

# EECS 312 Discussion 1

9/10/10

Myung Chul Kim  
([mckima@umich.edu](mailto:mckima@umich.edu))

## Overview

- Administrative details
- CAD tools and Lab assignments
- CADENCE Tool Setup Walk-through

## GSI Policies

- Discussion session
  - Friday, 12:30 – 1:30, 1303 EECS
- Office hour
  - Mon 3:30-5:00 Thu 10:30-12:00
  - EECS 2420 / EECS 2331 (CAEN Lab)
- If other help needed:
  - Send me an email ([mckima@umich.edu](mailto:mckima@umich.edu))
  - Use [eeecs312@eeecs.umich.edu](mailto:eeecs312@eeecs.umich.edu) mailing list

## Why come to discussion /office hour?

- Discussion:
  - Review some important lecture materials
  - Some (homework) problem solving
  - CAD tool walk-through
  - Discuss common questions
- Office hour:
  - Get more practical advice
  - Questions about homework/lab assignments

# CAD tools and Lab assignments

- CAD tool for circuit simulation for this course
  - SPICE in the CADENCE environment
- Use SPICE heavily in designing various blocks of logic in lab assignments as well as a design project
  - Do not copy the schematics, simulation results, or reports of other students.
- More details will be made available during the course.
  - Spend time reading tutorial and start ASAP!

# CADENCE TOOL SETUP WALK-THROUGH

## What is Technology Library?

- We imported technology library
  - NCSU\_Analog\_Parts / NCSU\_Digital\_Parts / NCSU\_TechLib\_tsmc03d
  - This is version 1.5.1 of NCSU Cadence Design Kit
  - Contains Definitions of Circuit Elements
    - Functional/behavioral description (Verilog)
    - Parameters (Hspice)
    - Schematic and/or Layout
  - Minimum feature size = 0.25um

## SPICE model parameter

```
• MODEL tsmc25dN NMOS ( LEVEL = 49
• +VERSION = 3.1 TNOM = 27 TOX = 5.8E-9
• +XJ = 1E-7 NCH = 2.3549E17 VTHO = 0.4308936
• +K1 = 0.3519429 K2 = 0.0298493 K3 = 1E-3
• +K3B = 0.0592323 WO = 1E-5 NLX = 1.465901E-7
• +DVTOW = 0 DVT1W = 0 DVT2W = 0
• +DVT0 = 0.0183405 DVT1 = 4.897584E-3 DVT2 = -0.0252658
• +U0 = 455.3033362 UA = 5.223592E-10 UB = 1.104713E-18
• +UC = 3.287888E-11 VSAT = 1.050993E5 AO = 1.2318623
• +AGS = 0.3043334 B0 = 6.67749E-8 B1 = 5E-6
• +KETA = 8.518046E-4 A1 = 0 A2 = 1
• +RDSW = 509.5675851 PRWG = 0.0227558 PRWB = -1E-3
• +WR = 1 WINT = 2.126497E-9 LINT = 4.399474E-9
• +XL = -3E-8 XW = 0 DWG = -3.409033E-9
• +DWB = 2.794842E-9 VOFF = -0.1026054 NFACTOR = 0.1344887
• +CIT = 0 CDSC = 1.527511E-3 CDSCD = 0
• +CDSCB = 0 ETAO = 3.48737E-3 ETAB = 4.557986E-4
• +DSUB = 3.045473E-3 PCLM = 1.0446257 PDIBLC1 = 0.1441952
• +PDIBLC2 = 4.513382E-4 PDIBLCB = -2.816756E-5 DROUT = 0.4698725
• +PSCBE1 = 1.761109E10 PSCBE2 = 3.772916E-9 PVAG = 0.0361824
• +DELTA = 0.01 MORMOD = 1 PRT = 0
• +UTE = -1.5 KT1 = -0.11 KT1L = 0
• +KT2 = 0.022 UA1 = 4.31E-9 UB1 = -7.61E-18
• +UC1 = -5.6E-11 AT = 3.3E4 WL = 0
• +WLN = 1 WW = 0 WVN = 1
• +WWL = 0 LL = 0 LLN = 1
• +LW = 0 LWN = 1 LWL = 0
• +CAPMOD = 2 XPART = 0.4 CGDO = 6.27E-10
• +CGSO = 6.27E-10 CGBO = 0 CJ = 1.918655E-3
• +PB = 0.9784049 MJ = 0.4721729 CJSW = 4.441595E-10
• +PBSW = 0.9419636 MJSW = 0.2871118 PVTHO = 1.342985E-3
• +PRDSW = -61.8357222 PK2 = -3.140724E-3 WKETA = 7.512693E-4
• +LKETA = -6.144062E-3 )
•
• .ENDL NMOS
```

