has been shifted to the tenure-track. The Physics/Engineering Department hired Dr. Ellen Siem, a condensed matter/materials science theorist, who will complement the current expertise in the Physics Department and contribute directly to the Materials Science Degree and the State’s nanotechnology initiative. Dr. Siem received her Ph.D. from the Massachusetts Institute of Technology, Materials Science and Engineering Department in 2005.

In addition we established collaborations with other institutions and through the Pacific Division of the AAAS, the department has organized an annual symposium of Materials Science and Nanotechnology in cooperation with faculty from PSU, Boise State and Washington State since 2005.

### **Role and uses of Support to accomplish plans:**

We have had a fine measure of success over the last few years in securing external funds in support of our Materials Science instructional and research capabilities, 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 (\$25,000.00) from Oregon Space Grant for a Balloon-Launched High-Altitude Glider. Both undergraduate and high school students are involved in this project. A proposal to continue our Ferroelectric Materials research is under review by the National Science Foundation. Details on Robotics/NASA reduced gravity/Ferroelectrics are listed on <http://www.sou.edu/physics>

### **Private Support**

We plan to aggressively seek new partnerships with companies in and outside Oregon to provide internships and scholarship support to students. For example, Pro-Weld (<http://.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 and most significantly, their success stories serve as an 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 research initiatives that will serve as capstone projects for our students and better prepare them for Oregon’s job market in technology.

## Results and Benefits

The proposed investments will maintain the momentum in Computer Science that was begun in 1999-01 and 2001-03. Computer Science Bachelor's Degrees increased from 34 in 1998-99 to 57 in 2001-02. The number dropped for 2002-03, and seemed to level off in 2004-05, not unlike the situation in computer science programs everywhere. However, we see hopeful signs in admissions data for next year that we are at or near the bottom. Given the slow rebound, we anticipate that our CS program will reach reasonable capacity between AY10 and AY14, by which time we should be producing 58 B.S. degrees and 8 M.S. degrees in Computer Science, assuming continued support through those years. If the same level of ETIC support continues through AY20 and enrollment growth and State support increase over the same time period, we can anticipate additional growth of 10 more Bachelor's degrees and 3 more Master's degrees.

The proposed investments will allow us to continue building a first rate undergraduate Materials Science program in partnership with the UO. The new Materials Science faculty at SOU are expected to develop nationally competitive research programs and synergistically aid the strong research efforts with MSI at the UO. Three students, Jennifer Brown, Isaac Steele, and Jeremiah Lewman are on track to graduate with the Materials Science option in AY08 and at least five students are on track to graduate in AY09. With continued ETIC support, we anticipate a program graduating approximately 20-30 majors between the two institutions, with SOU's share being 8 to 12 in AY11. Assuming continued ETIC funding and the same level of support through AY20 we project a graduation rate of about 15 to 20 majors.

Detailed metrics for this proposal are given in the table, below. We expect to attain at least 2.3X for total degrees (combining BS and MS in Computer Science and Materials Science degrees) by AY11, assuming continued support through that year. Undergraduate data are for a combination of Computer Science and Materials Science, but individual program goals are given above. Graduate data are only for Computer Science students. As we prepare our 2007-09 scorecards, we will determine the best way to treat SCH numbers for undergraduates in order to distinguish Materials Science students from other Chemistry and Physics majors. Because of targeted recruiting activities, we expect significant growth in enrolment of women and minorities to our programs. Our ability to offer high quality science and mathematics programs in a small school setting will allow us to continue the successful preparation of our students for ECS degrees and careers.

