

**Engineering and Technology Industry Council  
Core Investment Plan  
Biennium from July 1, 2005 to June 30, 2007**

**Campus: University of Oregon**

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## **Summary of Proposal**

This proposal is a combined effort of the Material Science Institute (MSI) and the Department of Computer and Information Science (CIS). The general aims of both are not dissimilar: namely to request support for enhancements to their activities which will attract higher quality and greater numbers of undergraduate and graduate students to apply and enroll in their programs.

In summary, CIS is requesting support for outreach and recruitment activities to attract undergraduate and graduate students to their programs. In doing so, they anticipate raising the already strong academic quality of the entrant cohorts and thereby fulfilling a goal of higher scoring in the national rankings. This in turn, will make the program more attractive to individuals being recruited to join the faculty and further strengthen the capabilities of the department.

MSI requests follow on funding for the current capacity and excellence investments underway in the current biennium. Funding is requested to: a) support a recruiter for MSI's graduate internship programs to further increase the number and quality of both Masters and Ph.D. graduate applicants; and b) complete the ETIC investment in the SOU-UO collaboration in a materials science program.

## **Goals**

### MSI

The goals of these requested ETIC investments are to:

- 1). Increase the number and quality of both Masters and Ph.D. applications and enrolling students in MSI's graduate internship programs.
- 2). Create an undergraduate materials science option at both Southern Oregon University and the University of Oregon students through collaborative programs.

## CIS

The over-arching goals of the core CIS ETIC effort during the 05-07 biennium remain to attract and retain top undergraduate and graduate students, particularly those who choose to study computer science in Oregon. Specifically we are focusing on those students who are only considering high quality, research-oriented computer science departments in a comprehensive research university. We will exploit the current abundance of fine graduate students, while increasing the attractiveness of the undergraduate program to top students and maintaining the capacity to grow as the high-tech economy rebounds, strengthening ties to Oregon high-tech industry through a growing internship program.

University of Oregon's CIS department is strongest among Oregon departments granting both graduate and undergraduate degrees, but Oregon loses top undergraduate and graduate students to stronger programs in California and Washington. In the most recent (1993) ranking by the National Research Council, UO CIS is ranked 61<sup>st</sup>. UO and OGI were tied at 60<sup>th</sup> in the 2002 US News and World Report rankings of graduate programs in computer science; OSU tied for 67<sup>th</sup> and no other Oregon university was ranked. UO as a whole is the only Oregon university ranked by US News in the top 126 national programs (tiers 1 and 2; OGI/OHSU is not eligible for that ranking because it has no undergraduate programs). Our realistic goal is to reach 48 in NRC rankings (an improvement of 21%) and to be ranked by US News in at least one research specialty.

Other measures of success are detailed under "Results," below.

## **Investment Description**

### MSI

Below we describe the three core investments that follow on the capacity and excellence investments underway during the current biennium.

1) MSI created its successful Masters internship program in 1998 through faculty voluntarily assuming the required new course teaching assignments as overloads and devoting the time required to both line up and monitor internships as overloads on top of their additional duties. During the previous 2 biennia, ETIC supported this program with start-up funds for faculty hires to eliminate the overloads. This program is now self-supporting from the tuition of the Master's students, requiring no further on-going ETIC support for faculty.

Through federal grants and equipment donations from our industry partners, we have expanded the capacity of our internship laboratories during the current economic slowdown while slightly increasing the number of graduate students in the internship programs. During the upcoming economic recovery, our goal is to expand the enrollments in these programs by 50% to satisfy the demand of our industrial partners while increasing quality. This requires more applicants. We request funding of \$60,000 a year for the upcoming biennium to invest in a dedicated recruiter for our graduate internship programs. This recruiter would promote and educate both students and faculty at colleges and universities on the unique opportunities available to students in these programs. The recruiter will also target other opportunities, for example talented individuals looking to retrain. These funds would be used for salary and travel expenses to permit the recruiter to visit schools and career fairs. We expect to cover the ongoing expenses of this recruiter using the increase in tuition dollars resulting from the increase in enrollments.

