

COLLEGE OF ENGINEERING  
INFORMATION TECHNOLOGY FUNDS ANNUAL SUMMARY REPORT  
(addressing allocations made in fiscal 1999-2000)

A. Funding summary:

The College of Engineering used the Information Technology (I/T) funds that were received during the 1999-00 fiscal year to continue supplemental funding for implementing a client-server computing model with workstation class machines to support an academic computing environment.

The College brought forward a balance of \$913,453 into the 1999-00 fiscal year and received an amount of \$2,104,145 in new I/T funds and \$126,000 one time allocation in Vision Plan funds for a total of \$3,143,598. The College chose to distribute these funds to its departments based on the number of semester credit hours that are generated by each department, the number of classrooms in which multimedia equipment could be installed quickly, and other needs. Additionally, each department chose to implement the College Vision Plan in a manner that best fits the needs of its students and academic programs. Appendix 1 represents these expenditures in line item format.

B. Description of funded projects:

The 1999-00 allocation from ITAC of \$126,000 was targeted wholly toward implementing, the Multimedia Teaching Podiums (MTP), Vision Plan priority #3. These funds were leveraged with other I/T funds to accomplish implementing 40% of the classrooms and teaching computer labs throughout the College of Engineering buildings on the main campus. Appendix 2b represents these expenditures in detail.

In addition to this partially ITAC funded project, the College was able to obtain generous grants from FORD (~\$500K) and Hewlett Packard (~\$500K) and by leveraging other College I/T funds to substantially fulfill Vision Plan priorities 1, 2, 4 and 5. Some critical elements of networking bandwidth (Vision Plan priority 6) were partially addressed through independent efforts. A progress report for items on the Vision Plan is posted on the web (<http://www.engr.utexas.edu/itg/vision/projects.htm>).

C. Evaluation of project impact:

The reception and impact of the Multimedia Teaching Podiums (MTP) has been phenomenal. There is much excitement about the innovative changes to instruction that are now available in the classroom. This project remains a high priority in this year's Vision Plan as only about 40% of the envisioned plan has been implemented within Engineering and the campus has substantially larger territories to outfit with these capabilities as identified by the Multimedia Enhancement Task Force report. Significant delays have been experienced in attempting to acquire funding and authorization to properly outfit MTPs for general-purpose classrooms. The Enterprise System Management (ESM) project is allowing us to re-architect our underlying I/T infrastructure through gradual and systematic steps which will greatly improve the effectiveness and level of I/T services that can be made available throughout the College in the future. The Laptops for Learning Initiative, now in its fourth year, continues to be a driving force within the College, and campus partnerships have permitted even more aggressive pricing on offerings. The second TEAM Center is already being used to capacity and faculty members are zealous for an opportunity to explore the capabilities of the Center with their students. Distributed Learning efforts and outreach efforts are beginning to take on a life of their own as grants and corporate partnerships are beginning to leverage College efforts. Adequate funding for network infrastructure needs remains a crucial concern.

# College of Engineering

## Vision Plan for Information Technology

2001-2002

### College of Engineering Computer Committee

ME: Crawford, Richard H. (Chair)

ASE/EM: Schutz, Robert

CE: Kallivokas, Loukas

ChE: Qin, Joe

ECE: Ghosh, Joydeep

PGE: Sepehrnoori, Kamy

Dir. I/T: Gloyd, Bob

Edgar, Thomas F. (ex-officio)

Armstrong, Neal E. (ex-officio)

Members of the Engineering Technical Advisory Group (ETAG) also attend the committee meetings.

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## Executive Summary

A matured vision and experience with Technology Enhanced Learning (TEL) initiatives are the focal point and impetus for this year's College of Engineering Vision Plan for Information Technology. The insight generated by acknowledging the roles of Information Technology (I/T) to enable Life Long Learning through conventional academic curriculum, continuing education, and K-14 outreach have been invaluable in working toward developing an infrastructure that also aptly supports research and administrative operations and facilitates corporate relationships.

Empirical understanding of the role of I/T in each of these venues is helping us to determine an optimal future and to align progress toward these goals purposefully with a Total Cost of Ownership (TCO) mindset. The Laptops for Learning Initiative, a voluntary laptop computer purchase program promoted through the College of Engineering, is but one of the tactics used to implement the spectrum of I/T computing solutions which range from enabling distributed learning to providing a robust set of application, instructional, collaborative, web, database and file services.

I/T efforts such as the campus license for National Instruments LabVIEW, multi-college AutoCAD license, UT System Microsoft licensing agreement, the Technology Classroom Committee and the ad hoc Help Desk coalition are greatly appreciated as they tangibly contribute to and align with College priorities. Forums, such as the Technology Dean's Working Group, have acted as a catalyst to identify key issues and forge I/T futures. These collective efforts provide an invaluable virtual infrastructure that sustains the front-line I/T efforts pursued from within the Engineering College.

The College of Engineering Vision Plan for Information Technology reflects, in the attached table, the priority projects desired for funding as a result of internal strategic planning and alignment with the University vision. The individual entries relate total budget requests and relevance to the overall mission along with numerous fundamental campus issues that should be addressed through collective efforts to fully implement the UT vision recommendations. As available, College funding will be committed to fulfilling the depicted projects. Alternate funding sources will be aggressively pursued to supplement the fee-based revenue and further progress toward achieving the identified goals. Any funding which ITAC could provide toward this objective will be greatly appreciated, and it is hoped that at least the top priorities will be adequately funded.

## **College vision, goals and objectives, recent progress towards realizing goals**

The College of Engineering Strategic Plan for 1999 is published on the web at the URL: [http://www.engr.utexas.edu/research/strategic\\_plan/](http://www.engr.utexas.edu/research/strategic_plan/) and should be considered the definitive document defining the overarching mission of the Engineering College in relation to the University's mission. The Strategic Plan relates our core purpose, values, and our Vision, as well as specific goals, strategies, and actions for implementing objectives.

The underlying objective of information technology is to support this Strategic Plan and, by the nature of the implementation, increase the value of the information to the enterprise and its constituency. This year's Vision Plan strives to take a fresh, hard look at the contribution of I/T toward our fundamental objectives and to discern the processes and projects that need to be implemented to fulfill the Vision. Although this document serves only as a summary of these efforts, as nominally applicable to the academic mission, painstaking efforts have gone into assessing the I/T status quo and envisioning a future system whereby academic, research and business processes will be optimized through the effective use of information technology. The proposed discrete projects depict a transition process to leverage existing resources toward the envisioned future.