# Basic Linux commands

- **man** command - print the specified manual page
- **mkdir** DIRECTORY- make directories
- **cd** DIRECTORY - change directories  
e.g., **cd ..** - move up to the parent directory  
**cd ~** - go to your home directory  
**cd ~/eecs312** - Once you created the symbolic link, you can go to the class directory from anywhere
- **mv** CURRENT\_FILE(DIR\_NAME) NEW\_FILE(DIR\_NAME) - change the name of a directory or a file
- **pwd** - print current working directory
- **rm -Rf** DIRECTORY - remove an existing directory including files
- **rm** FILENAME - remove an existing file
- **ls** - lists directory contents
- **cp** MYFILE YOURFILE - copy a file "MYFILE" to the file "YOURFILE" in the current working directory
- **cp -dpr** SRCDIR DESTDIR - copy all files from the directory "SRCDIR" to the directory "DESTDIR" preserving links (-p option), file attributes (-p option), and copy recursively (-r option)
- **ln** - create a symbolic link to a file.
- **cat** FILENAME - show the contents of short files to the screen
- **clear** - clear the terminal screen
- **diff** FILE1 FILE2 - compare two files, reporting all discrepancies
- **ps** - print currently running processes
- **kill** process\_ids - kill the specified processes
- **tar cvzf** filename target(directory / files) - create a tar ball
- **tar xvzf** filename - extract a tar ball
- **Wildcard characters** \*, ? can be used  
e.g., **rm ./\***                      **cp \*.src ~/eecs312**                      **tar cvzf eecs312submit.tar.gz ./\*proj.???**

# Cadence Common Hot-Keys

- **left-mouse** : select/click
- **middle-mouse over object** : bring up typical properties
- **right-mouse** : repeat last operation
- **right-mouse drag** : zoom in
- **shift + right mouse drag** : zoom out
- **c** : copy
- **f** : zoom to fit design to window
- **i** : add instance
- **l** : label wire
- **m** : move
- **p** : add pin
- **q** : edit parameters
- **r** : rotate
- **u** : undo
- **U** : redo
- **w** : add wire
- **arrow keys** : move around window
- **F3** : command options
- **E/⌘** : descend (edit mode) / ascend up one level (Multilevel design)

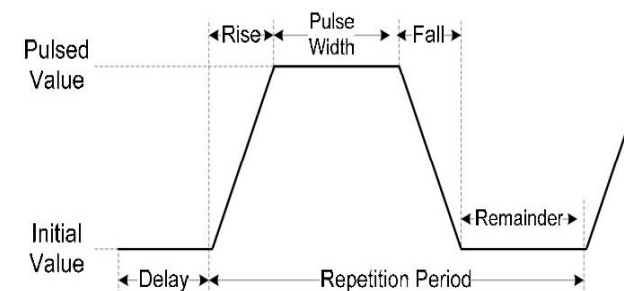
# Retrieving Marked Plot

1. SAVE GRAPH FILE (.GRF)
2. TOOLS > ANALOG ENVIRONMENT > WAVEFORM
3. FILE > OPEN > CHOOSE YOUR SAVED GRAPH FILE

This file preserves your markers

Please turn off Desktop Effects of Redhat Linux when saving as an image or printing plots

# Pulse waveform (vpulse)



## Spice Unit

Abbreviation	Exponential Form	Prefix
F	E-15	Femto
P	E-12	Pico
N	E-9	Nano
U	E-6	Micro
M	E-3	Milli
K	E+3	Kilo
MEG	E+6	Mega
G	E+9	Giga
T	E+12	Tera

## Remotely Running CADENCE Tool

- **Virtual Network Computing (VNC)**

<http://www.engin.umich.edu/caen/connect/vnc.html>

- VNC is a graphical desktop sharing system which is used to remotely access other computers
- Possibly slower