

Computer-Controlled Experiments in Introductory Electric Circuits Laboratories

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GOALS

- Comprehensive learning environment for lab students
- Complement front-panel operation of real instruments with comprehensive set of computer-controlled experiments
- Foster development of hands-on skills & intuition

Front Panel Operation



WORKSTATION CONTENTS

- Agilent instruments
 - 3120 oscilloscopes
 - 33220A function generators
 - 34401A or 34405A digital multimeters
 - E3631A power supplies
- Windows Computer
 - LabVIEW version 8 or 8.2
 - Networked: data saved to server
 - Students log on using university password

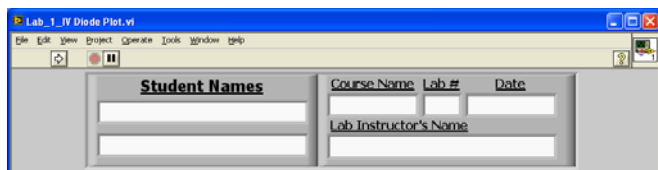
NEW LEARNING PROCESS

- 1 workstation for each team of 2 students
- Students first obtain a few data points from real bench-top instruments
- Students use Virtual Instruments (VI) to obtain remaining data points automatically

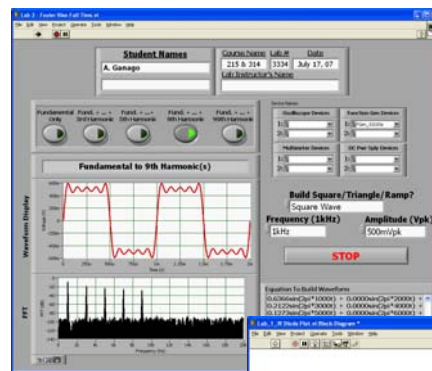
AVOIDING CHEATING

- In the lab
 - Authentication fields on each VI verify user
 - Printouts of lab data signed by lab instructor before students leave
- After the lab
 - Data uploaded on server checked for duplication
 - Due to noise, students will not have identical data

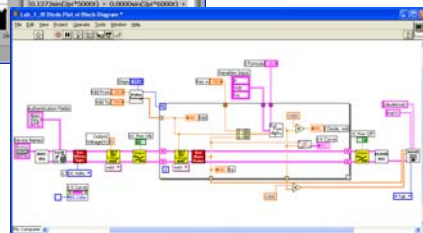
VI Authentication Fields



Example VI for Fourier Wave



Example VI block diagram for DC measurements



RESULTS & BENEFITS

- Data gathered from from 2 courses
 - 69 EE majors; 93 non-EE majors
- VI is more valuable to EE-majors who build more complicated circuits
- Helped students create neater reports (Allows for easier grading)
- Automated data collection moves focus to concepts
- Reinforces concepts by comparison of data sets
- Real time analysis verifies correctly built circuits
- General purpose VIs usable throughout curriculum
- Does NOT open loopholes for cheating