Forthright acknowledgement should be made that this is a dynamic process, constantly attempting to correlate an ever-changing reality with a living, fluid Strategic Plan. This admonition is not made to remove accountability, but rather to convey the purposeful design that the implementation details of the vision plan must be nimble and able to rapidly respond to the evolving requirements of the Vision. Thus, this vision plan has a built-in flexibility that allows for the investigation and, if appropriate, implementation of emerging technologies.

The experiential assumption is that we are not making optimum use of information technology within the College. The ad hoc and reactive heritage of I/T acquisitions has reflected a best-efforts mentality by the individual units and has inadvertently created a managed chaos environment whereby even seemingly trivial tasks may be complex and inordinately expensive from a labor requirement perspective. The goal is to evolve the use of I/T as an enterprise resource by assimilating industry best-practices and aligning these resources with enterprise objectives. A Total Cost of Ownership (TCO) model acknowledging the life-cycle cost for I/T is being applied to optimize the return of investment (ROI) for I/T expenditures. Cost-recovery models based upon service requirements and alternative-funding efforts are also being pursued.

Enterprise System Management (ESM) mechanisms comprise the main hope we have of affordably and effectively managing our information technology resources. Sustaining the capability for every person within the organization to access properly installed, configured, patched, secured, and maintained applications throughout the enterprise is essential. This necessitates mechanisms and an environment whereby this objective can be reasonably accomplished. Although this objective will not be overtly represented in the proposed projects, it is important to acknowledge the foundation upon which these projects are architected to ensure consistency and success.

Progress toward the envisioned future has historically been undesirably erratic due to the distributed and autonomous heritage of I/T support and funding structures, but progress within the past year has been remarkable due to common visions and commitment of our corporate relations group to help us leverage industry philanthropy. This is a direct result of the efforts being made to acknowledge the strengths of the existing diversity, develop new partnerships, and nurture cooperation through a best-practices focus to improve services and alleviate redundancies. These efforts are further illustrated in the Life Cycle Methodology section. Priority projects have focused on enhancing the ability to integrate multimedia capabilities and web-based materials into the curriculum, establish TEAM centers and forge ahead with Enterprise Systems Management plans.

## Facilities, staffing and other infrastructure

**Academic** computing support within the College is in large part supported directly from within the six departmental Learning Resource Centers (LRCs). Each department caters to its engineering niche and discipline-specific curriculum needs. Each LRC is independently managed within the department and determines the level and availability of services it will offer to students and faculty through departmental advisory committees and the support staff capabilities. LRCs attempt to offer an approximately 11-to-1, student-to-computer ratio with a mix of Windows, Mac, and UNIX operating systems within their facilities. The specifics of each LRC are published on their respective Web pages. Physical space for the individual LRC operations typically have been carved directly out of classroom or departmental lab space in direct competition with these missions. Remodeling challenges are often inadequate, costly, and interminably slow.

I/T support of **research** is highly variable. Research centers that can afford their own I/T personnel generally hire their own staff, spread them too thin, and seek to outsource for expanding or unanticipated service needs. Too often they may hobble together networks, operating systems, and applications for which there is little or no campus knowledge-base, then their overworked staff get better offers from industry and leave. Smaller research projects typically rely upon graduate students who become amateur system administrators developing useable and employable skills yet detracting from their prime objectives, then graduate, as students do, leaving behind a system that others seldom understand. The other students typically use it until something fails, and then they will pursue LRC or College I/T staff to help them get it fixed. The I/T staff will typically attempt to help, over-investing time, and detracting from other duties to update multiple versions of the operating system and patch numerous applications, then they may operate satisfactorily for awhile. Un-sponsored research generally occurs directly in the LRCs or on PCs tucked away in labs, student offices, or increasingly on student-owned laptops.

**Administrative** support consists of administrative and LRC staff, many of who are assigned part-time to support I/T and hence cannot fully provide the support desired of them. Things still get done, due to hard working and dedicated people. Efforts this past year have attempted to identify key administrative concerns and implement I/T services of tangible benefit to administrative staff.

**The networking infrastructure could best be described as “precarious”.** Although the departmental and campus staff have done a remarkable job of implementing and maintaining the network infrastructure thus far, the predicted demands upon the system to carry data, video, and voice will bring the system, along with our enterprise productivity, to its knees unless purposeful steps are taken and funding is provided to address these future bandwidth requirements. Some departments have even been able to implement gigabit infrastructures for their buildings, but the current emphasis on distributed learning may overload ailing network infrastructures. The current feast/famine/scrounge network sustenance process must be replaced by a funding model and implementation plan encompassing the spectrum from the desktops of distributed learners and distributed campus constituents, to building infrastructures, campus backbones, and hearty pipes to the World. Specifics of the network progress and challenges are related in Appendix 2a, report on the network status.

Finally, ACITS, ACS and OTS offer services and skills that are generally not available within the Colleges. In recent years, measurable progress has been made toward aligning the services of these units in support of College missions, but further work is needed at the institutional level to architect a comprehensive, inclusive institutional vision for I/T. College tactics for addressing facility, staffing and infrastructure issues are presented in the Life Cycle Methodology section. Particular challenges for the forthcoming year include addressing networking infrastructure funding needs, the deployment of campus-wide Active Directory Services (ADS), collaborative services based upon Microsoft Outlook/Exchange 2000, desktop video-conferencing and numerous Technology Enhanced Learning (TEL) initiatives.

**The College of Engineering academic thrust projects, for which funding is being aggressively pursued, are listed below in priority order.** The theme of the thrust projects is to implement technology enhanced learning as a catalyst to change the pedagogical experience and paradigm. Separate tables list the administrative, research and more comprehensive academic endeavors.

