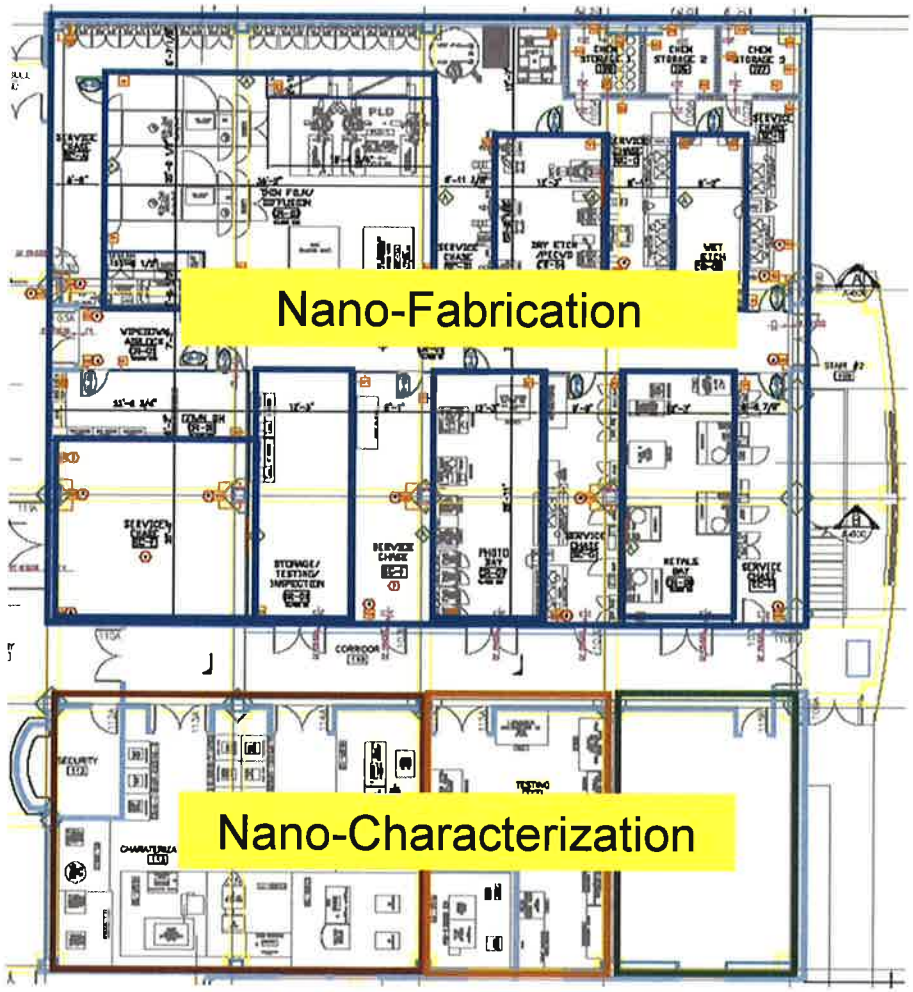
# NSU NanoFab (Cleanroom) Capabilities

Fall 2018

# NSU Nanofabrication Cleanroom (NSU NanoFab)

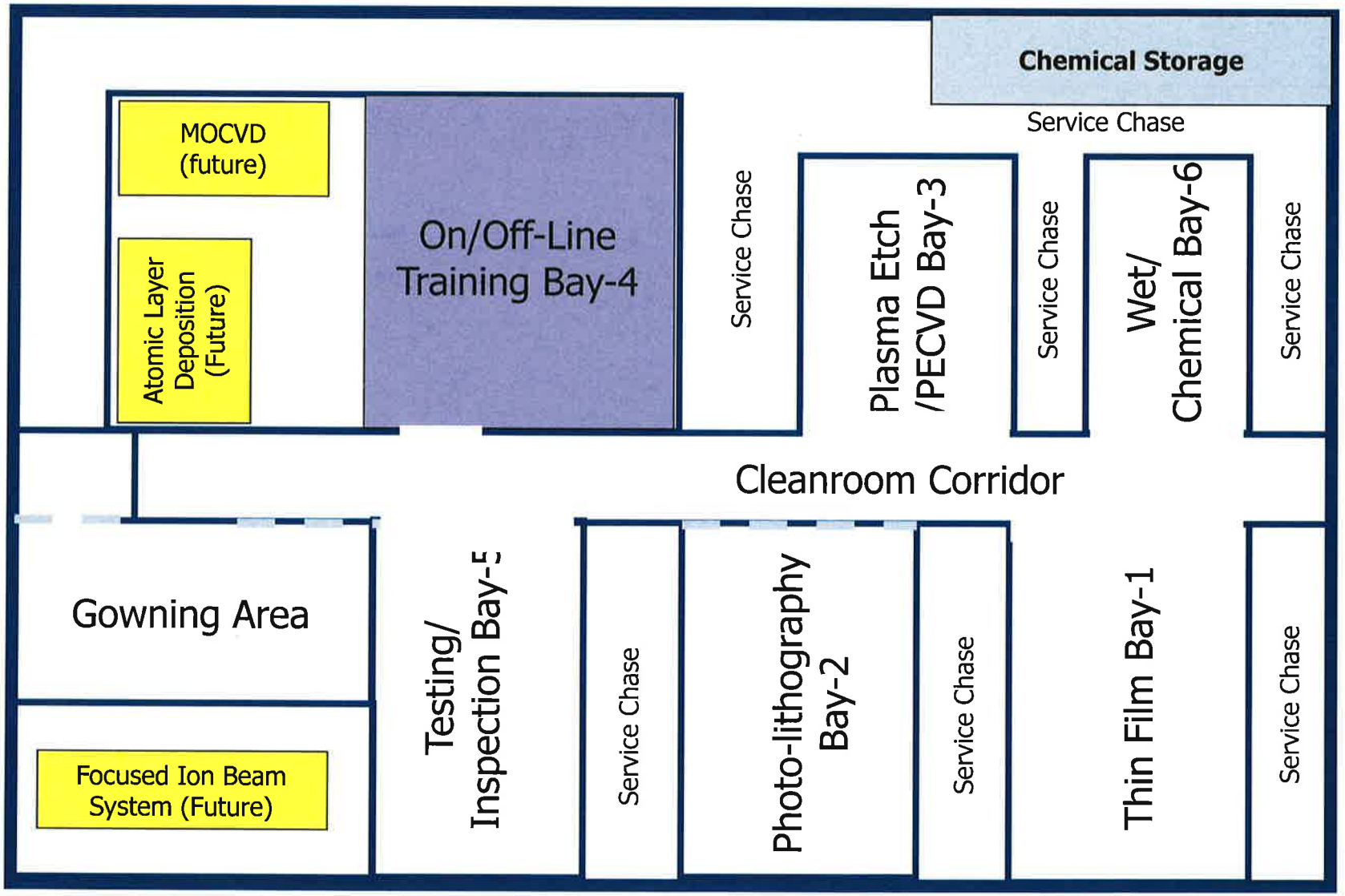
- **Facilities**
  - Class 100/1000 (ISO Class 5/6) Cleanroom with full microfabrication tools for Nano/micro-electronics, MEMS and bio-medical devices fabrication. It contains 6" wafer handling capability from standard nanofabrication processing to packaging and characterization
- **Research Works and Education**
  - Energy Conversion Devices
    - Solar cells
    - Optical Rectenna
  - Biomedical Devices
    - Neural probes for brain signal recordings and stimulation
    - Nanoprobes for functional brain imaging
    - Lab on a chip for biomedical application
  - RF and wireless communications (DOT and NASA)
    - Wireless sensor integration with remote power source
    - Integration of sensing platform with CMOS IC on silicon
    - Microelectronic device integration on flexible polymer substrates
  - MEMS-based sensors and smart hybrid sensors
  - Micro fluidic devices for Micro Total Analysis Systems" (μTAS)
  - Surface Plasmonics

# NSU Cleanroom Layout for Fabrication and Characterization




- 10,000 square foot facility including Class-100/1000 cleanroom and characterization space.
- Cleanroom is programmed for state of the art photolithography, metals and thin film deposition, wet and dry etch and capability of nano characterization.
- 20 Students can be trained at the same time in the Cleanroom.

# NSU Cleanroom for Fabrication



# Bay-1 for Metal Deposition and Thermal Process

- Metal and dielectric thin film deposition for the fabrication of microelectronic devices and MEMS devices
- Various metallic and metallic thin film can be processed in various thermal annealing conditions from few seconds to few tens of hours at above 1000°C.
