Physics Resources Supporting Innovation Teams

Randall Tagg
Physics Department, University of Colorado Denver

Introduction

A combination of resources supports student teams consisting of physics majors and non-majors. The first is a rich array of supplies and equipment spanning 52 applied-physics technologies. This is called the Innovation Hyperlab and is much more than a maker space. The second is an emerging web-based modular curriculum for on-demand learning of technical competencies needed to develop prototypes. The third is an organization of physics student innovators who will make physics-based resources accessible to a wider population of innovators

Specialized Resource Examples

Advanced measurement instruments such as lockin amplifiers & network analyzers.

Microscopes & micro-probes, such as an atomic force microscope.

Optoelectronics, including lasers, light modulators, detectors and fiber optics.

Vacuum pumps and vapor deposition systems.

Spectrometers and interferometers.

RF and microwave sources and instruments.

Fluid measurement systems such as laser doppler velocimetry.

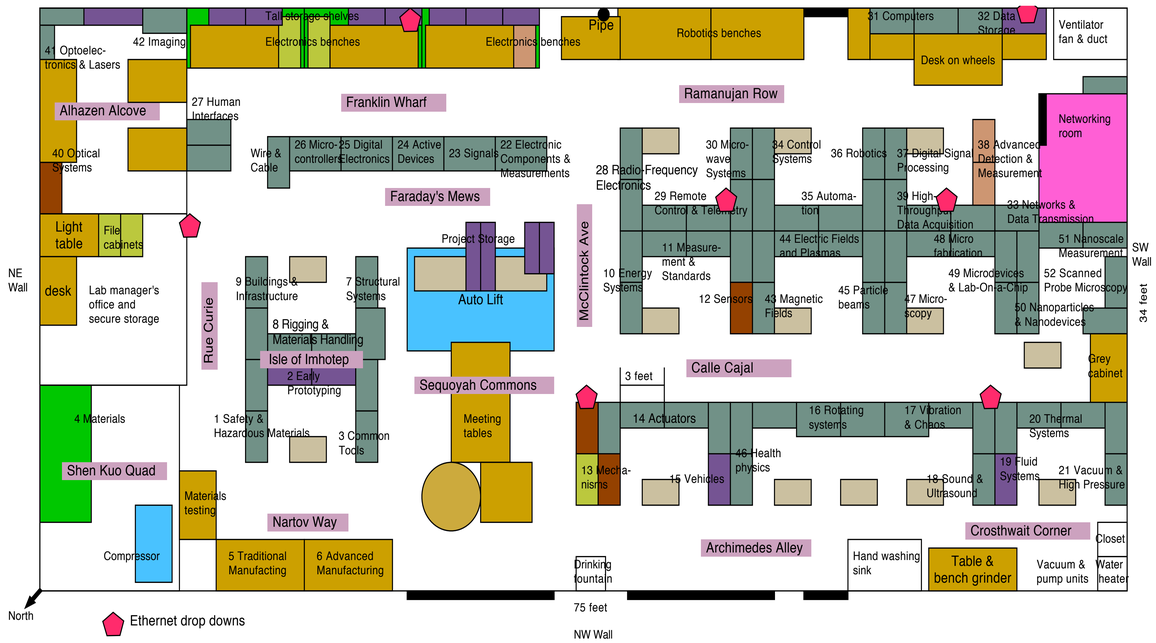
Imaging and image-processing systems

Plus capacities to alter and adapt such equipment beyond "turn-key" use.

Example: imaging particle sensor

An ongoing physics student project aims to couple a fiber-optic scintillator bundle to a CCD array and image particle tracks, first testing the system with cosmic rays and then applying to terrestrial and industrial radiation sources. --

The Innovation Hyperlab 1.0



The Technologies

https://sites.google.com/site/inventorsyeara/

Foundations
1. Safety & hazardous materials
2. Early prototyping
3. Common tools

General technical issues
4. Materials
5. Traditional manufacturing
6. Advanced manufacturing
7. Structural systems
8. Rigging & materials handling
9. Buildings & infrastructure
10. Energy systems
11. Measurement & standards
12. Sensors

Mechanics
13. Mechanisms
14. Actuators
15. Vehicles
16. Rotating systems
17. Vibration & chaos
18. Sound & ultrasound
19. Fluid systems
20. Thermal systems
21. Vacuum & high pressure

Electronics
22. Electronic components & measurement
23. Analog signals
24. Active devices
25. Digital electronics
26. Microcontrollers
27. Human interfaces
28. Radio-frequency electronics
29. Remote control & telemetry
30. Microwave systems

Computers, control & advanced instrumentation
31. Computers
32. Data storage
33. Networks & data communication
34. Control systems
35. Automation
37. Digital signal processing
38. Advanced detection & measurement
39. High-throughput data handling

Optics, fields & particles
40. Optical systems
41. Optoelectronics & lasers
42. Imaging
43. Magnetic fields &superconductors
44. Electrical fields & plasmas
45. Particle beams & detectors
46. Health physics & nuclear instrumentation

Micro- and nanotechnology
47. Microscopy & micromanipulation
48. Microfabrication & thin films
49. Microdevices & lab-on-a-chip
50. Nanoscale microscopy & measurement
52. Nanoparticles & self-assembly
52. Nanodevices

Physics Student Innovators (* and alumni) PSI*

The mission of Psi* is to bring physics students' inventiveness to fruition by means of logistic, financial, and creative support; to foster awareness in employers, investors, and the regional community of the unique and advantageous potential for innovation by physics students and graduates alike; and to encourage physics alumni to use their experience to aid current student innovators.

PSI* GOALS

Excite interest in connecting physics with innovation.

Engage physics students as innovators.

Connect with employers and community.

Foster technical competencies and achievements.

Incubate physics student ventures.

Display and disseminate.

Maintain integrity and openness.

Example: student project in dynamical systems approaches to medical assistive technology

University physics students and high school students explored dynamical systems approaches to robotic assistive devices and devices to counter-act neuromuscular tremors.