

Engineering Student Technology Committee

<http://www.engr.colostate.edu/ESTC>

**College of Engineering
Colorado State University**

1. Title of Proposal:

High Performance Liquid Chromatography: An Essential Tool for Undergraduate Students in CBE

2. Proposal Participants:

Brad Reisfeld
Christie Peebles
Tracy Perkins

Primary Contact for Proposal

Name: Brad Reisfeld

E-Mail: brad.reisfeld@colostate.edu

Department/Major: Chemical and Biological Engineering

Circle One: Faculty

Additional proposal participants

3. Proposal Abstract (limit to 100 words):

Liquid Chromatography is an essential technique used to separate and detect compounds in a complex mixture. It is widely used in industry and in academia for a wide variety of applications. It is increasingly important that students in CBE become familiar with this technique so that they have the skills necessary to be competitive in the job market. We are requesting support from the ESTC to purchase an HPLC machine to support an estimated 150-200 students per year in the CBE undergraduate program.

4. Proposal Budget

List of items to be purchased and cost

Items:	<i>dollar amount</i>
Shimadzu Prominence HPLC	\$39,478.50

This HPLC consists of a controller, a binary pump, a degasser, an autosampler, a column oven, and Labsolutions software.

Please see the attached quotation

TOTAL: \$39,478.50

Dollar or percentage amount requested from ESTC: 100%

5. Full description of proposal:

The Department of Chemical and Biological Engineering (CBE) is requesting help to purchase a High Performance Liquid Chromatography (HPLC) machine to be used in the undergraduate teaching labs. Liquid Chromatography is an essential tool used to separate and detect compounds in a complex mixture. This technology is widely utilized in industry and in academia for a wide variety of application. Thus, knowledge of HPLC is increasingly critical for students wishing to pursue a variety of careers in Chemical and Biological Engineering.

This HPLC will be utilized by all undergraduate students in CBE during several different undergraduate labs. Our freshman students taking CBE 101/102 will first be exposed to the basic principles of liquid chromatography during class and then can be shown in real time how compounds are separated on a column and detected utilizing the HPLC. Our senior students will utilize the HPLC in their unit operations laboratory (CBE 443) to track substrate utilization and product formation during a bioreactor experiment growing *E. coli*. The HPLC will allow students to quantify how much sugar the cells have consumed and how much product such as ethanol the cells have produced. Students in Senior Design (CBE 452) and independent study (CBE 495) will have access to the HPLC for their individual project needs to quantify and detect compounds of interest. We anticipate that between 150 and 200 students per year will make use of the instrument as part of their required coursework and independent-study courses.

We are requesting \$39,478.50 to purchase a Shimadzu Prominence HPLC. This HPLC consists of a controller, a binary pump, a degasser, an autosampler, a column oven, and Labsolutions software. The necessary detector (refractive index) has already been purchased by the CBE department and is temporarily used on an HPLC within Dr. Peebles lab. This detector will be moved to the undergraduate teaching labs when the above HPLC components are purchased. For educational purposes it will be ideal to have a separate HPLC system located in the CBE undergraduate teaching labs so that the undergraduates can gain hands on experience in running the HPLC.

QUOTE DESCRIPTION:

LC System Budgetary Quotation

Christie Peebles, Ph.D.
 Colorado State University
 1370 Campus Delivery
 Fort Collins, CO 80523
Phone: (970) 491-6770
Fax: (970) 491-7369
E-mail: christie.peebles@colostate.edu

Effective Date	2/21/2012	Proposed Ship Date	30 Days/ARO
Expiration Date	3/22/2012	FOB	COLUMBIA
Ship Method	BEST WAY	Shipping Terms	PREPAID & ADD
Inco Terms			

PLEASE SEE ATTACHED TERMS AND CONDITIONS

For questions or modifications about this quote, please contact your sales representative. If you are a tax exempt customer, please contact Customer Service and send a copy of your exemption certificate in with your order. The exemption certificate can also be faxed to 410-381-1222

Salesperson: Herb Potthoff MWR Regional Office
Phone: Ext. 8052 Reeder Street
E-mail: hbpotthoff@shimadzu.com Lenexa, KS 66214-1554

ADDITIONAL INFORMATION:

THANK YOU FOR YOUR INTEREST IN SHIMADZU SCIENTIFIC INSTRUMENTS

Authorization Signature

ESTIMATE ONLY

Date: 3/7/2012

For Order Placement:

Reference Quotation Number on Purchase Order
 Shimadzu Scientific Instruments
 7102 Riverwood Drive
 Columbia MD 21046
 Toll Free: 800-477-1227
 Phone: 410-381-1227
 Fax: 410-381-6781
 E-mail: customer.service@shimadzu.com
 Int'l Fax: 410-309-6130
 Int'l Email: icsc@shimadzu.com

