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# INTRODUCTION

## Project Overview:

The main aim of this project is to design the Buck-Converter which is an electrical device which used to step-down the DC voltage. In an Electric Vehicle buck converter has wide range of applications. For instance, it is used to step-down the voltage of Battery while giving power to the auxiliary systems.

## Objectives:

The goal of this project is to design and analyse the Buck converter using MATLAB by understanding the principles of step-down voltage regulation and its efficiency in different load conditions.

## Significance:

This assignment helps to understand about the importance of buck converter which is very essential device in the Electric Vehicle technology because of its own nature of boosting down the voltage which ensures the smooth and safe operation of an EV.

# Tools and Materials

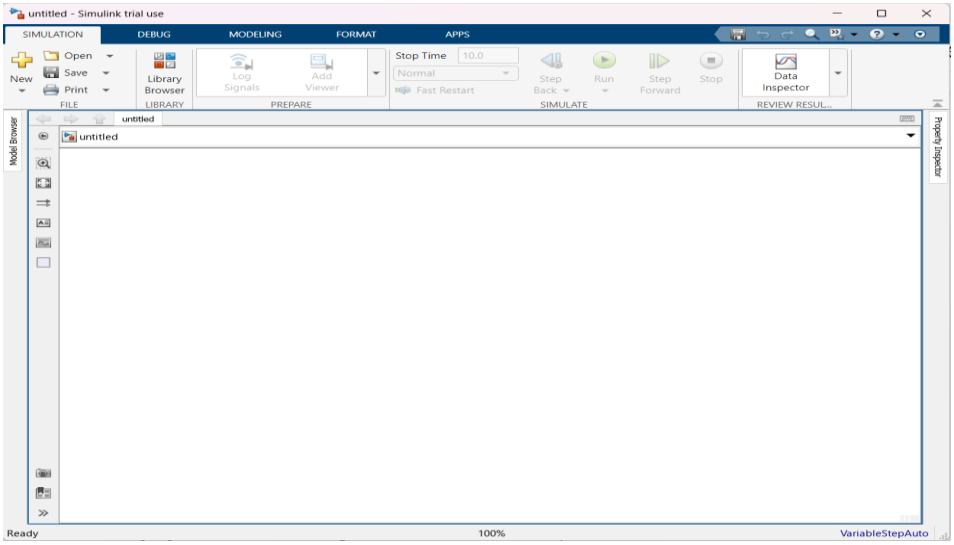
## Software Tools:

The Buck converter is designed by using MATALAB software of version R2023B. The Simulink environment in the MATLAB is more used for the design and analysis of buck converter.

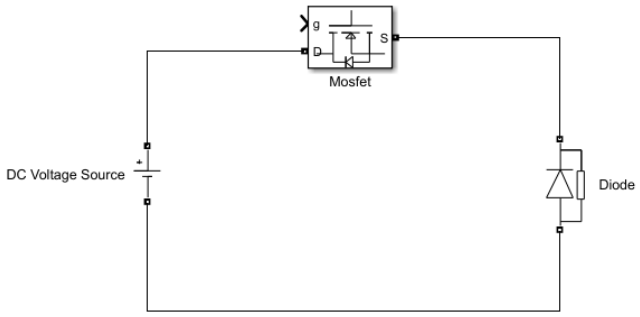
# METHODOLOGY

## Designing Procedure:

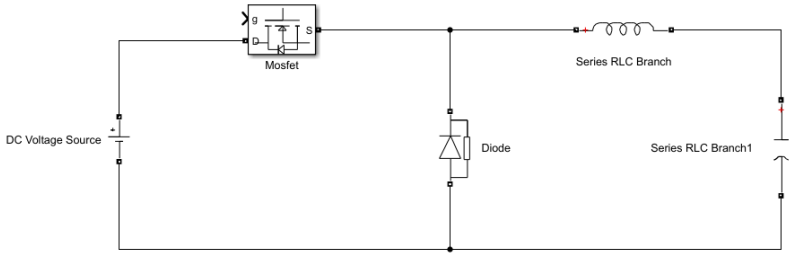
**Step 1:** Open the Simulink environment in the MATLAB Software.



