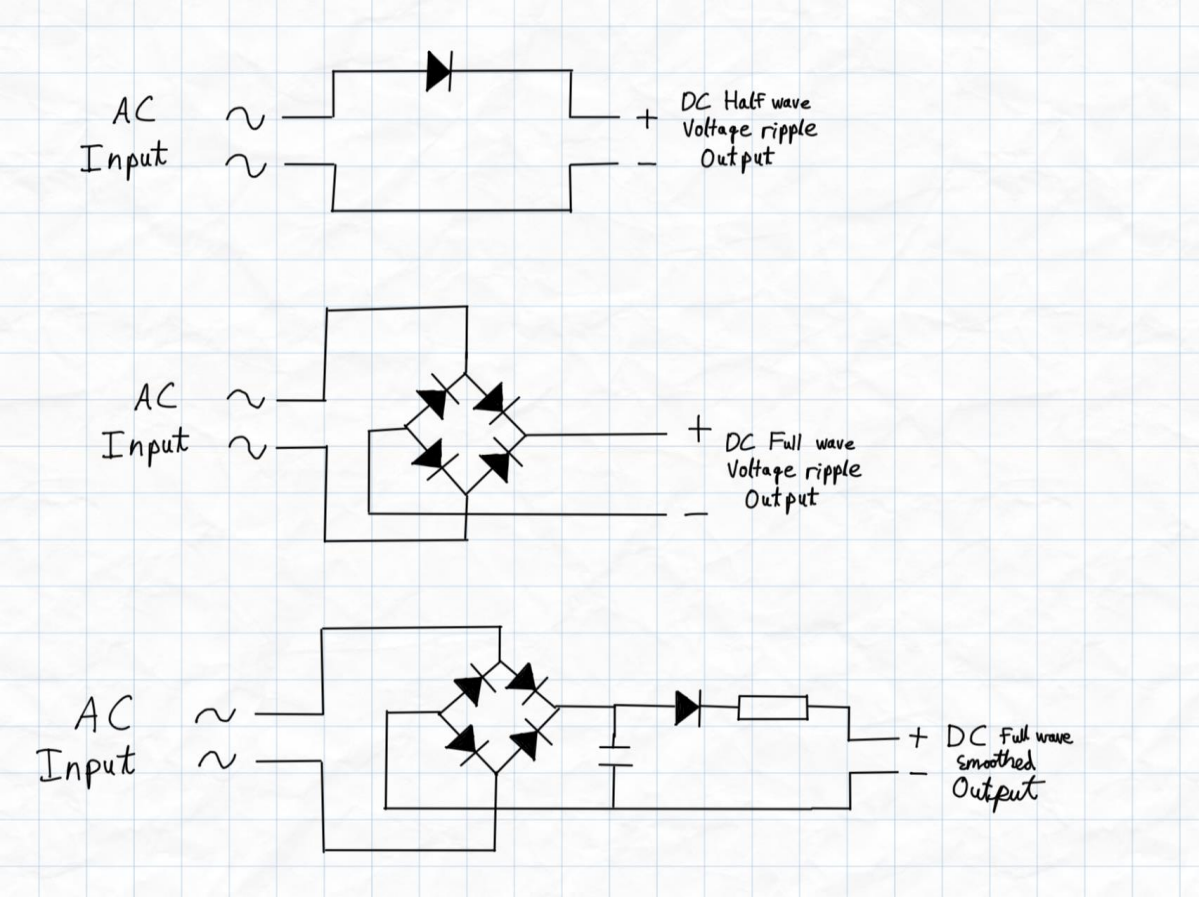
Electrical circuit design and assembly

Designing the electrical circuit required me to do some independent research on AC to DC conversion, voltage ripple smoothing, current regulation and backflow prevention.