**Proposed Investment and Private Support Forecast (\$M)**

		Level 0 Base Budget	Level 1 Policy Option
1	<b>Sources of funds</b>		-
2	<b>Base budget for ETIC-related programs -- all sources except ETIC allocation &amp; private support</b>	\$ 0.96	\$ 0.96
3	<b>Proposed allocation from ETIC budget (\$M) (3)</b>	0.56	\$ 0.64
4	<b>Expected private support (\$M) (4)</b>	\$ 0.26	\$ 0.26
5	<b>Total (\$M)</b>	\$ 1.78	\$ 1.86
6	<b>Personnel supported (FTE) (5)</b>		-
7	<b>Existing faculty (1)</b>	1.80	1.80
8	<b>New faculty(2)</b>	.75	.75
9	<b>Existing staff (1)</b>	.25	0.25
10	<b>New staff(2)</b>	0.0	0.0
11	<b>Total</b>	2.80	2.80
12	<b>New positions created (6)</b>		-
13	<b>Faculty (2)</b>	0.75	0.75
14	<b>Staff (2)</b>	0.00	0.00
15	<b>Total</b>	0.75	0.75
16	<b>Uses of ETIC funds in line 3</b>		-
17	<b>New facilities</b>	\$ -	\$ -
18	<b>Improvements to facilities (7)</b>	\$ -	\$ -
19	<b>Laboratory equipment (7)</b>	\$ 0.038	\$ 0.073
20	<b>Other equipment (7)</b>	\$ -	\$ -
21	<b>Other one-time expenses</b>	\$ -	\$ -
22	<b>Existing faculty salaries &amp; benefits (1)</b>	\$ 0.370	\$ 0.370
23	<b>New faculty salaries &amp; benefits (2)</b>	\$ 0.060	\$ 0.060
24	<b>Existing staff salaries &amp; benefits (1)</b>	\$ 0.030	\$ 0.030
25	<b>New staff salaries &amp; benefits (2)</b>	\$ -	\$ -
26	<b>Services &amp; supplies</b>	\$ 0.005	\$ 0.005
27	<b>Graduate Assistants, Student Hires, Recruiting</b>	\$ 0.057	\$ 0.102
28	<b>Total</b>	\$ 0.560	\$ 0.640

(1) Hired through June 2009 that will be supported by ETIC funds during 2009-11 biennium.

(2) To be hired with ETIC funds during 2009-2011 biennium.

(3) Include any Certificates of Participation to be issued during 2009-2011 biennium.

(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 7/1/10 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.

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

Level 0 Base Level Funding

	Actuals (1)		Projected (2)		
	AY 99	AY07	AY11	AY13	AY20
Undergraduate student credit hours	7389	7119	9400	13160	15040
Graduate student credit hours	128	150	517	517	611
Graduation rate, 6-year (3)					
Bachelor's degrees granted	43	28	58	67	82
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)					
Minorities graduating (5)					
Externally-funded research expenditures (6)	100,000	200,000	250,000	300,000	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>					
(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 students who started ETIC-related program six years earlier who have completed bachelor's degree. For our case the data is not all in for AY-07 and nothing was available for AY-99.					
(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) Because there is no ranking body for these programs at institutions like SOU, our quality control will be comparison to our aspirational peers.					

**Differences between Level 0 and Level 1 funding rational:**

The reductions from Level 1 to Level 0 as represented in the Investment and Support table are in the areas of equipment, recruitment and projections for summer research expenditures. No reductions were taken from faculty and staffing as these areas are the driving force behind generating student interest, involvement and consequently credit hours and graduation numbers. The Metrics Forecast table for Level 0 shows an approximate 6% decrease from the Level 1 numbers as there is most certainly a link between

reductions in spending in the areas designated above and the programs potential for generating student census increases.

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

Level 1 POP Funding

	Actuals (1)		Projected (2)		
	AY 99	AY07	AY11	AY13	AY20
Undergraduate student credit hours	7389	7119	10000	14000	16000
Graduate student credit hours	128	150	550	550	650
Graduation rate, 6-year (3)					
Bachelor's degrees granted	43	28	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)					
Minorities graduating (5)					
Externally-funded research expenditures (6)	100,000	200,00	250,000	300,000	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>					
(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 students who started ETIC-related program six years earlier who have completed bachelor's degree. For our case the data is not all in for AY-07 and nothing was available for AY-99.					
(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) Because there is no ranking body for these programs at institutions like SOU, our quality control will be comparison to our aspirational peers.					
(12) Add additional metrics as appropriate.					