- Thermal oxidation process can also be done.


**RF Sputtering System: thin film deposition (mainly for dielectric)**

**DC Sputtering System: thin film deposition (mainly for metallic)**

**Thermal evaporator for metallic materials with low melting temp.**

**E-beam evaporator for metallic materials with high melting temp.**

**Tube furnaces for annealing and oxidation**

**Rapid annealing processor for low thermal budget processes**

# Bay-2 for Lithography and Polymer Process

- Micro-level patterning for microdevice fabrication using UV lithography and various polymers
- Silicon, flexible polymer, glass substrates can be processed for MEMS, lab on a chip, flexible electronics application.

**Double side contact aligner: micro-level patterning and aligning**

**Spin Coaters for photoresist and polymer thin film coating**

**Wet benches for developing and solvent process**

**Profilometer for thickness measurement**

**Microscope for the inspection of microlevel pattern**

# Bay-3 for Plasma Etch/Deposition Process

- Plasma Enhanced Chemical Vapor Deposition for various thin film deposition.
- Inductive Coupled Plasma (ICP) etching for submicron patterning.

**ICP Etching System with $Cl_2$, $SF_6$, $CHF_3$ gases**

**PECVD system: 5% SiH4 based deposition.**

**Reactive Ion Etching System**

**Ellipsometer for thickness measurement of thin film**

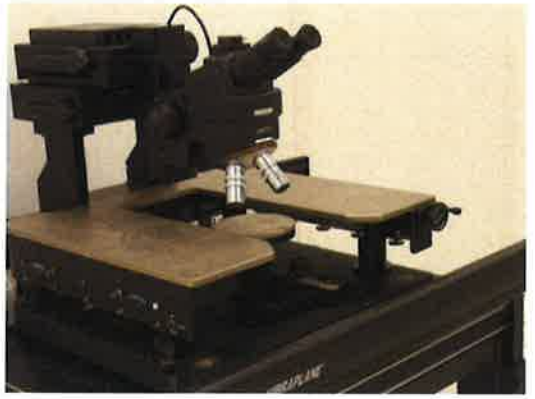
# Bay-4 for On/Off-line Training

**On-line training in the cleanroom**

On-line training in the classroom

Off-line training in the cleanroom

# Bay-5 for Characterization and Polishing Process



**Prove station for electrical characterization of microelectronic devices**

**Microscope for micron level feature inspection**