2) During the last round of proposals, ETIC supported an initial investment to begin the creation of a collaborative undergraduate materials program at SOU and UO although at half the funding level requested. A faculty position was created at SOU during this current biennium and the complementary faculty position at the UO was postponed until the following biennium. Here we request funding for a UO faculty position (\$500,000 in start-up funds and bridging salary) to cover the increase in teaching loads created by the new program and funds for a scholarship pool to increase the initial visibility of this program to Oregon high school seniors (\$50,000). These funds would permit us to bring up the University of Oregon part of the proposed collaborative. We anticipate reaching a steady state enrollment of 15-20 students in this program.

## CIS

UO CIS fills an important niche in the overall ETIC portfolio. A strong computer science program in a comprehensive university is capable of attracting and training students at least as good as, but different than, those who choose engineering schools. As a comprehensive university, UO is well situated to attract top students who would not consider an engineering school but who would consider other degree programs in the natural sciences, business, law, etc. The unique strengths of UO CIS must be used to attract top students who would otherwise be lost to Oregon.

While our goals remain the same as in previous biennia, our tactics must shift somewhat to address prevailing conditions. Computer science enrollments nationwide have declined precipitously, much more than the aggregate of engineering and computer science. The main limiting factor for the undergraduate program is no longer capacity to teach, but ability to attract and retain students who would otherwise choose other fields or leave Oregon. Our core proposal for 05-07 biennium therefore builds on the investments made in prior periods that have the greatest potential to increase the attractiveness of the major to top students and improve our ties with Oregon industry.

We believe a strong internship program is needed both to attract students and to strengthen ties with Oregon industry; we therefore propose to continue 0.25FTE faculty time in support of the internship program. 0.25FTE is slated to continue support for programs for improving recruitment and retention of under-represented groups in computer science, with a particular focus on women in computer science.

No new faculty salary lines are proposed here, and therefore no faculty salary is budgeted. However, we anticipate faculty lines coming open through normal retirement (at least one in 2006), creating an opportunity to improve the attractiveness of our program by targeted hiring. Building on our thrust in distributed informatics will require substantial startup packages for new faculty.

Students over-reacted to the dot-com boom, and now potential computer science students are over-reacting to the slump in the high-tech economy. In this climate, it is important not only to provide attractive programs, but to communicate to the brightest high school students in Oregon and surrounding states that computer science remains an attractive field of study, rewarding both intellectually and economically, and that a first class computer science education can be obtained in Oregon. 0.5FTE of staff time is budgeted for secondary school outreach and recruiting.

## Results

### MSI

The MSI Internship programs continue to get national recognition. The UO Chemistry program currently ranks 7<sup>th</sup> nationally in degrees awarded as a result of the Masters internship programs. The Ph.D. internship program will be highlighted, with both a graduate student and faculty invited speaker, as a part of a special symposium at the American Chemical Society meeting in August 2004 focused on innovations in graduate education. The innovative aspects of these programs and the partnerships with Oregon industry have permitted us to continue to recruit outstanding graduate students into our graduate program. The requested support for additional recruiting resources will increase the number of applications and enrollments in our Masters internship program by 50 percent.

The result of ETIC support of the materials program partnership between UO and SOU will be the beginning of a top rated undergraduate materials program to meet anticipated industrial needs for effective researchers/problem solvers in the microelectronics and the polymer/coatings industry. The materials faculty currently being recruited at SOU will be expected to develop nationally competitive research programs and, along with the UO materials faculty position currently being requested herein, will synergistically aid the already strong research efforts within MSI at the U of O. We anticipate a program with approximately 20-30 majors graduating a year between the two institutions. This program will be very efficient, producing 10-15 additional graduates per additional faculty member hired, because the core of the program is a blending of the existing physics and chemistry curricula and because of the collaboration between SOU and U of O. The proposed materials program complements the existing engineering programs at PSU and OSU. We will welcome students from other campuses to our summer courses. We believe this program will build collaborative bridges between the OUS institutions.