## Academic Thrust Projects for College of Engineering I/T Vision Plan 2001-2002

P#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
1	Network connectivity	<p>Increased network capacity and broader access for Engineering buildings including those located at PRC, MCC and other key sites are needed in order to keep pace with increasing service demands.</p> <p>Full deployment of network connections throughout the College is desired and will need to include wireless strategies in order to make internet resources available in the classroom as desired by the instructors. Lack of pervasive classroom connectivity hinders innovative instruction initiatives all across campus. Existing deployment has been prioritized and implemented in alignment with available funding.</p>	<p>Funding requests focus on only the six Engineering buildings on the main campus. There are also significant needs in other Engineering buildings including those at the PRC, MCC and in many other campus classrooms that do not have essential service for the instructor.</p>	<p>Primary building network switches, fiber pulls to NOC and client hub/switch capacity.</p> <p>Engineering consistently consults with William Green of ACITS/OTS to ensure Engineering network upgrades are necessary and in alignment with the total campus networking.</p> <p>[Network connectivity has been a chronic issue for too many years. Identifying this as a priority 1 issue on our vision plan requests a permanent funding model to be established to address this mission-critical service.]</p>	<p>\$530,000 per year ITAC (a permanent funding model needs to be established and was proposed in a Compact proposal in the Spring of 2000)</p>	<p>Existing network control room space within each building will be utilized.</p>	<p>The hurdles for coordinating network connections beyond the realm of Engineering's network control are stifling. This inhibits adequate deployment of innovative instructional materials developed for the Engineering curriculum. Forums such as the Technology Classroom Committee are needed to help promote adequate connectivity campus wide.</p>

2	Wireless Pilot	Wireless networking is becoming affordable and reliable, and therefore is a practical consideration. A well-documented pilot project with campus partners should be established and tightly coupled with laptop and hand-held computing capabilities. Effective utilization of wireless technology could fundamentally impact other I/T costs and innovative instruction efforts.	Initial investigation would involve a small control group, but implementation/ utilization implications would involve the entire campus.	Total pilot project parameters would need to be matured by participating parities, but would largely use existing staff and infrastructure. Procurement of access points and wireless cards for laptops would be a key need. Preliminary discussions are already underway with OTS that acknowledge existing campus experiments, but this project proposes to formalize campus wireless efforts and develop a deployable model and strategy.	\$25,000 ITAC	Above ceiling space for mounting of access points.	ACITS, Fine Arts, ACES and the Business School would be good partners to implement this pilot by extending existing services.
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## Academic Thrust Projects for College of Engineering I/T Vision Plan 2001-2002 (cont)

P#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
3	TEAM Focus Center	Extrapolating the success of the studio classrooms, TEAM focus centers need to be established to provide an environment for small, technologically equipped brainstorming and project work.	Direct impact upon engineering students in a team project/participatory environment.	1-3 client CPUs, server, networking, multimedia teaching podiums integration, whiteboards, distributed collaboration capabilities, room remodeling.	\$80,000 for the pilot facility	Space will be allocated from within the College.	General Library Space may be the most accommodating environment for these centers. Remodeling assistance may be needed.
4	Active Directory Services	Windows-centric directory structure providing individual accounts for students, staff and faculty across the entire campus providing ease of accessing services across departments and colleges and ease of granting privileges to users for other resources such as printers.	Entire UT community.	Campus centralized servers and support staff are needed to host this service for the entire campus.  It is crucial to include key campus stakeholders in the services that should be provided by this mechanism.	Unknown, but affordable ITAC/ITF (Pennies per month per customer at a campus scale)	Integration with existing capabilities is anticipated.	Engineering is well aware of existing efforts to bring this service to life on campus and would like to emphasize the importance of having this service in place ASAP and supported in a robust manner.
5	@home connectivity	Campus dorm rooms have addressed the need for adequate bandwidth, but off-campus students, faculty and staff are generally lacking adequate bandwidth capability to accomplish learning effectively.	Entire UT community.	Affordable models need to be developed and promoted, likely in partnership with industry, that ensure the special service needs of the academic user are being addressed.	Unknown, but primary costs would be accepted by those desiring service.	Likely some space impact within OTS NOCs.	Industry ISPs with service level agreements in place.
6	Universal File & Web Services	0.5GB per student accessible from both Windows and UNIX across the enterprise offering both file and web services.	Initially Engineering and scaling with participating campus partners.	Terabyte sized disk farm, supporting network infrastructure and support staff.	\$500,000 per yr. ITAC/ITF (~ \$5 per month per user)	Existing space.	Ubiquitous and ample access to this resource are now affordable and the geographical installation could address networking demands. A student portfolio project has been completed.

7	Desktop teleconferencing	Virtual office hours facilitating faculty/TA/student interactions in the evenings are of particular interest.	Initially, the engineering community of students, but models would be easily translated to other campus groups.	A directory server for engineering has been established already.  Camera and digital tablet equipment is needed to seed faculty and students to make capability more broadly accessible.	\$30,000. ITAC/ITF (catalyst pilot to make capability more broadly available within College)	Existing space for directory server. No new space needed for implementation.	Pilot programs have already identified the excitement and productivity over this now practical collaboration medium.
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## Academic Thrust Projects for College of Engineering I/T Vision Plan 2001-2002 (cont)

P#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
8	Live Distributed Learning	Extensive capability for providing live streams of the classroom learning with two-way interaction capability is desired to provide increased access to the classroom experience.	Initially, the engineering community of students, but models would be easily translated to other campus groups.	Specifications determined by the Distributed Learning report as appropriate for auditoria.  (3 facilities are desired immediately and at least one new facility per year in the forthcoming years)	~\$250,000 per classroom ITAC (ideally ~\$750,000 for the first set of 3 classrooms)	The extent of remodeling necessitated will differ greatly from building to building.	Renovation costs and an aggressive timeline for implementation must be made a priority by the institution.
9	Unrestricted Access to Learning Resource Centers (LRCs)	Providing 7x24x365 access to existing LRCs for undergraduate students is of particular concern.  Expensive I/T equipment is being somewhat underutilized during night and weekend hours due to antiquated UT policies for providing access cards to undergraduates.	Entire UT community.	Pervasive deployment of Smart Cards is perceived as the appropriate solution.  Extensive installation/upgrade of card readers across campus is anticipated.  Administrative support will be needed at some level.	Total cost is unknown, but is anticipated to be relatively small on a per card basis especially when weighed against the existing losses of utilization of expensive I/T equipment.	Minimal space is anticipated at card access sites, but the central authority may need a center of operations.	Campus efforts have faltered in the in past with limited vision and resources. It is time to offer a comprehensive solution to campus which does not place an inordinate financial burden on the Colleges and provides necessary access to expensive I/T resources.

