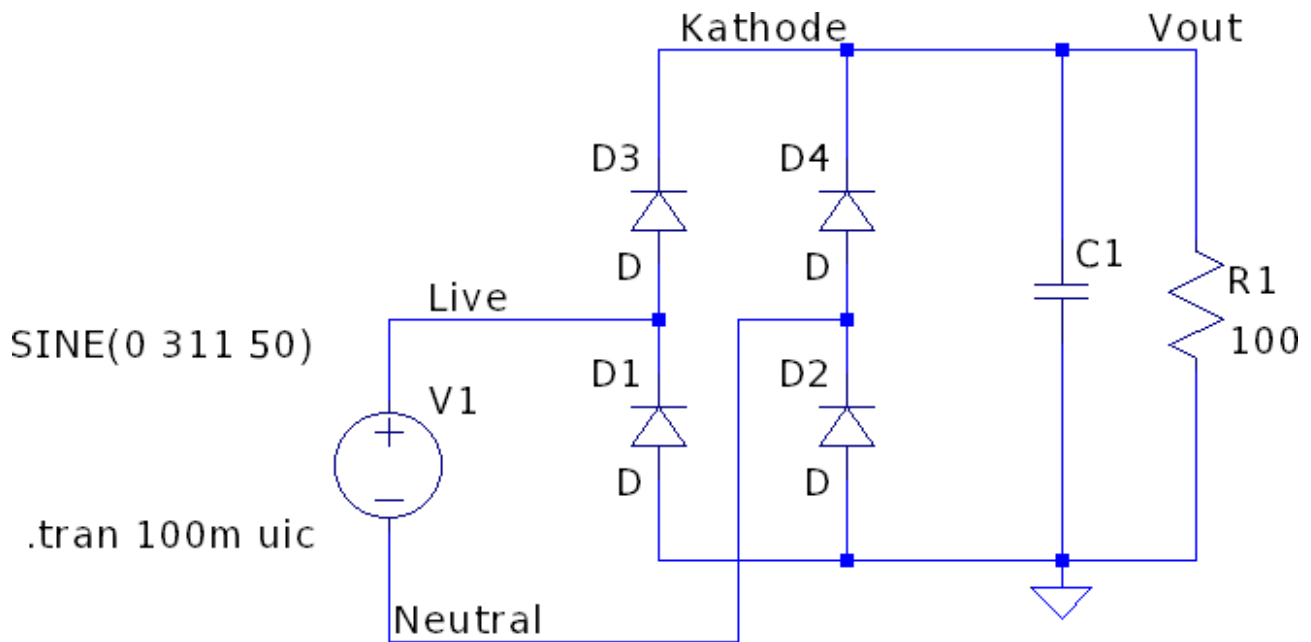


Single phase uncontrolled rectifier.



This circuit is available in UncontrolledRectifierResistiveLoad.asc

Figure 1

Figure 1 shows an uncontrolled, single phase full wave rectifier with a smoothing capacitor C_1 and a resistive load R_1 across its output.

Leaving R_1 at 100 ohms, simulate and plot V_{out} , $V(\text{Live,Neutral})$ and $I(V_1)$ (mains current) for the smoothing capacitor specified in the table below.

