SPICE BASICS

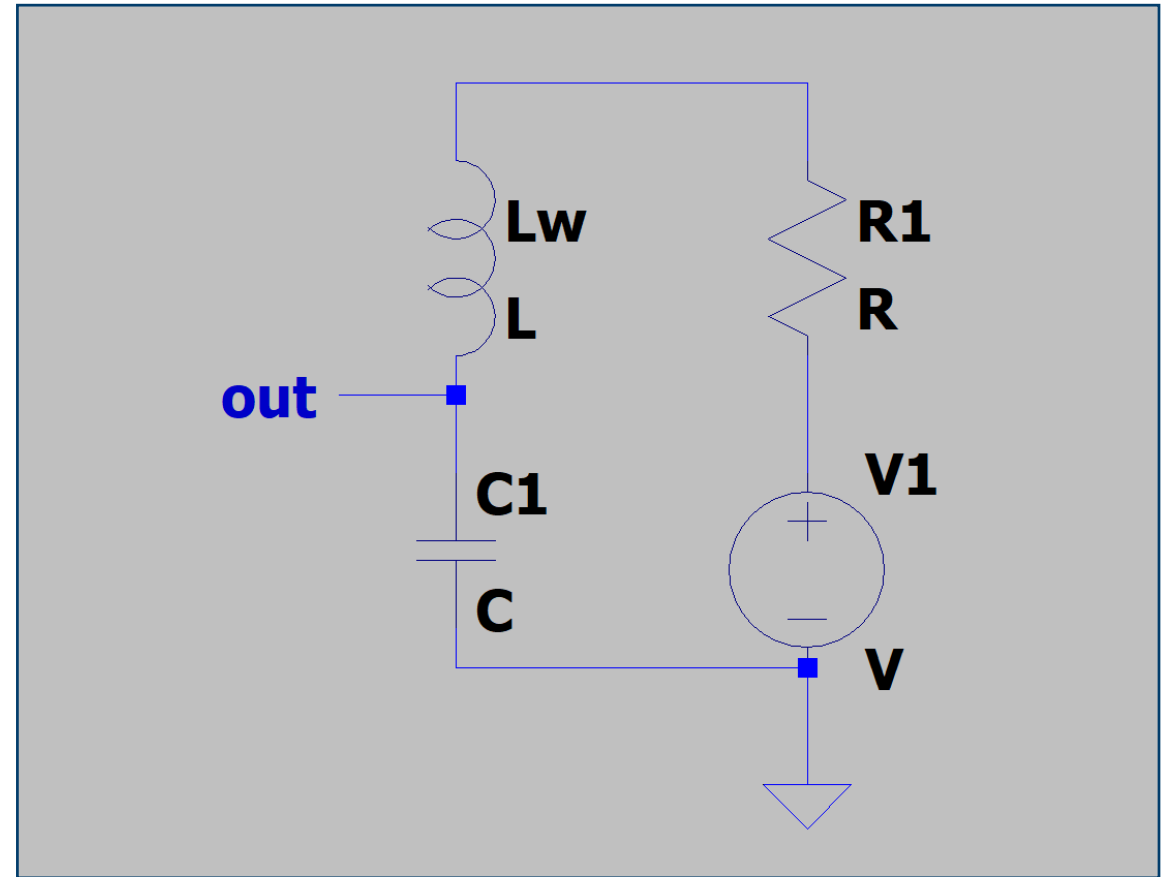**Key Component Types**

Prefix	Component	Example	Notes
R	Resistor	R1 in n2 1k	1 kΩ between node 1 & 2
C	Capacitor	C1 out 0 10u	Node 0 = ground
L	Inductor	Lw n2 out 50n	1 mH
V	Voltage src	V1 in 0 DC 5	DC or AC

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Netlist vs Schematic

```
V1 in 0 DC 5
R1 in n2 1k
Lw n2 out 50n
C1 out 0 10u
.end
```

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Noise Analysis

```
.NOISE V(<OUT_NODE>) <INPUT_SOURCE> <SWEEP_TYPE> <NPOINTS> <FSTART> <FSTOP>
```

`V(<out_node>)`   Output node for noise calculation

`<input_source>`   Reference source for input-referred noise

`<sweep_type>`   Frequency sweep style (dec, oct, lin)

`<Npoints>`   Points per decade/octave or total

`<Fstart> <Fstop>`   start and stop frequencies (**1 Hz to 1 GHz**)

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Time-domain Transient Analysis

`.TRAN <TSTEP> <TSTOP> [TSTART [DTMAX]]`

`<Tstep>`	Plotting increment
`<Tstop>`	Total simulated time
`[Tstart`	Time to start saving data
`[dTmax]]`	Maximum time step

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Frequency Response (Gain & Phase)

```
.AC <TYPE> <POINTS> <START_FREQ> <STOP_FREQ>
```

`<type>` Sweep spacing (dec, oct, lin)

`<points>` Number of frequency points per decade/octave or total (linear)

`<start_freq>` Starting frequency

`<stop_freq>` Ending frequency

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Parameter Sweep

```
.STEP PARAM <PARAM_NAME> <START> <STOP> <INCREMENT>
```

<param_name>   Name from the parameter definition

<start>   Start value of the sweep

<stop>   End value of the sweep

<increment>   Sweep increment

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SPICE CHALLENGE

- Make Teams with minimum one Github Account and minimum one IC Designer

- Install LTSpice

- Clone Repo https://github.com/padiro/co-simulation-workshop

- Import netlist into LTSPICE

- Fix errors in netlist

- Find the resistance value for R1

- Find the voltage noise power spectral density at 1kHz

- Submit solution via Pull Request on Github

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