10	Multimedia Teaching Podiums (continuing)	Consistent with the suggestions of the Multimedia Enhancement Task Force (METF), campus teaching centers should be appropriately equipped to facilitate the integration of multimedia into the classroom either through permanent installations or through a responsive service organization.	Direct impact upon classrooms proximate to engineering to include serving general purpose classrooms as instructors integrate multimedia into the curriculum.	Specifications determined by the METF report as appropriate for auditoria, large, medium, and small classrooms.  This objective needs to be tightly coupled with a service organization which can properly operate and maintain these facilities.	~\$900,000 per year ITAC and other sources  Incremental deployment throughout the college as funding allows.	The extent of remodeling necessitated will differ greatly from building to building.	Innovative instruction must be deliverable in trivial fashion else much of the effort and emphasis placed upon these innovative tools will go unrealized. Current capabilities largely require inordinate pre-coordination and labor-intensive support to insure a professional presentation.
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## Academic Thrust Projects for College of Engineering I/T Vision Plan 2001-2002 (cont)

P#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
11	Handheld wireless	A new class of mobile computing devices are coming onto the market and may bridge the gap between PDAs and laptops computers. It is an appropriate time to begin accessing their impact/benefit to academic objectives.	Initially, the engineering community of students, but models would be easily translated to other campus groups.	Procurement and evaluation of devices coming onto the market will be the objective of the exploratory pilot project, hopefully leveraged by industry participation and grants.	\$25,000 ITAC/ITF (exploratory pilot)	No anticipated space impact	This project should be tightly coupled with wireless networking initiatives.
12	Studio Classroom	At least one additional studio classroom per year within the College will be needed for the foreseeable future.  The capacity of the two classrooms with this capability is saturated. It is necessary to extend this capability rather than restrict its availability once it becomes a motivating force behind the innovative use of I/T in the classroom.	Direct impact upon engineering students in the classroom in a participatory environment.	20-25 client CPUs, server, networking, multimedia teaching podiums integration, room remodeling.	\$230,000 ITAC Per classroom.	Space will be allocated from within the College.	Once the students have experienced the presentation of various technology based tools and been made aware of their capabilities, a portion of these capabilities needs to be followed up by hands-on studio classroom activities. The campus needs to be a contributing remodeling partner.

13	Real-world classroom	Bringing real-world data and analysis into the classroom by equipping real-world structures such as strain-gauges to bridges to measure structural stress, accelerometers to measure vibration, thermal couples to measure outside air and structural temperatures, and video to monitor traffic flow is the objective of this project.	Engineering community	Industry partners would be pursued to help provide data acquisition equipment and integration of metering devices into real-world scenarios. The equipment purchased would largely facilitate analysis and exploration of the information in the classroom.	\$60,000 ITAC/ITF (pilot program)	Integration into Distributed Learning classroom.	There are many current structures, machines, geographical sites, and governmentally instrumented locations that could be used for this kind of activity. We could leverage industrial and government investments by setting up systems to access this information for instructional purposes.
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The Laptops for Learning Initiative, a voluntary laptop computer purchase program for students, faculty and staff promoted through the College of Engineering, will remain a centerpiece of the technology strategy within Engineering and is one of the tactics used to implement the spectrum of I/T computing solutions which range from enabling distance education to providing a robust set of application, instructional, web and file services.

## Administrative Project Listing for College of Engineering I/T Vision Plan 2001-2002

Project Title	Brief Description	Proposed Budget / Funding Source
Service Desk	An accessible and responsive service desk promoting guaranteed service levels in being pursued as a productivity imperative.	Existing funds, although a “technology fringe” is highly desired as a suitable means for providing adequate funding.
Calendaring, email and Collaboration	Evolving calendaring capabilities beyond the limitations of Meeting Maker MUST be communicated and accomplished carefully. Bulk email facilities need to be matured to permit enhanced communication with colleagues. Collaborative sharing of documents and access to resources such as projectors and scheduling of rooms is an optimization necessity. Calendaring and collaboration have many intertwined capabilities, and the envisioned solution is tightly integrated and based upon Microsoft Outlook/Exchange.	
Training	Training is needed for the entire spectrum of I/T activities to include novice, intermediate, and advanced offerings.	
WinTel migration	Although the Engineering Dean’s office has made a formal commitment to migrate to PCs through attrition in order to lower cost and increase level of service, other departments seem to be pursuing this same objective by less formal means.	

## Research Project Listing for College of Engineering I/T Vision Plan 2001-2002

Project Title	Brief Description	Proposed Budget / Funding Source
Collaboration	Collaborative tools are needed in order to facilitate proposal writing and accomplish research activities to include communicating with sponsors.	Existing funds, on a per project basis.
Industry Interface	The existing database of research interests needs to be matured and integrated with industry interface portals.	
Presentation Services	Presentation services are needed in order to help deliver engaging proposal presentations at off-campus sites.	
TEAM Centers	Honing the academic TEAM center concept to focus on small, technologically equipped brainstorming and project centers.	

All areas, including corporate relations, lifelong learning and outreach projects will highly leverage the technologies put into place for accomplishing the academic mission to take advantage of the expertise available within the College. Major thrusts will be the implementation of managed systems, through the use of enterprise system management tools and application servers, to deliver services to customers. Emphasis will be placed on the maturation of digital dashboards, data warehouses, and collaborative tools that will enhance workflow. Existing funds and grants will attempt to fund these projects.

# Academic Project Listing for College of Engineering I/T Vision Plan 2001-2002

This opportunity also has been taken to list numerous projects, some of which are already in progress by various groups and fundamental campus issues that should be addressed through collective campus efforts to fully implement the UT vision recommendations.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	Application Servers (continuing)	Extending application services to all computing platform clients from a unified client/server model leverages many factors and is anticipated to have a significant cost savings on both hardware and software licensing costs in the future. This funding would determine the scalability of these types of applications and gauge the impact upon the networking infrastructure to provide this new service capability.	Initially for Engineering students, but the benefits of this technology could rapidly unfold to the entire campus as Windows- based computing is made available to mobile, remote, UNIX, and MacOS users across the network.	LRC effectiveness could substantially increase as they evolve to support more computationally intensive tasks.  The potential contribution to distance education programs is promising.	\$90,000 ITAC	Minimal server room space, which is already available.	Liberal Arts, Business, ACS and ACITS would be valuable partners in this groundbreaking endeavor.  Network bandwidth requirements could be impacted as the demand and maturity of these services evolves.