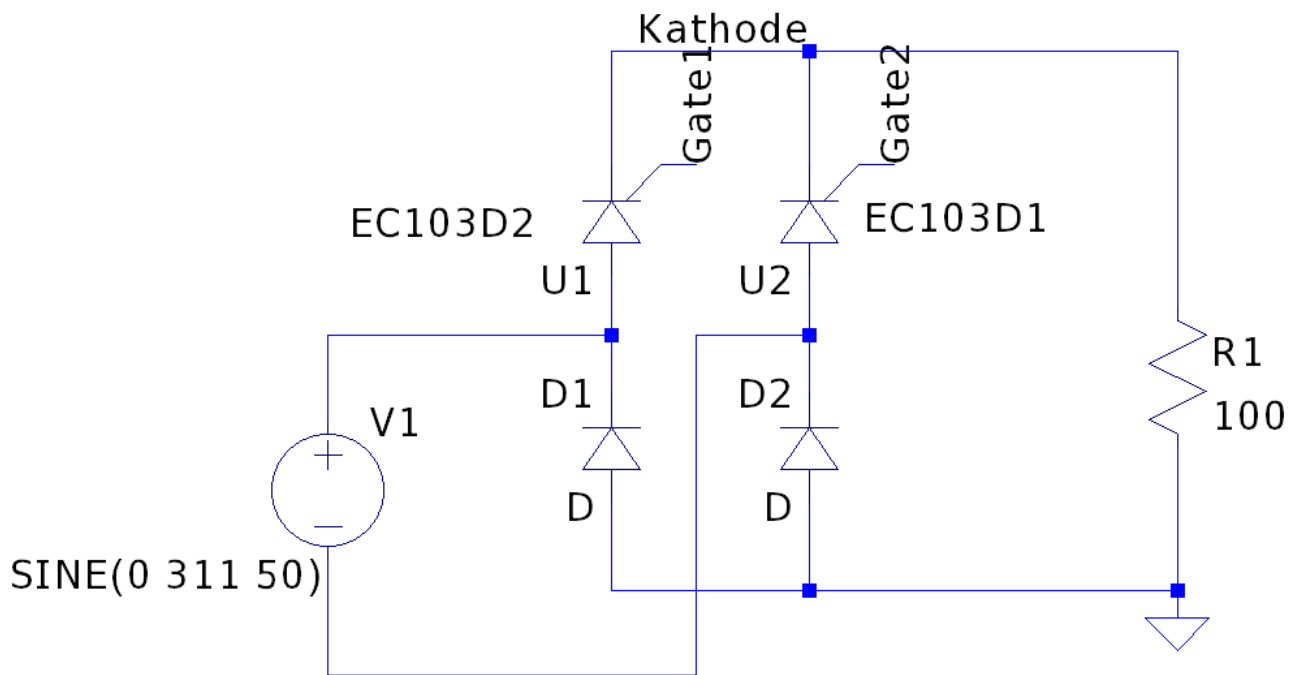
What happens to the input current when you make the smoothing capacitor:

- 1) 1/10 of this size
- 2) 10 times bigger?

Calculate a suitable sized capacitor to meet the following spec given for your individual resistor in the table below.

	C_1	R_1 (individual)	% voltage ripple (mV)
Carmen Boupda Mekamgho	10uF	50	400
Mark Digan	20uF	60	300
Sean Doorly	30uF	70	200
Erika German	40uF	80	100
Conor Goodrich	50uF	90	200
Cillian Martin	60uF	100	300
Alessio Persechini	70uF	120	200
Eoghan Ryan	80uF	130	100
Vanessa Sorecau	90uF	140	50
Talha Tallat	100uF	150	100
Arthur Trousseau	110uF	160	50

Single phase controlled rectifier.



This circuit is available in `ControlledRectifierResistiveLoad.asc`

Figure 2

Plot the output voltage for the firing delay angle assigned to you in the table below (you will need to convert this to a delay time)