Line #	Product Number	Product Name	Qty	List Price	Ext'd Price
Primary					
1	220-91398-20	CBM-20A W/ Network Switch	1	\$3,000.00	\$3,000.00
Central communication and control module for the Prominence Series. System components connect via fiber optic cables for easy "plug and play" configuration. Internal web server offers convenient control and monitoring of the HPLC system through a web browser.					
2	228-45002-32	LC-20AB HPLC PUMP	1	\$11,900.00	\$11,900.00
Binary High Pressure pump that utilizes micro-volume plungers for pulse-free HPLC gradient formation and solvent delivery. The LC-20AB is ideal for binary gradients of 1-2 mL/min. It provides the performance of dual LC-20AD pumps in a space saving platform.					
Flow Rates from 0.0001 to 10 mL/min; 3 nL/step resolution; 10 µL sapphire pistons; CBM-20A Lite can be installed; Graphite/Teflon® seals.					
3	228-35830-93	High pressure mixer, 100 µL	1	\$1,000.00	\$1,000.00
Stainless steel mixing chamber (ternary inlet) for use in semi-micro to standard analytical applications. Required when using XR pumps up to 9500 psi. Performance is excellent at flow rates from 250 µL to 5 mL/minute with common HPLC solvents.					
4	228-45018-43	DGU-20A3R	1	\$2,400.00	\$2,400.00
5	220-91397-02	SIL-20AC UFLC AUTOSAMPLER W/ INSTALLATION KIT	1	\$15,900.00	\$15,900.00
High speed, temperature controlled (4-40C), low carryover autosampler for analytical HPLC. Accommodates several vial sizes and titer plate formats for fast (10 sec.), accurate, and precise HPLC sample injection. The needle in the flow path design coupled with patented material technology virtually eliminates carryover.					
Sample Capacities: 175 1 mL; 70 2 mL; 50 4 mL, 2 MTP (STD 96, DW 96, or STD 384); Control Rack accommodates 10 2 mL vials; 0.1 to 100 µL inj vol; 6 nL/step metering pump motor resolution; 2nd Peltier unit for dehumidifying sample compartment. Includes 1.5 mL vial rack (no substitutions), 100 1.5 mL vials, Prominence vial sample pack, and 4.6 x 50 mm C18 column and 4-component test mix.					
6	228-45009-32	CTO-20A	1	\$3,100.00	\$3,100.00
Full-sized oven with forced air temperature control from 10 C above ambient temperature to 85 C. Can accommodate a manual injector, mixer, and 2 switching valves.					
Linear temperature programming is possible; Optional Column Management Device (228-37281-91) with CMD Cable (228-39991-01) can be used.					
7	223-07723-99	Labsolutions Workstation Ver.5 Single-LC PDA (WITH PDA)	1	\$6,565.00	\$6,565.00
8	I&F	INSTALLATION AND CUSTOMER FAMILIARIZATION	1	\$0.00	\$0.00
9	1YW	1 YEAR WARRANTY	1	\$0.00	\$0.00

NOTE: Taxes are not included in the quoted amount

Total List Price	\$43,865.00
Academic discount	\$4,386.50
Subtotal	\$39,478.50
Total Amount	\$39,478.50

Quote Options

Line #	Product Number	Product Name	Qty	List Price	Ext'd Price
Primary - Options					
10	228-45095-32	RID-10A,120V, REFRACTIVE INDEX DETECT	1	\$10,200.00	\$10,200.00
Refractive index detector suitable for analytical to prep analysis. Optional flow selection blocks are available for high sensitivity, prep, and large scale prep applications.					
11	220-91403-01	SPD-M20A W/ NETWORK SWITCH	1	\$14,700.00	\$14,700.00
Variable slit width photodiode array detector with D2 and W lamps for a wavelength range of 190-800 nm. The standard temperature controlled flow cell coupled with new noise reduction and optical processing technologies result in extremely low noise and a greatly extended linear range.					
Includes standard temperature controlled flow cell (9 - 50C Settable - Minimum is Ambient+5C); 1 cm path length; 10 µL volume; linear to 2.0 AU; D2 and W lamps can be lit simultaneously; 1.2 & 8 nm slit widths; slit switching possible. Includes 4 port 10/100 Ethernet switch.					
12	220-97318-10	STANDARD WORKSTATION PC (DELL T3500-W3503)	1	\$2,100.00	\$1,890.00
STANDARD WORKSTATION PC (DELL T3500-W3503) Shimadzu Standard Workstation Mini tower PC with Intel® Core 2 Duo™ processor (2.40GHz/13337MHz/4MB L2 cache).					
13	220-97320-10	DELL P2210, 22INCH PROFESSIONAL WIDESCREEN, FLAT PANEL	1	\$350.00	\$315.00
22" LCD display, resolution to 1680 x 1050, contrast ratio (typical): 1000:1. Brightness (typical): 300 cd/m2, 0.282 mm pixel pitch.					
Limited warranty: Three years Advanced Portable Exchange through Dell.					
14	228-45019-43	DGU-20A5R	1	\$2,900.00	\$2,610.00
15	223-07702-92	LabSolutions LC Workstation Ver.5 Multi LC-PDA (WITH PDA)	1	\$7,599.00	\$6,839.10