



AC TO DC Converter

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1 Introduction:

An AC to DC converter is an essential circuit used in various electronic applications to convert high-voltage alternating current (AC) into low-voltage direct current (DC). This project focuses on designing and implementing an AC to DC converter that steps down 220V AC mains supply to a stable 5V DC output. The 5V output is widely used for powering microcontrollers, sensors, and other low-power electronic devices. The design includes components such as a step-down transformer, rectifier, voltage regulator, and filtering capacitor to ensure a smooth and regulated output.

2 Applications:

- Powering microcontrollers (e.g., Arduino, Raspberry Pi).
- Charging small electronic devices.
- Used in embedded systems and IoT devices.
- Providing regulated power for sensors and actuators.
- Industrial automation and control systems.

3 State of the Art

Below is a table summarizing the evolution of AC to DC converters, including their timeline, price, design, and pros/cons.

Timeline	Price	Design	Pros	Cons	Links
1980s	High	Linear Regulators	Simple design, reliable	Inefficient, bulky	Link 1
1990s	Moderate	Switching Regulators	High efficiency, compact	Complex design	Link 2
2000s	Low	Integrated Circuits (ICs)	Compact, cost-effective	Limited power handling	Link 3
2010s	Very Low	Advanced SMPS (Switched-Mode Power Supply)	High efficiency, scalable	Requires careful design	Link 4

Table 1: Evolution of AC to DC Converters

4 Design Requirements:

The AC to DC converter consists of several key stages:

- **Step-Down Transformer:** Converts 220V AC to a lower AC voltage, typically around 12V AC.
- **Rectifier Circuit:** A bridge rectifier (using diodes) converts the AC voltage to pulsating DC.
- **Filter Circuit:** A capacitor smooths out the fluctuations in the rectified DC.
- **Voltage Regulator:** A regulator IC (such as 7805) provides a steady 5V DC output.

5 Working Principle:

- **Step-Down Transformation:** The AC mains supply (220V, 50Hz) is stepped down to 12V AC using a transformer.
- **Rectification:** The bridge rectifier, consisting of four diodes, converts the AC voltage into pulsating DC.
- **Filtering:** A capacitor (typically 1000F) smooths the rectified DC voltage by reducing fluctuations.
- **Regulation:** The voltage regulator (7805) ensures a constant 5V DC output by stabilizing any voltage variations.
- **Output Delivery:** The final regulated 5V DC is used to power electronic circuits safely and shown in below figure.

6 Software Implementation:

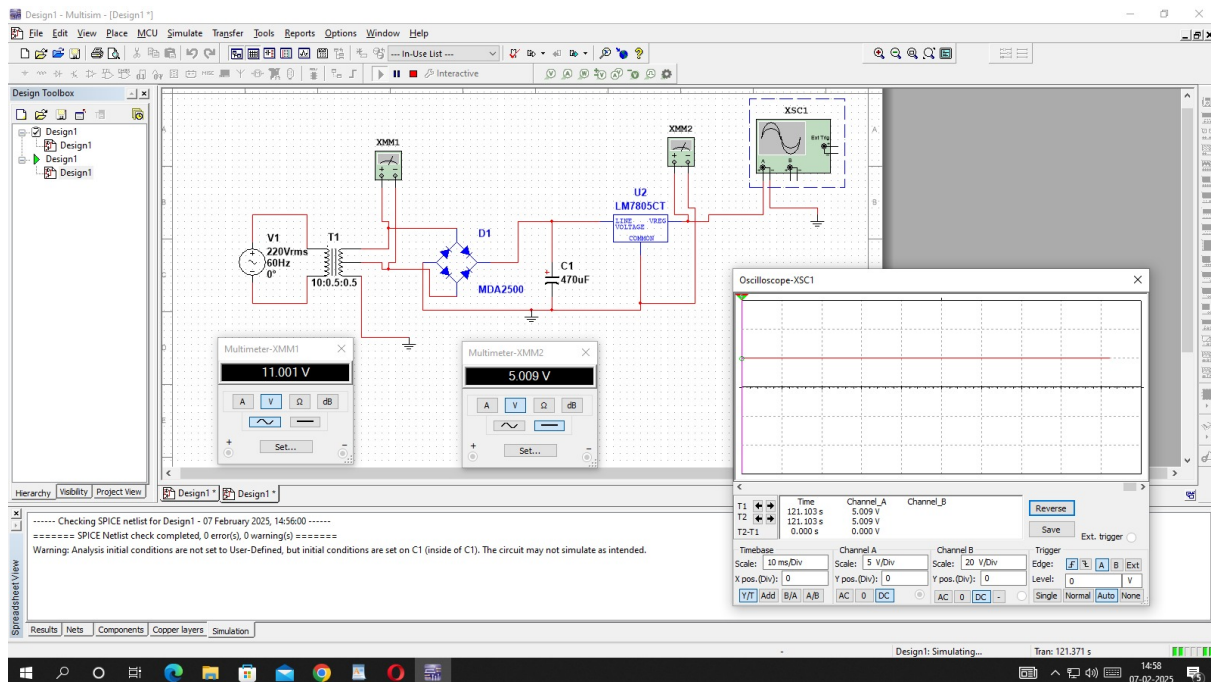
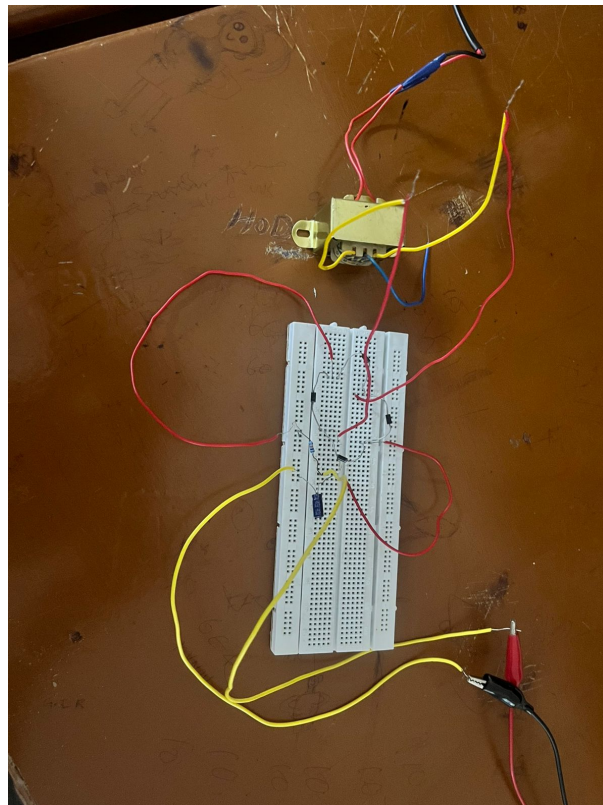


Fig1: Multisim implementation

7 Hardware implementation:



8 Video Link :

There is a [Google Drive](#)

9 Conclusion:

The AC to DC converter successfully converts 220V AC to a stable 5V DC output using a transformer, rectifier, filter, and voltage regulator. This design ensures efficiency, reliability, and minimal voltage fluctuations, making it suitable for various low-power electronic applications. The project demonstrates a fundamental power supply design widely used in embedded and industrial applications.

10 References

- [AC to DC Converter Basics](#)
- [7805 Voltage Regulator Datasheet](#)
- [Proteus Simulation Software](#)