Goal – I am here to:
- discuss the lab-works before you enter and work in the lab
- help you understand the lab better
- help you get a better grade on lab
- answer questions you have for previous and subsequent labs
- answer questions you have on lab reports
- in general, help you out

In order to achieve the above more successfully and effectively, I want your feedback from time to time.

Day: Monday  
Time: 4pm – 5pm  
Place: will be confirmed later  
Email: kinyip@eecs.berkeley.edu  
O.H.: none, sent email to ask me questions, please  
Material:  
- slides, will be uploaded weekly  
- lab manual, will be best if you’ve read them before coming

Week 2:  
- brief intro to the lab  
- chip layout & process flow  
- safety, cleaning, chemical disposal rules  
- a virtual tour to the lab
Intro:
- You learn the theories in class; you practice them in lab
- You are going to make resistors, diodes, MOS-cap bipolar transistor, MOS-transistor, …
- By the end of the semester, you should have learnt basic lab techniques how to operate some of the equipments how to characterize the devices you made

Process Flow:
Week 2: Field Oxidation - 5300 A

Week 3: Active Area Photolithography
Field Oxide
Active Areas

Week 4: Gate Oxidation - 800 A
Gate Oxide

Week 5: Poly Deposition
PolySi

Week 6: Gate Photolithography
Gate

Week 6: Source and Drain Sources / Drain Regions

Process Flow (cont.):
Week 7: Source-Drain Deposition (N+)

Week 8: Contact-Hole Etch (Mask 7 - CONT)
Contact Holes

Week 9: Metallization
Aluminum

Week 10: Metal Definition
Metal Definition
Cleaning:
- only enter the clean room fully gowned
  hair net + lab coat + glove + shoe net + safety google
- do NOT touch chemicals / equipments with bare hand
- always handle wafers with tweezers and trays (unless told otherwise)
- wash hand before and after entering the lab (why??)
  before: so not to contaminate wafers or equipment
  after: avoid chemicals being indigested
- Next week, GSIs will demonstrate how to clean up masks
- 4th week, GSIs will demonstrate how to piranha-clean wafers

Safety:
- do NOT enter the lab when GSI aren’t present, under all conditions
- know all the emergency exits (ask the GSIs to show you)
- know where to find the MSDS
  under the whiteboard in characterization room
- know where to find the closet water sources, shower, eye wash
  - ask whenever not clear
- do NOT try things out without permissions
- NO eating, drinking, playing, … inside the lab

Things in the lab can be dangerous if not carefully handled. Be sure to
respect the chemicals.

Safety: Chemical Handling
- wear protective gears when handling corrosive chemicals
  - face shield, chemical apron, chemical glove
  - respirator if necessary
- check glove for holes
  - blow with N₂, then submerge in water
- check pH of unknown spillage, label everything
- corrosive chemicals: H₂SO₄, HF, aluminum etch, TMAH
- wash and rinse the exposed part with water for > 15mins
- add acids to water, not the other way around (why??)
  - potential spilling if add water to acid
- handle wet chemicals only at sinks, acid on right, others on left side

Safety: Chemical Handling
- HF: be very very careful, can be deadly
  - when you feel it, it is attacking you bone
  - will keep eating your bone, without being consumed
  - apply calcium gluconate if exposure is suspected
- use only plastic beakers for HF (why??)
- H₂SO₄ should be very painful, severely burnt when in touch
- add H₂O₂ to H₂SO₄ to prepare piranha
  - do not carry the beaker around after mixing (HOT!!)
  - use only glass beakers for piranha (why??)

Chemicals used in the lab are harmful one way or the other. Don’t
breathe and avoid exposure if possible.

Use teflon-wares when handling wafers in acids. Be careful, those
teflon tweezers do not hold the wafers very well!!
Safety: Chemical Disposal
- water-soluble chemicals should be aspirated
- organic chemicals are discarded in designated container however, in this lab, photoresist (PR) are also dumped down the drain.
- do NOT mix organic wastes with acids (why??) can cause fire or even explosion
- do NOT mix acids and bases
- when needed to aspirate acid, bases, organic solvents, aspirate a beaker of water as buffer

Lab Floor Plan:
If time allows, you can ask your GSI to show you the clean room!

Next Next Week:
- discuss what you have to in the lab
- briefly go over how to operate the spinner and mask aligner
- review how to handling and drying wafers
- review rules of handling acids