Undergraduate Laboratories
Department of Civil Engineering

Note: This document has been reviewed by Undergraduate Laboratory Directors. All the comments received as of Sept. 15, 2006 have been reflected in this posting.

Introduction

The Department of CE maintains seven undergraduate instructional laboratories on the first floor of Nitschke Hall totaling 8,596 square feet. Table 1a lists these laboratories; their directors; their status in regard to safety, housekeeping, and general condition; their adequacy for instruction; the square footage. The department also maintains research laboratories. Information on key equipment in undergraduate laboratories is given in Table 1b. We first occupied these laboratories in fall 1995 when we moved into the newly constructed Nitschke Hall.

Table 1a: CE Laboratory Facilities and Condition

Room	Bldg	Name	Safety	Housekeeping	Condition	Adeq. For Instr.	Director	Area
1024	Nitschke	Banyas Soil Mechanics Laboratory	good	very good	exc	very good	A. Heydinger	1200
1095	Nitschke	Environmental Laboratory	good	very good	exc	good	C. Gruden	750
1033A	Nitschke	Chemical Storage	good	very good	exc			300
1052	Nitschke	FPS Design Laboratory	good	very good	exc	excellent	J. D. Gupta	1413
1073	Nitschke	Bituminous Materials Laboratory	good	good	exc	very good	E. Chou	1000
1074	Nitschke	Construction Materials Laboratory	good	good	exc	very good	M. Pickett	3000
1074A	Nitschke	Measurements Lab Equipment	good	very good	exc	excellent	D. Nims	180
1098	Nitschke	Engineering Mechanics Laboratory	good	very good	exc	very good	D. Nims	753

Table 1b: Key Equipment in CE Laboratories

Name	Equipment
Engineering Mechanics Laboratories (Rooms NI 1098 and NI 1053)	(NI 1098) - Torsion test machine, 120,000 lb. capacity hydraulics driven universal test machine, 60,000 lb. hydraulics driven universal test machine, 10,000 lb screw driven tension test machine, 2 test tables with loading frames and load cells. (NI1053) - Sinusoidal shake table, 5 PC based DAS, PC controlled 25 pound capacity earthquake simulator, 3 test tables with loading frames and load cells
Environmental Laboratory	Burets, jar testers, dissolved oxygen meters, nephelometers, spectrophotometers, top loading balances, muffle furnaces, drying ovens, flume, pH meters, and glassware
Construction Materials Laboratory	400,000 lb. compression machine, rectangular sieve shaker, circular sieve shaker, concrete curing chamber, Los Angeles abrasion testing machine, 2 table top mixer machines, concrete mixer
Bituminous Materials Laboratory	Large and a small oven, electronic balance for specific gravity determination, controlled-temperature chamber (freezer), two sieve shakers, complete set of equipment for Marshall mix design, SuperPave Gyratory compactor, asphalt ductility tester, asphalt viscosity tester, asphalt penetrometer, and ring-and-ball temperature measuring device, small centrifuge for extracting asphalt, mineral spirit parts washer, and various sieves, containers, utensils, and gloves, etc.
Banyas Soil Mechanics Laboratory	Permeability apparatuses, permeability panels, water deairator, triaxial/unconfined compression machines, triaxial cells, consolidometers, sieve shakers, Proctor compression machine, direct shear machine, electronic balances, drying ovens, (2) Bishop consolidometers.
Measurements Laboratory	(1) Trimble GPS System, (4) Sokkia Set 6F Total Stations, (4) Sokkia Data Collectors, (4) Sokkia B21 Automatic Level, Dell computer, metal tripods, GPS System, wood level rods, measuring rods, anemometer, Trimble survey software, Stereoscope viewer, Leitz levels, (6) 100’ measuring tapes, rain coat, magnifiers
FPS Design Laboratory	Six Dell Precision 220 P3 computer with monitors, Two HP Design Jet 450C plotter, Luxeon projector equipped with input from computer for power point presentation with screen, One Laser 4Si HP printer

CE laboratories are well developed for undergraduate teaching. We are constantly spending funds on developing and improving the undergraduate CE laboratories. The College of Engineering, the OBOR biennial equipment allocation, private donations, and faculty grants provided most of these funds. The department operating budget, overhead funds, and private donations in our foundation progress fund are used to maintain and service the equipment used in our teaching laboratories. We share with the Department of Chemical Engineering a full-time laboratory machinist who maintains a 760 square feet CE machine shop adjacent to the laboratories to prepare test specimens, maintain and repair equipment, and fabricate customized devices conceived by the faculty and students.

Most of the equipment in these laboratories is functional and spans the range of equipment expected in an undergraduate CE facility. The equipment that is not functional is either being repaired or will be replaced in the future. The equipment is calibrated on an as-needed basis. Additional laboratory facilities are available in the department for research purposes.

The Table 1b provides examples of the modern engineering tools that our students learn to use in the CE program. A faculty review of the equipment in March 2005 did not indicate any major weaknesses in undergraduate laboratory experience.