	Enterprise System Mangement (continuing)	Providing asset management of networking and computing resources with such tools as Tivoli Enterprise will help to evolve the use of information technology as an enterprise resource by assimilating industry best-practices and aligning these resources with enterprise objectives. A Total Cost of Ownership (TCO) model acknowledging the life-cycle cost for I/T will be applied to optimize the return of investment (ROI) for I/T expenditures permitting proactive adjustment to service requirements.	Initially Engineering and scaling with participating campus partners.	Initially 1 FTE and 1 student, control consoles and ESM software working in concert with existing departmental resources.  Enterprise System Management (ESM) mechanisms are the best hope we have of affordably and effectively managing our information technology resources. Sustaining the capability for every person within the organization to access properly installed, configured, patched, secured and maintained applications throughout the enterprise is essential. This necessitates a mechanism and environment whereby these objectives can be reasonably accomplished.	\$465,000 ITAC/ITF Implementation tools could appear costly, but the ROI cannot be truly assessed in our ad hoc environment. Recurring costs are also substantial. Cost recovery models based upon service requirements and alternative-funding efforts can be provided as necessary.	Office space to house two staff members, initially.	Corporate partnerships will be pursued to substantially reduce implementation costs.
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# Academic Project Listing for College of Engineering I/T Vision Plan 2001-2002 (cont)

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	Learning Resource Centers (LRCs)	Learning Resource Centers (LRCs) are the staples of our I/T capabilities, housing our front-line talent and the computing resources that the students use daily. Funding for these centers needs to be maintained and standards for services they provide need to be established and evolved while developing campus partnerships and eliminating redundant efforts.	Direct support of students on a daily basis, department by department or college.	Centralized computing resources need to be well maintained and have well documented standards of operation to serve academic endeavors effectively.	ITF Existing student fees are the primary source of funding.	Space adjustments will be made at the college and departmental levels. A building designed with this purpose in mind is envisioned.	
	Process Infrastructure	Campus policies and service standards need to be established as the infrastructure within which we work. These parameters will transcend the ever-changing technology. Mission-critical functionality, such as our networking infrastructure needs to be identified and adequately funded. Pervasive impact and synergy will occur once training and help desk support are aligned and evolved with the service standards established. Engineering will pursue coordinating these structures with campus partners to collaborate and establish this framework where a void remains.	The entire campus computing community and setting standards for other institutions (leading the way).	Cooperation and a focus on identifying core business processes are the keys here. It may require distinguishing when autonomy is desirable to promote innovation and when standards may provide more time for innovation.	Reallocation and more effective use of existing resources are most likely.	No known impact	Losses in productivity and energies toward innovation are immeasurable within our functional chaos. Factions currently succeed in spite of all odds, but effective I/T tools need to provide services for our entire campus community.

## College I/T funding overview and life cycle methodology

Funding models for I/T, although still inadequate, have been earnestly addressed only within the academic realm, and are founded upon assessing student fees. The academic fee structure has evolved over the past dozen years to three primary fees that largely contribute to the operation of the departmental Learning Resource Centers (LRCs).

Information Technology Fee - \$9/SCH University-wide fee. Approximately 57% is returned to the College initially. Additional funding may be received through ITAC allocations for specific projects. (\$6 97-00)

Instructional Technology Fee - \$17/SCH College of Engineering fee in 98-99 (\$9 97/98; \$12 98/99; \$17 99/00)

Learning Resource Center Fee: ~\$150/semester (six distinct fees aligned with their respective departments)

Administrative funding of I/T has been a perpetual concern. Operational budgets have not been adjusted for the inclusion of technology as an essential tool to accomplish administrative functions. Although the Faculty Computing Initiative (FCI) and the Computer Lifecycle (CLC) programs have been a step in the right direction to address faculty computing needs, these efforts need to be better coordinated to address actual needs and extended to address staff computing needs. Research funding for I/T is, of course, project based. One particularly sensitive issue is the percentage of a project allocated to overhead for infrastructure costs, yet I/T still not being considered part of the infrastructure. In addition to this, research, in many situations, has found it necessary to subsidize the purchase of adequate technology to perform both academic and administrative functions for themselves and to support staff.

This improvisational system is a response to the lack of a purposeful funding mechanism provided by the institution acknowledging the role of technology in accomplishing job-duties. It also has an unfortunate side-effect of units attempting to purchase the most powerful computer they can afford with available funding, which is many times not the most appropriate solution, because they are not sure when the next opportunity to replace the equipment will arrive. An innovative solution for providing appropriate technology and training for an individual to accomplish their job may be something along the lines of a "technology fringe" corresponding to fringe benefits associated with a person's salary and aligning with their role within the institution. The technology fringe could be allocated to ensure the infrastructure, services and training needed to perform a specific job function are adequate. Enterprise system management efforts and strategic purchasing opportunities are attempting to improve this situation.

The first step in implementing an effective Total Cost of Ownership (TCO) model to improve the Return On Investment (ROI) for I/T expenditures is architecting an infrastructure that leverages existing investments and assesses life cycle costs for all future acquisitions. Specifically, strategic procurement, proactive deployment and monitoring coupled with training and a responsive service desk are projects currently underway. Where these practices will have the most noticeable impact is upon the migration toward managed desktop computing environments where a user's application suite can be audited and updated across the network as deemed appropriate to accomplish their job-related duties, transcending the current inability to keep all systems across the enterprise properly maintained. This capability will be implemented by the deployment of enterprise system management (ESM) tools that facilitate the installation and maintenance of applications through a central console and will have an especially significant impact upon administrative and

academic installations that deploy numerous instances of the same configuration. Initially, parallel ESM systems will need to be maintained to accommodate the arbitrary diversity of computing platforms, but through attrition over the next few years, managed clients will be able to replace conventional desktops, reducing the overhead and providing better service to the desktop. In the meantime, the establishment of application servers and multi-platform software clients will extend the life of existing hardware until its utility is diminished. Similar services will be offered to mobile computing users and system adjustments will be accomplished when the units are connected to the network. Effective license management and application servers will enable network access to high cost or volume needs. Through these ESM mechanisms, software licensing will be afforded several benefits and yield significant savings.

Life cycle optimization standards for multiprocessor workstations, servers, printers and peripherals also will be established and acknowledge the capital expenditure, configuration, training, support, supplies, and maintenance needed to effectively utilize the resources. Coincident with this assessment should be the declaration that multiple CPUs are rarely needed by a single individual to accomplish their job-duties and every effort should be made to ensure this is a cost-effective situation when it arises. Paramount in the establishment of these standards will be the effectiveness in meeting customer needs and developing supportable standards to ensure that there will be no second-class citizens in the organization. When we give an individual a charge to perform a task that requires the use of information technology, adequate resources should be supplied to that individual to accomplish the task at hand. Both the individual and the technical support staff should feel adequately prepared and trained to perform the task and able to quickly recover from unpreventable circumstances such as hardware or software failures.

