University of Hawaii At Manoa (UHM) Fabrication Laboratory

Trent Robertson, Richard Ordonez, Jeremy Chan, Dr. Aaron Ohta, Dr. David Garmire
University of Hawaii At Manoa (UHM), Dept. of Electrical Engineering
In collaboration with the Hawaii Space Flight Laboratory (HSFL) and the Space and Naval Warfare Systems Center Pacific (SSC Pacific)

Introduction

The University of Hawaii At Manoa (UHM) Fabrication Lab was founded in 2012, a joint effort with the University of Hawaii At Manoa, Hawaii Space Flight Laboratory, and Space and Naval Warfare Systems Center Pacific. The existence of this laboratory has allowed undergraduate and graduate students to take their capstone projects and inventions from idea to reality through in-house rapid prototyping.

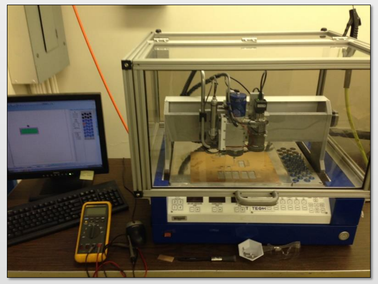


UHM Fabrication Lab Main Room

Located on the 4th floor of Holmes the UHM Fabrication Lab is open daily to conduct research. Knowledgeable students aid each other in a collaborative work environment, learning industry practices that are vital within the professional engineering fields.

Capabilities

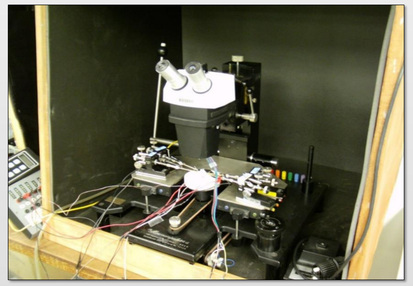
What began with a donation of a high-end Printed Circuit Board (PCB) Milling Machine from the UHM Hawaii Space Flight Laboratory, student efforts have developed the need to fulfill a fully functional engineering fabrication lab. Through various funding sources within the university and its partners, the UHM Fabrication Lab has acquired various capabilities to construct and test electronic circuits such as an ultraviolet lithography kit, electroplating system, and electronics diagnosis equipment. 3D printers are also on hand to develop robotic parts and device enclosures. The fabrication lab is still growing as students continue to improve on fabrication techniques such as for developing RF devices that demand strict design rules. For example, a multilayer press has been purchased and a very low resistance through-hole plating process is actively being developed



PCB Milling Machine for rapid PCB Prototyping



Replicator 2X 3D Printer for highly detailed fabrication



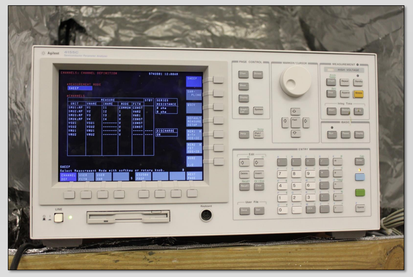
Micro-manipulator for MEMS-scale device testing



Electroplating system for copper through-hole plating



Lithography kit for solder masking and silk screening



Semiconductor Parameter Analyzer

Projects

Below is a list of projects that have been developed by students within the UHM Fabrication Laboratory.

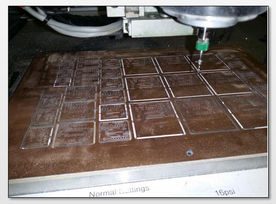
- Wireless Prototyping Microcontrollers
- Calibration unit for MRI
- 3D Printed Robotics
- Mars Rover (NASA Competition)
- Anti-Theft Devices
- Vertical Take Off And Landing Quadcopter
- Graphene RF Detectors
- Wireless Moisture Sensors
- Web Accessible Sensor Arrays
- IR Waveguide Pressure Sensors
- Autonomous Road Safety Devices
- High Accuracy Thermal Regulators
- Interactive Lighting Systems
- GPS Skateboard Speedometer
- Adaptive Optics
- Health Monitoring Systems
- Solar Monitoring Systems
- Solar Panel Cleaning Robots

Rapid Prototyping Process



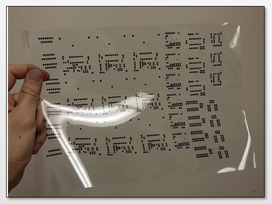
Preparation:

A bare copper board is prepared and placed on the machine.



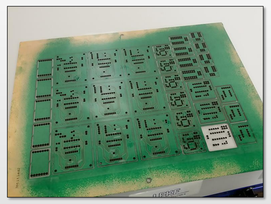
Milling:

PCB isolation traces and drill holes are milled into the board.



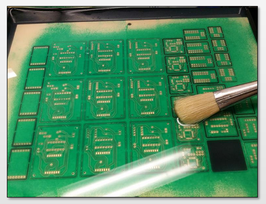
Solder Mask:

A mask is generated for the photoresist solder mask using a transparency and laser printer.



Photoresist:

A photoresist lacquer is applied. Mask is placed on the PCB, followed by UV exposure.



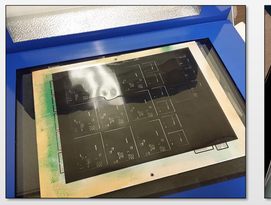
Developer:

PCB submerged in a chemical developer , removing lacquer from the areas that were not exposed.



Silkscreen:

PCB coated in negative photoresist lacquer to create printable text and graphics.



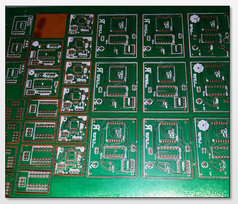
Silkscreen:

Negative mask applied, followed by UV exposure.



Developer II:

PCB Submerged in chemical developer, that removes majority of the silkscreen layer.



Final Product:

Professional PCB with Solder Mask and Silk Screen, with a same-day turnaround