## CIS

The key results in CIS will be a higher quality program with a reputation and offerings that attract more and better undergraduate and graduate students, including top students who would otherwise choose a field other than computer science or a university outside Oregon. Crucially, this includes students who demand the breadth of a comprehensive research university, who will not be attracted to an engineering school. Further, links with Oregon industry will be improved through a strong internship program.

The key metric of research quality is NRC ranking; we aim for an improvement from 61<sup>st</sup> (the most recent ranking of 1993) to 48<sup>th</sup> (+21%). Since this is a decennial rating, we will also use the more frequent US News rankings to gauge progress in reputation and quality. Our US News ranking is currently 60, and we aim for 50 by 2009.

The quantitative GRE scores of graduate students are already so high that we could instantly raise the average score of accepted students to 800 by selecting those with highest scores; the median quantitative score of accepted students (770) is actually lower than that of all applicants (780), an indication that small differences among near-perfect scores have become less important than other factors in selecting top applicants. Metrics on output may be more useful, but are more difficult to collect; we are attempting to find good objective measures of output quality.

Unlike GRE scores, SAT scores of incoming freshmen are a reasonable measure of input quality. We are aiming for a substantial improvement in average SAT scores, from 66<sup>th</sup> percentile in 1999 to the 84<sup>th</sup> percentile in 2009. Median scores may be a better measure than arithmetic means (less sensitive to outliers); we will track both.

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

	7/1/05- 6/30/06	7/1/06- 6/30/07	Total
<b>Proposed OUS Investment (\$M)</b>			
Support of existing faculty (1)	0.00	0.00	0.00
Funds tied to existing programs (2)	335000.00	335000.00	670000.00
<b>Programs (3)</b>			0.00
Internships	58000.00	58750.00	116750.00
Undergraduate Recruiting	20000.00	22500.00	42500.00
Secondary School Outreach	32500.00	32500.00	65000.00
Distributed Informatics (faculty startup)	75000.00	80000.00	155000.00
<b>Subtotal</b>	520500.00	528750.00	1049250.00
<b>Expected private support (\$M) (4)</b>	871000.00	886375.00	1757375.00
<b>Total (\$M)</b>	1391500.00	1415125.00	2806625.00
<b>Faculty Supported (FTE)</b>			
Existing (1)	1.00	1	1.0
New (5)	2.00	1	1.5
<b>Total</b>	3.0	2.0	2.5
Notes:			
(1) Hired with ETIC funds through June 2005.			
(2) Programs started with ETIC funds through June 2005.			

## Metrics Forecasts

### MSI

	Baseline	Projected			
	AY 99	AY04	AY05	AY06	AY09
Total research expenditures per year	2,880,000	6,000,000	6,500,000	7,000,000	8,000,000
Average GPA of incoming freshmen	3.4	3.6	3.7	3.7	3.7
Average SAT/ACT percentile of incoming freshmen (1)	66%	80%	80%	80%	80%
Average GRE percentile of incoming grad. students (2)	70%	75%	80%	80%	80%
Pass rate of Fundamental of Engineering (3)	NA	NA	NA	NA	NA
Women entering ECS programs (4)	28%	35%	35%	40%	40%
Women graduating from ECS programs (5)	25%	30%	30%	30%	35%
Minorities entering ECS programs (4)(6)	5%	10%	10%	10%	10%
Minorities graduating from ECS programs (5)(6)	4%	8%	10%	10%	10%
ECS undergraduate student credit hours	0	0	40	60	120
ECS bachelors degrees granted	0	0	0	5	15
ECS graduate student credit hours	190	1000	1200	1400	1600
ECS graduate degrees granted	2	15	18	21	25
National ranking of <program or department> (7)(10)	See note	below			
Ranking of total federal expenditures as if all chemistry .	91	top 50	top 50	top 50	top 40
Ranking of total federal expenditures as if all physics .	83	top 50	top 50	top 50	top 40
Ranking of total federal expenditures as if materials dept.	31	top 25	top 25	top 25	top 20
National ranking of <college>	NA	NA	NA	NA	NA
Pre-college contact hours (8)	NA	NA	NA	NA	NA
Licenses sold (9)	0	1	1	1	1

#### Notes:

(1) If your applicants are required to submit SAT scores, use the percentile corresponding to the average composite score of those submitting them. If they have the choice of SAT and ACT, use the average composite SAT score average composite ACT score, convert them to percentiles, and compute a weighted average of the two.

