

## **BME LABORATORIES**

The BME undergraduate program was developed with a virtual instrument approach from its inception in 2001<sup>1</sup>. Our BME laboratories begin in the freshman year with the virtual instrument package called BioPac. Following this laboratory, we have 8 additional BME laboratories that focused on LabView and National Instruments (NI) hardware. LabView is a virtual instrument oriented around a graphical software environment. Using LabView, biomedical engineers interface biosensors to NI hardware to acquire and analyze data, and plot results with easily created displays. These results are easily exported to reports and the web. LabView is quite flexible, and with a drag and drop programming language, difficult and challenging problems are easily solved. Visit <http://www.ni.com/labview/whatis/> for more information on LabView and NI hardware, and <http://www.biopac.com/> for more information on Biopac.

BME industry is increasingly using LabView and NI hardware in the development of new products and in research laboratories. BME Faculty are transforming their research laboratories to LabView and NI hardware because of the flexibility and ease of use. Those who have this programming and hardware experience are highly desired by BME industry and graduate programs. Students interested in internships have a significant advantage with LabView experience than those without it.

The goal for our BME students is for each to become eligible to be an NI certified expert in LabView by graduation. Our two LabView laboratories in the sophomore and junior year were developed in consultation with NI. These laboratories are essentially the first two NI 40-hour LabView workshops. Also, we have included additional material and assignments in these laboratories beyond the NI workshops. We further develop LabView expertise in 6 other BME laboratories. We encourage all of our students to take the certification because of the employment and graduate school advantages. We are the only program in the world that has incorporated LabView so completely in our BME laboratories and that provides NI LabView certification by graduation.

BME laboratories are included in the following courses:

1. Engineering Fundamentals - Physiological Measurements using BioPac
2. Biosystem Analysis - Signal Processing Laboratory
3. LabVIEW Basics for Biomedical Engineers - Beginning LabView laboratory
4. Biomechanics - Biomechanics laboratory
5. Biomedical Engineering Measurements - A biosensor measurement laboratory

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<sup>1</sup> Trumbower, R.D., and Enderle, J.D., Virtual Instruments in Undergraduate Biomedical Engineering Laboratories, *IEEE EMB Magazine*, Vol. 22, No. 4, 101-110, 2003

6. Biomaterials – Biomaterials laboratory
7. LabVIEW Intermediate for Biomedical Engineers – An intermediate level LabView laboratory.
8. Senior Design I
9. Senior Design II