Research should adopt these established standards wherever possible to ensure the availability of a campus knowledge-base should service outsourcing become desirable.

I/T staffing adjustments will be needed as various projects are funded and specific roles will be adjusted to accommodate the changing skill set requirements as TCO models are deployed. Staff and student positions capable of ensuring the effective deployment of technology in the classroom and supporting distributed-learning, diagnosing network problems and implementing enterprise system management tools will be of special interest.

The network infrastructure needs to be adequately funded from all participants, academic, research and administrative, and a funding model which implements this needs to be established (a college-wide model is under consideration). Specific challenges to the College of Engineering network are identified in Appendix 2a, but it is believed that an institutional model is needed which does not leave the internal building infrastructure unspecified and without robust diagnostic and bandwidth utilization assessment tools. It is anticipated that adequate networking capability could be provided to an individual for a cost less than that of a telephone handset per month. Capacity offerings could mimic television cable service such as BASIC (10/100 MBPS) and PREMIUM ( $\geq$ GB) and offer innovative new services such as voice-over-IP (VoIP) and wireless services. An internal, College of Engineering model will be established in lieu of a campus model in coordination with campus networking services.

Adequate physical facilities to support complementary academic and research endeavors have historically been lacking and it is suggested that efforts be pursued to construct a building that is specifically designed to accommodate academic and research computing requirements. The ACES building is an excellent model addressing research computing needs.

# Appendices

## 1. Information & Instructional Technology Fee expenditures report for 1999-2000

	ITAC Fee	Inst. Tech Fee	TOTAL
<b>BALANCE FORWARD</b>	<u>\$441,371</u>	<u>\$472,082</u>	<u>\$913,453</u>
<b>AMOUNTS RECEIVED:</b>			
Fee Income		\$1,738,607	\$1,738,607
IML Income		\$78,069	
Continuing Annual Amount	\$365,538		365,538
One-Time Allocation	126,000		126,000
<b>TOTAL AMOUNT AVAILABLE</b>	<u><b>\$932,909</b></u>	<u><b>\$2,288,758</b></u>	<u><b>\$3,143,598</b></u>
<b>SALARIES AND FRINGE:</b>			
Salaries	\$0	(\$664,898)	(\$664,898)
Fringe Benefits	0	(121,559)	(121,559)
	<u>\$0</u>	<u>(\$786,457)</u>	<u>(\$786,457)</u>
<b>HARDWARE:</b>			
Computer Purchases (Capitalized)	(\$317,624)	(\$545,560)	(\$863,184)
Computer Purchases (Not Capitalized)	(36,480)	(20,632)	(57,112)
	<u>(\$354,104)</u>	<u>(\$566,192)</u>	<u>(\$920,296)</u>
<b>SOFTWARE:</b>	(\$19,396)	(\$35,654)	(\$55,050)
<b>SUPPORT:</b>	(7,953)	(4,832)	(12,785)
Telecommunication Expenses	(7,953)	(4,832)	(12,785)
Telecommunication Equip. Not Capt.	0	(14,055)	(14,055)
	<u>(\$7,953)</u>	<u>(\$18,887)</u>	<u>(\$26,840)</u>
<b>MAINTENANCE:</b>			
Computer Maintenance	(7,324)	(8,101)	(15,425)
Maintenance & Repair	(11,983)	(50,593)	(62,576)
	<u>(\$19,307)</u>	<u>(\$58,694)</u>	<u>(\$78,001)</u>
<b>OTHER:</b>	\$0	(\$502)	(\$502)
Books and Subscriptions	\$0	(\$502)	(\$502)
Consumable Supplies	(17,677)	(12,600)	(30,277)
Equipment & Furniture	(134,081)	(177,425)	(311,506)
Freight & Postage	(65)	(2,144)	(2,209)
Insurance	(703)	(388)	(1,091)
Other Operating Expenses	(5,621)	(6,994)	(12,615)
Other Services	(60)	(9,569)	(9,629)
Printing and Reproduction	0	(5,702)	(5,702)
Travel	0	(8,449)	(8,449)
	<u>(\$158,207)</u>	<u>(\$223,773)</u>	<u>(\$381,980)</u>
<b>ENCUMBRANCES</b>	<u>(\$68,703)</u>	<u>(\$165,132)</u>	<u>(\$233,835)</u>
<b>TRANSFERS OUT FOR RENOVATIONS</b>	<u>(\$12,000)</u>	<u>(\$32,000)</u>	<u>(\$44,000)</u>
<b>TOTAL EXP, ENC &amp; TRANSFERS OUT</b>	<u><b>(\$639,670)</b></u>	<u><b>(\$1,886,789)</b></u>	<u><b>(\$2,526,459)</b></u>
<b>ENDING BALANCE</b>	<u><u><b>\$293,239</b></u></u>	<u><u><b>\$401,969</b></u></u>	<u><u><b>\$617,139</b></u></u>

## 2a. Networking Status

The College of Engineering networking infrastructure spans six main campus buildings with a seventh shared facility recently completed, the ACES building. Engineering facilities located at the Pickle Research Center and other locations are not included in this inventory perspective although they are hoped to be assessed in the forthcoming year. Efforts are underway, as resources allow, to integrate the entire spectrum of networking needs for the college into a master networking plan for engineering.

The most recent collective efforts to upgrade networking capabilities throughout the six main campus buildings were made in the Fall of 1994. Each building implemented a network infrastructure in coordination with the Office of Telecommunication Services (OTS). The three main goals accomplished during this implementation were:

1. Bandwidth connectivity to UTnet: Each building installed a Cisco 7000 router and all six buildings used a single-shared 10 MBPS Ethernet link to the UTnet Network Operations Center (NOC).
2. Wiring within the Buildings: Category 5 Unshielded Twisted Pair cable (Cat5 UTP) was installed to as many end-points as could be afforded, to include classrooms (for the instructor) and faculty offices. (As a side note this simple concept took over two years to accomplish as a battle raged with telephone services to transcend the historical telephone patch panel convention and move toward installing "home-runs" (which permit a single cable to run from a centralized network control room (NCR) directly to the users CPU), but this insistence has proven to be worth its weight in gold and today, it is still the standard installation procedure. These home-runs are also a critical link that will allow us to ability to deliver multimedia and Voice over IP (VoIP) throughout the college without modifying this portion of the infrastructure.)
3. Bandwidth within the Buildings: This was the installation of 10 MBPS shared Ethernet hubs to interconnect computers, printers, and servers within the building.

