# ECEN405 Lab 2 Report
# Synchronous Buck Converter

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1. $L = 3.7mH$
   $C = 5.3\mu H$

2. $f_d = 4400\text{Hz}$

3. $R_D = 4.3k\Omega$

## Appendix

1. $f = 22k\text{Hz}, \quad V_o = 20V, \quad V_in = 30V, \quad R_L = 100\Omega$

$$\begin{aligned} D &= \frac{V_o}{V_{in}} = 0.6\bar{6} \\ I_L &= \frac{V_o}{R_L} = 0.2A \\ I_{ripple} &= I_L \cdot 0.4 = 0.24A \end{aligned}$$

$$L = \frac{V_o \cdot (1-D)}{f \cdot I_{ripple}} = 3.7mH$$

2. The converter will become discontinuious when the ripple current is twice the average inductor current, therefore we can rearrange for $f$:

$$f_d = \frac{V_o \cdot (1-D)}{L \cdot 2I_L} = 4400\text{Hz}$$

3. I took the points of $(0\Omega, 0.4\mu s)$, $(200k\Omega, 5ns)$ and linearised, then rearranged to find the resistance at $0.5\mu s$:

$$R_D = \frac{(D_t - 0.4) \cdot 200k}{5 - 0.4} = 4.373k\Omega$$