WELCOME TO eLAB!!! Mon 1/27

Emergency fone 3-2121, we are in 3 Cummington, Room 364

Fire extinguishers at door & diagonal; cut power if any smoke

1 hand in pocket with hi current or 110vac

Lab open hours: Mondays 10:10am - 6:35pm 8.5 hrs min

Goal: minimum of 8 in-lab hrs/wk available to each researcher

”All-hands” (no class conflicts) 5:40-6:35

Quick review of ”teaching moments”

Doodle tentative make-up times Tues 2-4:30, Wed 2:30-4:30

Monday holiday exceptions complicate make-up sessions

Mon Feb 17 → Tues 20 President’s Day

Mon Apr 20 → Wed Apr 22 Patriot’s/Marathon

Critical prep: skim H&H “Class” to max lab efficiency

assimilate H&H reading & “pre-Lab”

10 min quizzes based on that prep

10:10 SHARP start to 10:20 quiz; discussion at 5:30

Week 1, today

1) Syllabus questions?

Hayes & H (HH) Lab 1...record all in your personal logbook, graded

2) Intro to equipment: breadboard, VOM, DVM, function g, scope

3) Passive Rs (Ohmic) (*vs.* Cs (open low f, short hi): linear *vs* non)

4) Critical Concepts:

Thevenin equivalent circuit R&V; voltage divider

5) Confusions? many from in HH but no alternative lab manual & $85 HH text too dense, a reference book for life

6) All prep & in-lab exercises in you personal logbook…graded

7) Required: Scan your email each day for missives from me.

Any questions: call/email Larry 617 735 7636, anytime 24/7

Next class: capacitors & a/c voltage dividers
(= hi & lo pass filters = integrators/differentiators=RC)
& diodes: HH p32-81, Labs 2&3

Intro to Tools & Test Equipment at your workstation:

PS – ideal, Thevenin equivalent R inside ~0 Ω impedance

VOM - electromagnet, *f*(current), beware fused for too hi i! 20 kΩ/v
always start FIRST with highest scale, 500mA = ½ A

DVM – field-effect transistor front end, *f*(voltage) ~10 MΩ
a similar meter measures C (& L)

Signal/waveform/function generator – an ac PS, but low power!

Scope – an ac/dc DVM, *f*(voltage) MΩ, x10 w/probe; compensate
speak up, who wants a tutorial?

"Breadboard" prototype circuits; beware: verify all functions, a blackbox!

DO NOT HOT PLUG! turn on power only after full circuit assembled.

Distrust any 1 instrument/meter..double check with alternative!

Default breadboard etiquette

NO HOT PLUGGING! you'll burn out active elements inside the box

$Source_{in}$ on left, use coax…shielded from a hot bath of e-noise

V_{out} on right, with coax.

Build circuit in exact topology as HH drawn…

Color-code your rails: ground = black, + = red, *etc.*

Beware...ground rail often is "understood" on schematic diagrams

Virtual on circuit diagrams: must complete "circuit." 3 ways to draw

Leads as short as possible; use twisted pair were possible to kill pick-up.

Wire most complex nodes first; recycle for next project.

Start in a different place if a complex new circuit.

We prefer external PS; check all Vs before hot plugging.

Use VOM or DVM to check all PS voltages, & leave meters connected.

Beware: +15v and -15v are VARIABLE; "wipe" each time before use.

No alligators...too bulky, too easy to short, grabbers better, coax best

…first thing next session (or at Make-Up), time out for tutorial…

Default scope etiquette

V_{in} to channel 1, zero at +2 vertical boxes, input on top, above output

V_{out} to channel 2, zero at -2 vertical boxes

Causality ⇒ always trigger on input

Horizontal trace starts at horizontal box 1 — to see precursors

Choose time scale to display a couple of cycles — not too many, not too few

Trigger: "normal", "rising" slope — ~ never use "line" or "auto"

DC coupling...to see DC offset — AC inserts a capacitor in the way

"Thou shall not touch trigger once its operational !!!"

"Only use Auto in desperation to find the trace."

Use a x10 probe to minimize disturbance to circuit…inserts 10x V divider

Compensate probe using a square wave;
it's Fourier transform has all frequencies.

Week 1...what's to remember?

1) Passive Rs (Ohmic)

vs. Cs (open circuit at low f, short circuit at hi): linear *vs.* non-

2) Thevenin equivalent circuit, with equivalent V & R

3) Voltage dc (resistors only) divider