Incremental changes have occurred since this coordinated effort to include accomplishing independent fiber pulls directly to the NOC and three departments have pursued Gigabit core installations. Also, as funding has allowed, the 10 MBPS shared Ethernet hubs have been replaced with 10/100 MBPS Ethernet Switches in ~75% of the buildings. This alone has improved network performance ~10x.

The bandwidth demands upon the network infrastructure continue to escalate as new services are brought on-line such as Distributed Learning, TEAM Centers, Application Servers and Enterprise Systems Management capabilities. Of particular concern are emerging applications for distributed learning that can place inordinate demands upon general-purpose infrastructures when attempting to deliver instructional materials with either synchronous or asynchronous video and audio signals. In a specific project, distributed learning capabilities were enhanced between main campus and the Applied Research Lab (ARL) at PRC to demonstrate the ease with which distributed learning may be accomplished when significant scheduling overhead, due to limited bandwidth, is not a deterring factor. This production system has also made clear several enhancements needed to ensure quality instruction at the distant site to accomplish the virtual classroom experience. Voice over IP (VoIP) also has numerous applications, from distributed learning to service desk and the potential for incredible impact.

Network accessibility is also becoming an increasing concern. The increasing prevalence of laptop computers with the college, due to the continued success of the Laptops for Learning Initiative, demands pervasive campus DHCP and DNS standards in order to provide these services in a consistent and reliable

manner. The delays in implementing campus-wide active directory services are becoming an increasing impediment to overall network security and better service capabilities. The increasing demand for multimedia in the classrooms also stresses the need for consistent networking standards across campus. Since hardwiring classroom desktops will always be cost prohibitive, a wireless pilot project, in coordination with OTS, is being pursued to provide network services to classrooms, libraries, and other previously inaccessible zones.

Although crucial components of the networking infrastructure are requested for funding through the proposed projects within this vision plan and network connectivity is identified as the number one priority, a comprehensive plan and associated funding model must be established in order to address our increasing reliance upon network services to accomplish our academic, research, outreach missions and administrative operations. Particular attention should be paid to the challenges and capital expenditure associated with adequately networking buildings not located on main campus and the unfortunate circumstance where a unit must be moved from one location to another.

Projects of special importance to the six engineering buildings on main campus:

- Replace remaining Cisco 7000 Routers. Funding of this project will be used to replace the aging single-shared 10 MBPS hardware infrastructure installed in the 1994 Fall semester with current technology standards which consist of 1 GB single-mode fiber links to UTnet. (Fair compensation should also be considered for those departments who have already accommodated this need.)
- Replace remaining 10 MBPS Hubs. Funding of this project will be used to install 10/100 MBPS Ethernet Switches capable of current Vlan technology and high-speed data throughput.
- Wireless pilot project. This project will be coordinated in conjunction with OTS to serve as the test bench for the campus.
- Voice over IP pilot project. This project too will be coordinated in conjunctions with OTS to serve as the test bench for the campus and leveraging experiences in the CoB.

## **2b. Technology Classroom Inventory**

The College's Strategic Plan and the report written by the University's Multimedia Enhancement Task Force have enabled the College to move forward on implementing multimedia in the classrooms in a timely and coordinated manner. College of Engineering buildings house approximately 10 percent (60 rooms) of all classrooms on campus. To date, 40 percent of these 24 general-purpose classrooms and 36 College and Departmental classrooms have some level of multimedia equipment installed.

Historically, multimedia in College of Engineering classrooms have been accomplished by independent, almost disjoint, grass-roots efforts to provide projection systems and Internet connectivity to the classroom with no over-arching vision or concept of quality or level of service. Independent initiatives (e.g., roving projectors via the College and departments plus the IML Distance Learning Classroom and ENS 302) evolved into collective purchasing attempts. Some of these independent efforts provided a good service foundation for the College to build upon.

In FY 1996-1997, the College purchased three 3M LCD projectors (~\$20K) for use throughout the College. In FY 1997-1998, the College allocated a total of \$90,000 (\$15,000 to each of the six departments) to use for independent installations and facilitated the purchase of nine Sharp 3000XGU projectors. Both Chemical Engineering and Mechanical Engineering permanently mounted projectors in two rooms each. Electrical and Computer Engineering outfitted a classroom on their own. At the same time, the College developed a Strategic Plan that included pursuing technology in the classrooms as a high priority and the University coordinated the Multimedia Enhancement Task Force (METF). As a result, the next round of multimedia installations was pursued in a more systematic manner.

In FY 1998-1999, College Vision Plan funding of \$160,000 was allocated to outfit 14 classrooms (six departmental, eight general purpose) that were targeted for multimedia installations because data showed that these rooms had a strong correlation between high engineering usage and a high number of requests for multimedia equipment. This analysis also anticipated high multimedia usage in four classrooms under construction in ENS. Of the 14, four classrooms were completed during the fiscal year while the remainder waited for funding and construction.

In FY 1999-2000, with \$126,000 of Vision Plan funding, the College partnered with the Departments of Mechanical Engineering and Civil Engineering to outfit an additional six rooms with multimedia equipment based upon further review of the data and input from the departments and faculty. The College also was able to partner with the Departments of Aerospace Engineering, Petroleum Engineering and Electrical and Computer Engineering to complete an additional seven rooms initially targeted the previous fiscal year.

In FY 2001-2002, the College will attempt to leverage the \$35,000 allocated from Vision Plan funding by joining a partnership with the Colleges of Natural Sciences, Liberal Arts and Fine Arts to further leverage our resources so our faculty can take advantage of the latest technologies. In addition, a request for a new student fee that would go towards funding a multimedia classroom technology service organization has been submitted to the UT System Board of Regents.

