

The following is a revised Sierra Hall equipment request. The full request is reduced to \$74,397 from the original amount of \$107,099.

Computer Science – Computer Science completely reconfigured the design and hardware for its Networking lab to reduce costs. This change meant that the Sierra Hall project will be able to acquire the needed hardware for this lab within the project budget. This still leaves the embedded systems lab without one critical piece of equipment, a Vicon motion capture system, for the Embedded systems lab. The cost for this system is \$27,722.50 (\$30,495 after estimated tax and shipping). This is a fundamental device for UAV teaching and student research work, as well as game and graphics related projects. (Additional information is included below).

Physics – Franck-Hertz system and Universal Interface – This equipment will be used to support modern physics labs. The Physics program is adding labs and these units provide important resources for instruction and study that have not previously been available to students. In response to questions about reduced funding options the program indicated that its minimum need is for eight Universal Interface units, after that, as funding permits, their request is to alternately add one Franck-Hertz system and one Universal Interface up to the amount of the full request.

ESRM – SCUBA compressor, hose and tanks – no change to this request

Revised Sierra Hall Equipment Request

	Quantity	Unit Cost	Subtotal	Tax & Shipping	Total
Embedded Systems Lab					
		\$			
Vicon Motion Capture System	1	27,723	<u>\$ 27,723</u>	<u>\$ 2,772</u>	<u>\$ 30,495</u>
			\$ 27,723	\$ 2,772	\$ 30,495
Physics Lab					
		\$			
850 Universal Interface	12	999	\$ 11,988	\$ 1,199	\$ 13,187
		\$			
Frank-Hertz System	8	2,813	<u>\$ 22,504</u>	<u>\$ 2,250</u>	<u>\$ 24,754</u>
			\$ 34,492	\$ 3,449	\$ 37,941
SCUBA Support					
		\$			
SCUBA Compressor	1	4,123	\$ 4,123	\$ 412	\$ 4,535
		\$			
SCUBA hose & supplies	1	500	\$ 500	\$ 50	\$ 550
		\$			
SCUBA Tanks	4	199	<u>\$ 796</u>	<u>\$ 80</u>	<u>\$ 876</u>
			\$ 5,419	\$ 542	\$ 5,961
					\$ 74,397

Additional information about Vicon Motion Capture System

1) With this type of accurate and complete information one can emulate other types of sensors that provide noisy or degraded information without needing the actual sensor at all. Another benefit is that one can use this system to provide ground truth information that one can use gauge performance of other sensor systems.

2) Vicon motion capture system is used to teach students how to program and control both ground robots as well as UAVs. One nice feature is that with 'near perfect' position information the students can focus on writing and debugging the core algorithms without needing to debug the 'imperfect' sensors that may be on the robot. Then as the core algorithms are figured out, noisy sensor data can be introduced to gauge robustness of the algorithms. Here is a video from teaching high-school students how to design tracking and control algorithms for quad-rotors.

<https://www.youtube.com/watch?v=7ou07hJSN50>

3) These systems are also commonly used in CG for both video games and movies. Here is video showing how a similar system was used in the creation of the Incredible Hulk.

<https://www.youtube.com/watch?v=VYsPw7qJAN0>