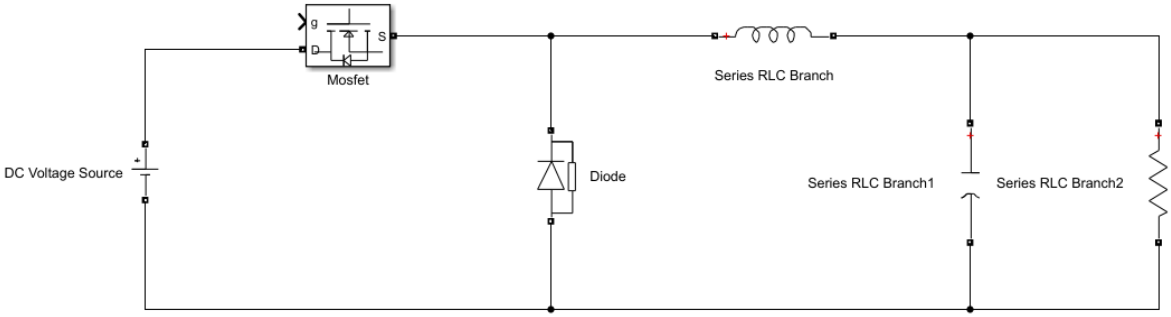

**Step 2:** Make the Connect the DC voltage source, MOSFET, Diode as shown.



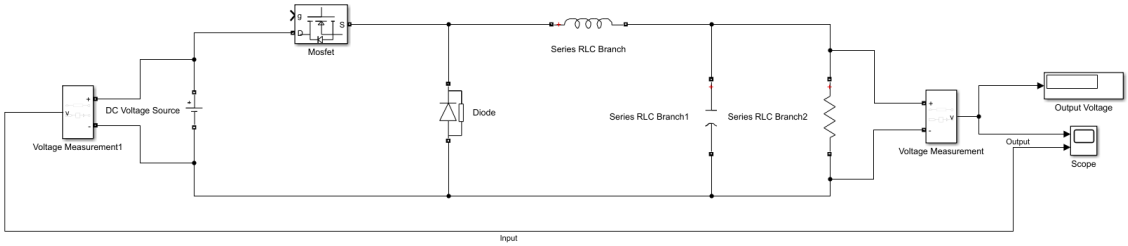

**Step 3:** Connect the Inductor to the Capacitor and connect this assembly to the node of MOSFET and Diode Connection as shown below. This makes the basic circuit of the Buck converter.



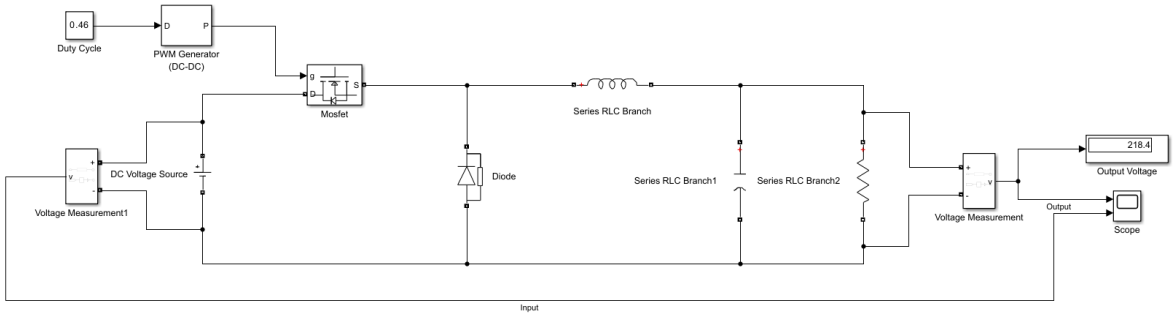
**Step 4:** Then connect load to the circuit as shown.




**Step 5:** Connect the voltage measurement block to the Load and DC voltage source to measure the input and output voltages. Also connect the scope and display blocks to identify the results.




**Step 6:** Connect the PWM Generator to the MOSFET as shown and provide duty cycle to the PWM generator with the help of constant block.