Maintenance Plan for the CE undergraduate laboratories

At present we are taking the following steps:

Step 1: The Chair meets with the lab technician from time to time during each semester and discusses about any calibration needed for any equipment for undergraduate labs.
Step 2: All the calibration work is ordered, as needed by the lab technician.
Step 3: The Chair discusses with the lab technician about general lab supplies, broken equipments to be fixed, and any other special needs on a regular basis. The lab technician orders any reasonable work completed in the next several days.
Step 4: The Chair sends regular e-mails to faculty for any maintenance work needed for the labs.
Step 5: Any request received is either completed in the same year or waits for the availability of funds.

All emergency and day-to-day requests have been fulfilled with the operating budget, overhead account, student laboratory fee, and special allocation from the Dean's office and the university. Some times OBOR funds are available for this activity.

Maintenance, Upgrade, and Replacement of Laboratory Equipment

Support of laboratory equipment and computer software is achieved using several sources of funding: the CE base budget, special institutional appropriations, a biennial appropriation of funds by OBOR for support of instructional facilities, and a student laboratory fee assessed each semester to each student enrolled in the College of Engineering which is used exclusively to support ECC labs.

Equipment maintenance and software support contracts are funded from the departmental base budget for supplies and equipment maintenance and the overhead account, as required. The minimal laboratory allocation is used to fund small items such as minor equipment repair and calibration. Departments receive major funding for upgrade and replacement of laboratory equipment from the biennial allocation of OBOR. Allocation of OBOR funds is a two-step process: departments prepare proposals for development, upgrade, and replacement that are reviewed and priorities set at the college level. Then these requests are consolidated and submitted for consideration at the university level through consultation with faculty and board of trustee committees.

After funding levels are established, the dean, in consultation with the department chairs, adjusts departmental allocations within constraints of actual funding and in accord with approved departmental priorities.

A change initiated by the current college and department administration has been to focus on periodic complete upgrades of a few laboratories rather than distributing a collection of items across a large number of departmental laboratories. This philosophy is also applied to resources from targeted fundraising.

The CE faculty members were asked to submit a laboratory upgrade plan for the last three rounds of OBOR funding. The department chair discussed the submitted requests with faculty and prioritized them for funding. The college OBOR allocation was over a million dollars in the 1999-2006 periods, with the department of CE being allocated approximately $156,000. As a result, the department was able to purchase Flume, Universal Testing Machine, and a shake table for our environmental engineering and engineering mechanics/stress analysis laboratories. We also received start-up funds from the university to upgrade the environmental engineering laboratory in fiscal year 2002.

College computing purchases the site license for the software needed by CE students. This program is a good way to provide new technology to our students. Many faculty members also purchase site licenses for the use of specific software in their laboratories so that undergraduate students working with faculty members can use these facilities.

Indirect research funds were used to purchase a site license for software from Geo-Slope International ($11,811) by sharing the cost with the College of Engineering.

In the beginning of the fall semester in 2006, the CE department upgraded all six computers in the design laboratory to P4 level. Future computer upgrades to higher speed and additional storage are needed.

Faculty members have been encouraged to submit requests to external agencies for additional sources of funding. Faculty responsible for the teaching laboratories will continue to submit proposals to foundations and agencies that support teaching laboratories.

Some equipment needs were identified, but unfunded during the OBOR allocation. Aggressive private fundraising resulted in an additional $15,000 to fund significant equipment purchases for the Banyas Soil Mechanics Laboratory.

The chair developed the laboratory upgrade plan for 2005-2008 in consultation with the faculty. Each undergraduate laboratory director as well as faculty member was contacted several times during spring 2005 to submit his or her plan to the chair. As a result we received approximately $ 50,000 to purchase new surveying equipment, printers for design laboratory, and equipment for environmental laboratory in 2006.

Contingency plan for the CE undergraduate laboratories

The CE Department has the following informal plan in place:

Step 1: The lab technician informs the CE chair that he/she is on vacation/sick.
Step 2: The Chair informs the faculty about the lab technician situation and requests the faculty to inform him/Undergraduate Program Director for any work that needs attention.
Step 3: The Chair works with the Undergraduate Program Director to make necessary arrangements.
Step 4: CE secretary orders all the supplies needed for the laboratories.
Step 5: If a problem requiring immediate attention arises, the Chair and/or Undergraduate Program Director request(s) Department of Mechanical Engineering, Department of Electrical Engineering or College Computing to provide any necessary help.
Step 6: Any raw materials that were prepared by the lab technician which are consumed are reordered from the suppliers.
Step 7: Commercial specimens are purchased right away rather than waiting for the lab technician to return.

In addition to the above steps, supplies for all the lab work are ordered in advance. For example, the lab supplies for fall 2006 were ordered in summer. The order is placed as faculty informs the chair or the lab technician. Common use supplies such as batteries, screws, specimen, and concrete are ordered in bulk and kept on hand.