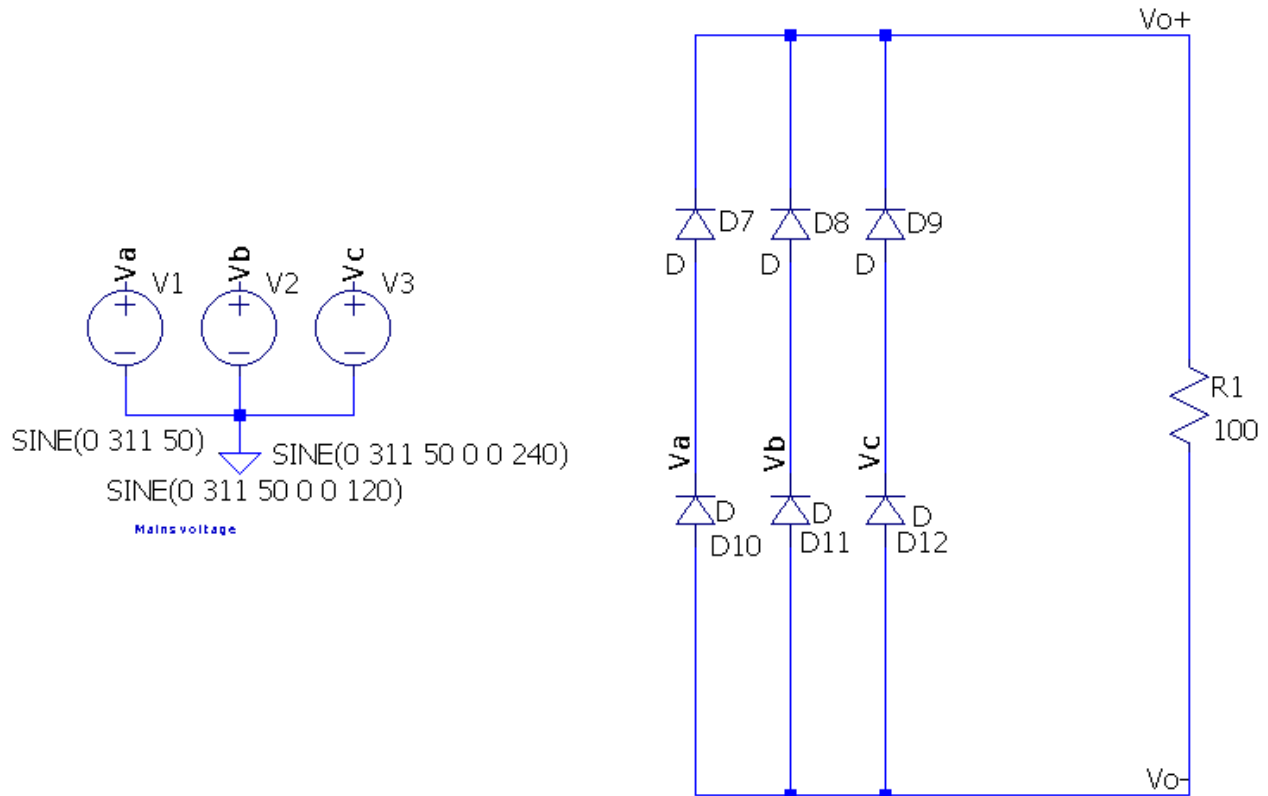
	alpha (deg)
Carmen Boupda Mekamgho	10
Mark Digan	15
Sean Doorly	20
Erika German	25
Conor Goodrich	30
Cillian Martin	35
Alessio Persechini	40
Eoghan Ryan	45
Vanesa Sorecau	50
Talha Tallat	55
Arthur Trousseau	60

Investigate the following terms in relation to Thyristors.

Holding Current

Latching Current

Three phase 6 pulse rectifier.



This circuit is available in 3PhaseRectifier.asc

Figure 3

Run the simulation above in LTSpice and plot the following on a shared time axis:

1) $V(va)$, $-IV(1)$ (zoomed to a couple of cycles)

2) On a separate plot show $V(Vo+,Vo-)$ zoomed to a couple of cycles and with the voltage axis set as follows: Top : 550V, Bottom : 0V.

How many pulses are there in the output waveform for each cycle of the input voltage?

Place a 100mH inductor in series with R1 and plot a couple of cycles of the voltage across R1.

What is the peak to peak ripple voltage?

Investigate and sketch the circuit diagram for a 12 pulse rectifier. Where are such rectifiers used?

Rectifiers can be half controlled or fully controlled. What is the difference and what additional extra capability does a fully controlled rectifier have?