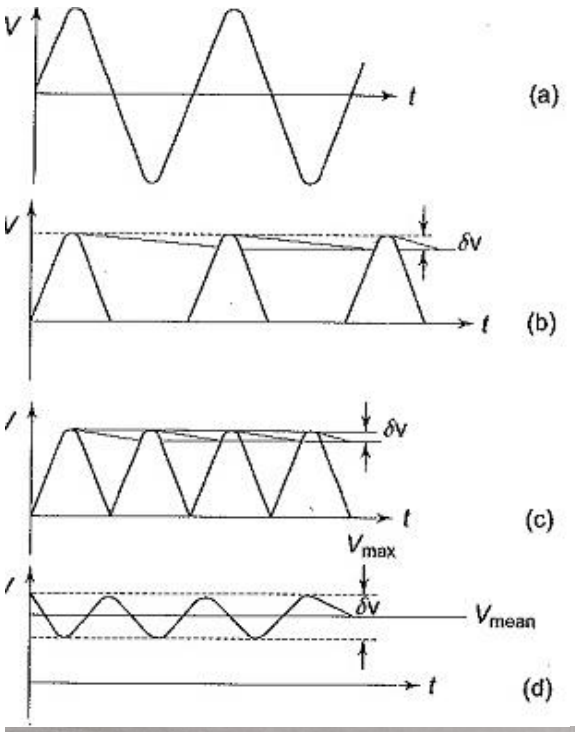
As I learnt more about the different methods of AC to DC conversion such as half wave and full wave rectifier circuits, I was able to develop the electrical circuit further to provide a more consistent voltage output.



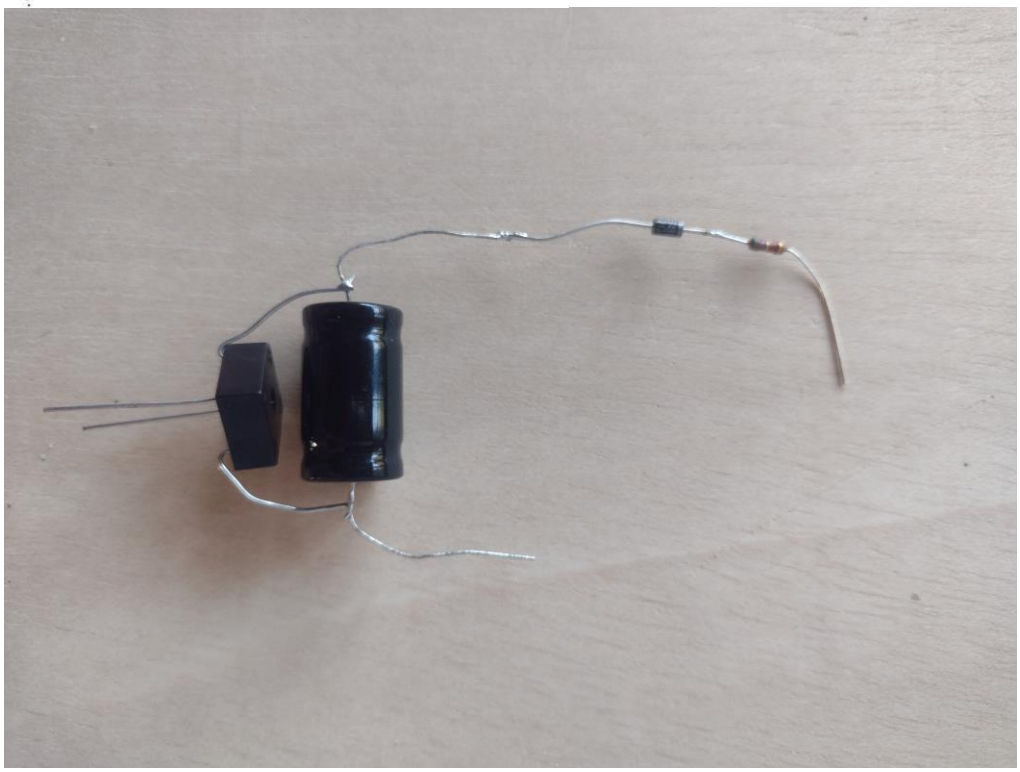
The addition of a capacitor to the circuit significantly smoothed the voltage ripple in the output from the bridge rectifier, increasing the charging efficiency by keeping the voltage above the charging threshold of the battery for longer.

The addition of a battery to the circuit led me to another problem, electricity production from the windmill was inconsistent, during periods of low wind speeds the battery would discharge into the capacitor instead of the other way round which was easily prevented by the addition of a Schottky diode. I chose the Schottky diode over a regular silicon diode as they have a lower voltage drop, maximising the voltage reaching the battery.

Finally, I added a 5.6 ohm resistor to limit charging current to prevent the battery from overheating and also allow the capacitor to discharge when no battery is connected to the circuit.



(a) Input AC
(b) Half wave rectifier output
(c) Full wave rectifier output
(d) Full wave rectifier output with capacitor



The electrical components were soldered together to form the final assembled circuit.