(2) Percentile based on the average quantitative score over those submitting such scores; ignore verbal and ana scores.

(3) As a percent of those taking it for the first time

(4) As a percent of all those entering

(5) As a percent of all those graduating

(10) Since the MSI is an institute, not a department, we are invisible to most national rankings. MSI's status as an institute, however, makes it much more able to respond to opportunities. There would be definite losses in MSI becoming a department. To address the issue of National rankings, we have examined the basis for the ratings given by various sources (US News and World Report, Chemical and Engineering News, ...). While several are based on opinion polls, we believe the most impartial rankings are based on federal research dollars obtained. This data is collected nationally by NSF and is published yearly with breakouts based on disciplines – chemistry, physics and materials. We will determine the federal research expenditures generated by the institute (using the numbers reported to the federal government) and then

compare the total dollars with those from other institutions across the country. The figures for academic year 1999 are detailed below.

Total federal research expenditures from MSI faculty	-	\$2,257,000
Average federal research expenditures/MSI faculty	-	\$205,000

MSI's funding level would place it 92 with respect to chemistry funding, 84 with respect to physics funding and 31<sup>st</sup> as a metallurgical/materials department. Given the small number of MSI faculty in 1999 (eleven), these rankings are actually quite good. For example, the chemistry related funds at University of Texas at Austin were generated by more than 60 faculty in both their chemistry and biochemistry departments. If the ranking were done on the basis of average federal research expenditures per faculty to compensate for the different faculty sizes at each institution, MSI would rank approximately 40<sup>th</sup>, above the University of Texas at Austin.

## Metrics Continued

### CIS

	Baseline	Projected			
	AY 99	AY06	AY07	AY08	AY09
Average SAT/ACT percentile of incoming freshmen (1)	66%	78%	80%	82%	84%
Average GRE percentile of incoming grad. students (2)	88%	89%	90%	90%	90%
Women graduating from ECS programs (3)	8%	8%	10%	12%	14%
Minorities graduating from ECS programs (3)(4)	unknown	5%	5%	7%	8%
ECS undergraduate student credit hours	13,925	10,000	12,000	14,000	16,000
ECS bachelors degrees granted	58	75	83	92	116
ECS graduate student credit hours	2254	2300	2385	2385	2500
ECS graduate degrees granted	19	25	27	30	36
Pre-college contact hours (5)					
Total research expenditures per year (6)	\$3,252,000	\$3,902,400	\$4,097,520	\$4,302,396	\$4,732,636
National ranking of CIS department (7)	61 (7)	58	54	50	48
National ranking of U Oregon (10)	AAU (60+)	AAU (60+)	AAU (60+)	AAU (60+)	AAU (60+)
Licenses sold (8)	2	4	4	4	4
(9)					
<b>Notes:</b>					
(1) SAT scores.					
(2) Percentile based on the average quantitative score over those submitting such scores; ignore verbal and analytic scores. NOTE: The mean GRE score of accepted students is currently BELOW that of applicants; clearly we regard other selection criteria as more important. The median GRE quantitative score of accepted students accepted with support is 800, a perfect score. Increasing this score is not a meaningful goal.					
(3) As a percent of all those graduating					
(4) Racial and ethnic minorities who are US citizens or permanent residents					
(5) Pre-college students participating in pre-college engineering, technology, computer science, math, and science programs					
(6) Total dollars spent by ETIC-related departments towards research during academic year.					
(7) 99 and 09 are decennial ranking by National Research Council. Largely a research and graduate education ranking; US News ranking, which considers a wider range of criteria (not all meaningful), is 60 in 03; 04-08 goals are for US News rankings.					
(8) Patent licenses or other royalty-generating intellectual property licenses granted to commercial entities. U Oregon IP is primarily open source, so we do not project large growth in commercial licenses.					