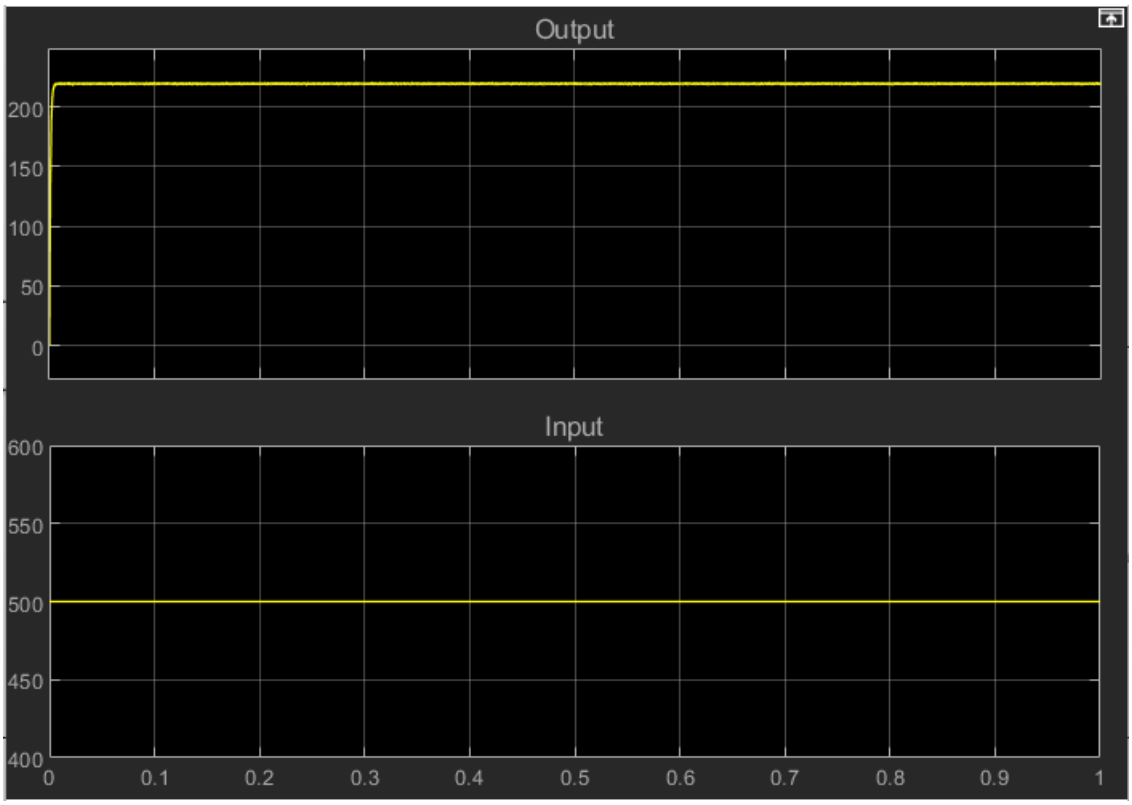



**Step 7:** Then Simulate the model and identify the output voltage.

# RESULT AND ANALYSIS

## Final Outcome:

The Design of the Buck Converter is achieved by following the steps which are mentioned above. The Converter is designed to Boost down the Voltage of 500V to the Voltage of 220V which is used for the household supply. The obtained results are shown below.




## Result Analysis:

The Duty Cycle of the Buck Converter is the ratio of Output and Input Voltage which is 220/500 = 0.44. Due to the present of some losses in the Circuit the Duty Cycle is slightly increased to 0.46 and shown in the figure of Step-6 in the design procedure.

By this we achieved our desired output voltage i.e. 220V in Buck Converter.

# CONCLUSION

## Summary:

Since the aim of this project is fulfilled by Designing the Buck Converter which is an Electronic Device which was used to Step Down the DC Voltage. The Results are also analysed to achieve the desired output.

## Final Thoughts:

Through this project I have an idea of the significance of the buck converter and the role of this converter in an Electric Vehicle. This Converter steps down the Voltage from the Battery of the vehicle to required voltage for specific applications to ensure smooth and safe operation.

## References:

Aden, I. A., Kahveci, H., & Şahin, M. E. (2021). Design and implementation of single-input multiple-output DC–DC buck converter for electric vehicles. *Journal of Circuits, Systems and Computers*, *30*(13), 2150228.