## 2b. Technology Classroom Inventory (cont)

Within the College of Engineering main campus buildings we have:

- 1 fully equipped distance education classroom
- 2 studio classrooms (via two grants from HP)
- 22 classrooms and computer labs with permanently affixed multimedia teaching podium equipment (planning for the next round of classrooms is underway). Presentation needs for the remaining rooms are met with by individual users with roving platforms equipped with an LCD projector, a computer and a VCR that can be checked out from any of the six Engineering departments or the centralized Service Desk organization residing in Dean's office.
- 6 LRCs with varying levels of support to accommodate classes within their facilities

The tables and associated legend below depict an audit of all classrooms located with the engineering buildings, both general purpose and departmental, and the equipment with which they are equipped. A web-based mechanism is available to facilitate requests for mobile equipment within the classroom and a web-published table will be updated as we progress in our project to better equip the classrooms per the Multimedia Enhancement Task Force (METF) suggestions.

Comprehensive Engineering Classroom Inventory									
Building	No.	Configuration	Authority	Capacity	ADA	Capabilities		Cost	FY
						Instructor	Student		
CPE	2.202	Classroom	PGE	26	1	CWS, SCR, TBL			
CPE	2.204	Classroom	GP	90		CWS, SCR			
CPE	2.206	Classroom	GP	73		CWS, SCR, LCD (Proxima 9250+)		\$13,000	99-00
CPE	2.208	Classroom	GP	144		SCR			
CPE	2.210	Classroom	GP	73		CWS, SCR			
CPE	2.212	Classroom	GP	73		CWS, SCR			
CPE	2.214	Classroom	GP	144		SCR			
CPE	2.216	Classroom	GP	73		CWS, SCR			
CPE	2.218	Classroom	GP	90		CWS, SCR, LCD (Sharp XG3000U)		\$11,000	97-98
CPE	2.220	Classroom	GP	73		CWS, SCR, LCD (Sharp XG3000U)		\$11,000	97-98
CPE	2.222	Classroom	ChE	50		CWS, SCR			
ECJ	B.102	Classroom	CE	22	1				
ECJ	B.111	Classroom	CE	18	1				
ECJ	B.226	Classroom	CE	28	1	SCR, LCD (Proxima 9250+)		\$11,000	99-00
ECJ	1.202	Classroom	GP	176		CWS, SCR			
ECJ	1.204	Classroom	GP	75		CWS, SCR			
ECJ	1.214	Seminar room	GP	36		MC, TBL, SCR			
ECJ	3.301	Computer lab	CE	15		1 PC	14 PCs		
ECJ	3.302	Computer lab	CE	20		1 PC	19 PCs		
ECJ	3.402	Computer lab (HPSC2)	CE	22		1 PC, LCD (Sharp XG3000U)	22 PCs		
ECJ	5.406	Classroom	CE				drafting tables		
ECJ	5.410	Classroom	CE	50	1	CWS, SCR, LCD (Proxima 9250+)		\$11,000	98-99
ECJ	5.416	Classroom	CE	22	1	LCD (Proxima 9250+)		\$11,000	99-00
ECJ	7.202	Classroom	CE	22	1	SCR, LCD (Proxima 9250+)		\$11,000	98-99
ECJ	7.208	Classroom	CE	28	1	SCR, LCD (Proxima 9250+)		\$11,000	98-99
ECJ	9.236	Classroom	CE	30	1	LCD (Proxima 9250+)		\$11,000	99-00

## 2b. Technology Classroom Inventory (cont)

Comprehensive Engineering Classroom Inventory, continued									
					Capabilities			Cost	FY
ENS	109	Classroom	GP	42		SCR			
ENS	115	Classroom	GP	81		LCD (Proxima 9250+)		\$11,400	99-00
ENS	116	Classroom	GP	49		LCD (Proxima 9250+)		\$11,400	99-00
ENS	126	Classroom	GP	49		LCD (Proxima 9250+)		\$11,400	99-00
ENS	127	Classroom	ECE	87		LCD (Proxima 9250+)		\$11,400	99-00
ENS	145	Classroom	GP	42		SCR			
ENS	302	Classroom	ECE	100		SCR, PC, VCR, LCD (Sanyo), Elmo		\$35,000	97-98
ENS	317	Computer lab	ECE	80	1	CWS, SCR, 1 PC	79 PCs		
ENS	334	Computer lab	ECE	36	1	CWS, SCR, 1 PC	35 PCs		
ENS	340	Computer lab	ECE	36	1	CWS, SCR, 1 PC	35 PCs		
ENS	507	Computer lab	ECE	80	1	CWS, SCR, 1 PC	79 PCs		
ETC	2.102	Classroom	GP	32		CWS, MC, SCR			
ETC	2.108	Classroom	GP	150		SCR, LCD (Sharp XG3000U)		\$16,000	97-98
ETC	2.114	Classroom	GP	38		CWS, SCR			
ETC	2.132	Classroom	GP	38		CWS, SCR			
ETC	2.136	Classroom	GP	94		CWS, SCR, LCD (Sharp XG3000U)		\$16,000	97-98
ETC	2.144	Computer lab (HPSC1)	ME	38		1 PC, LCD (3M 8740)	18 PCs		
ETC	3.112	Computer lab	ME	26		LCD (Proxima 9250+)	26 PCs	\$11,000	99-00
ETC	3.134	Computer lab	ME	11			11 PCs		
ETC	3.136	Computer lab	ME	12					
ETC	3.142	Computer lab	ME	26		LCD (Proxima 9250+)	26 PCs	\$11,000	99-00
ETC	4.110	Classroom/ Presentation room	ME	37		TBL, LCD (Proxima 9250+)		\$11,000	99-00
ETC	4.160	Computer lab	ME	18			5 PCs		
ETC	4.150	Classroom	ME	37		TBL, LCD (Proxima 9250+)		\$11,000	98-99
ETC	5.132	Classroom	ME	38					
ETC	5.148	Distance ed	ME	30	1	PC, LCDs, CWS			
ETC	7.111	Classroom	ME	24					
ETC	7.146	Classroom	ME	38					
WRW	101	Conference	AE	12		CWS			
WRW	102	Classroom	GP	139		SCR, LCD (Proxima 9250+)		\$11,000	99-00
WRW	113	Classroom	GP	56		CWS, SCR, LCD (Sharp XG3000U)		\$11,000	99-00
WRW	312	Classroom	AE	24		CWS			
WRW	410	Classroom	AE	40		TV/VCR SCR CWS			
WRW	413	Classroom	AE	20		CWS			

### Legend

CNF = Conference Room	MF = Media Facility
CWS = Continuous Writing Surface	PC = Computer
LCD = Computer Projector	SCR = Screen
MC = Moveable Chairs	TBL = Movable Tables.