<u>SDSU MEMS Lab Training and Certification</u>

Pre-clearance:

- Perform proper gowning procedure
- Utilize log sheet
- Prepare cleanroom for experiment at hand
    - ensure enough acetone, isopropyl alcohol, DI water, developer is present
    - prepare proper aliquots of photopolymer
    - cut silicon wafer into proper size for experiment
- Clean up after experimentation has been completed
    - Remove residues from hotplate
    - Clean spin coater and replace foil if visibly contaminated
- Log out and note any comments and concerns. Examples:
    - low on photopolymer
    - low on other chemicals
    - lack of clean environment**
- Perform proper degowning

Clearance Level I:

- Continued demonstration of all *Pre-clearance* techniques
- Demonstrate knowledge of basic photolithography without assistance
    - Cut silicon wafer using diamond tipped cutter
    - Properly clean the substrate using correct order of chemicals and events
    - Add correct amount of photoresist and use spin coater to get specified feature thickness.
    - Understand baking times and temperatures, and perform proper soft bake.
    - Understand UV exposure times and intensities, and properly expose pattern.
    - Perform proper post bake
    - Perform proper development
- Utilize Hirox microscope to characterize features.

Clearance Level II:

- Continued demonstration of all *Clearance Level I* techniques
- Receive certification from EM Facility (Barlow Lab) to utilize metal deposition
- Demonstrate successful metal lift-off in both positive and negative lithography.
    - Understand at what stage metal deposition takes place.
    - Understand why metal deposition may be necessary
    - Be able to deposit metal and remove unwanted photoresist from sample.
- Understand and be able to perform soft lithography
    - Perform proper mixing of PDMS with curing agent, and be able to explain ratios used.
    - Use vacuum desiccator to evacuate all air bubbles from sample
    - Be able to properly remove PDMS sample from master mold

    - Demonstrate proper usage of plasma etcher to bond PDMS to glass

Clearance Level III:
- Continued demonstration of all *Clearance Level II* techniques
- Utilize Coventorware or similar layout editing software to create mask for use in lithography
    - create multiple cells
    - reference cells into design
    - array reference design into mask
- Be able to perform CF4 etch using plasma etcher
- Be able to perform proper KOH etch.

Clearance Level IV:
- Continued demonstration of all *Clearance Level III* techniques
- Receive certification from EM Facility to utilize Scanning Electron Microscope
    - Demonstrate proper mounting, metal coating, loading, and characterization of samples
    - Demonstrate EDX analysis of sample