



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)



COIMBATORE-35

**Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai**

DEPARTMENT OF BIOMEDICAL ENGINEERING

COURSE NAME: 19EIB201/ ELECTRONIC DEVICES

II YEAR / III SEMESTER

Unit 1 – PN Junction Devices

Topic 2: Rectifiers





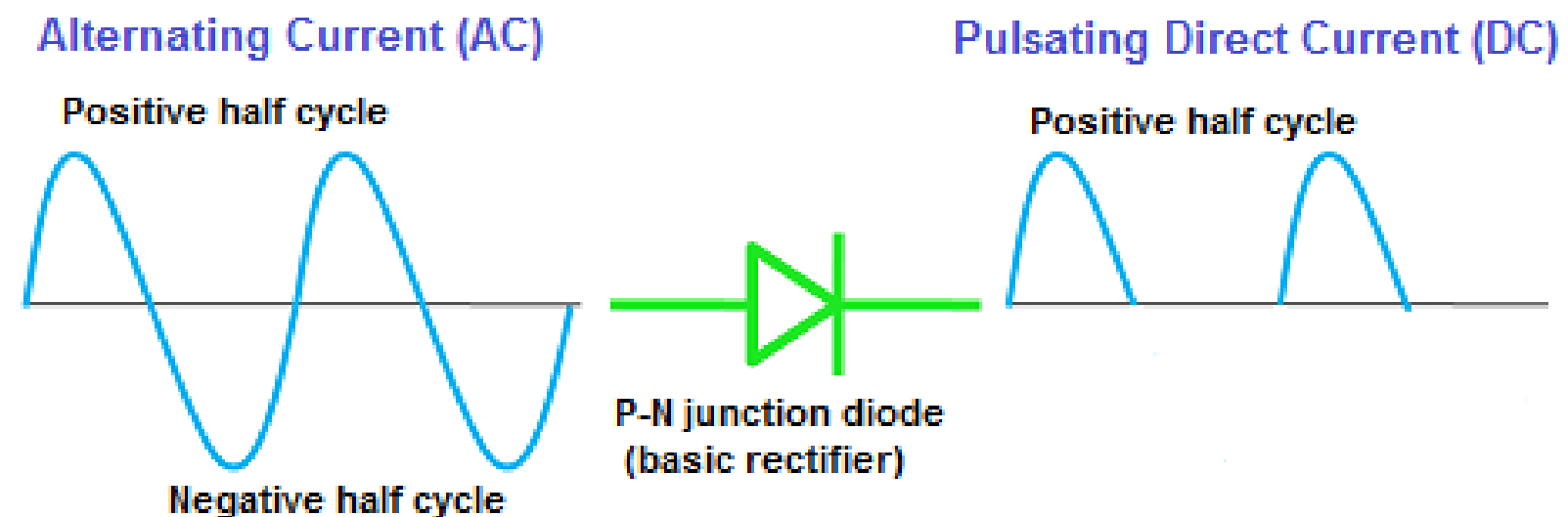
Rectifier

- The main application of p-n junction diode is in rectification circuits.
- A rectifier is nothing but a simple diode or group of diodes which converts the Alternating Current (AC) into Direct Current (DC).
- A diode allows electric current in one direction and blocks electric current in another direction. This principle is used to construct various types of rectifiers.
- Rectifiers are classified into different types based on the number of diodes used in the circuit or arrangement of diodes in the circuit.



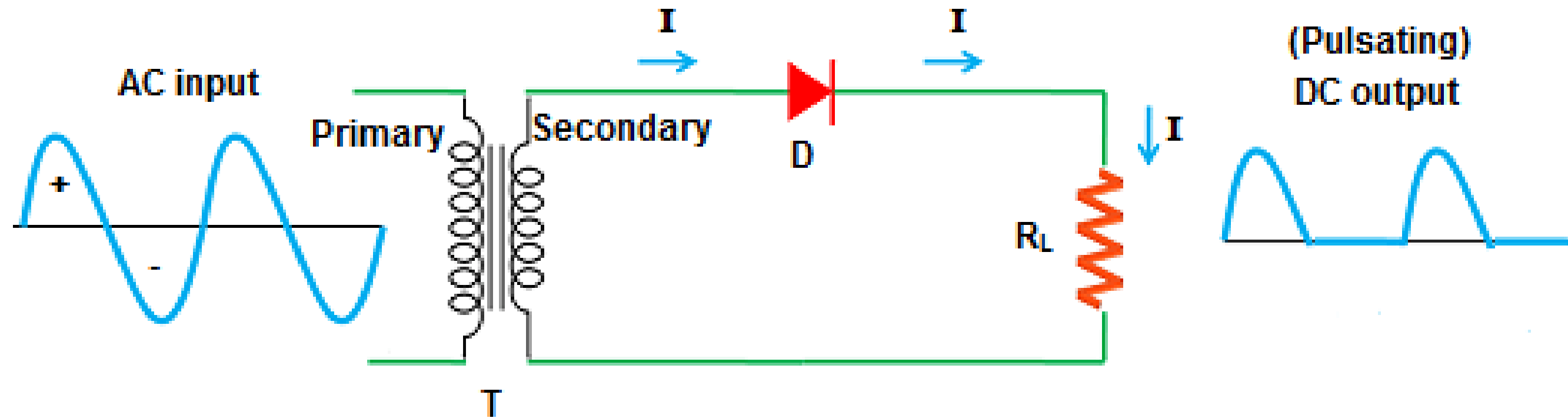
Half Wave Rectifier

- A half wave rectifier is a type of rectifier which converts the positive half cycle (positive current) of the input signal into pulsating DC (Direct Current) output signal.
- If the positive half cycle is allowed then the negative half cycle is blocked. Similarly, if the negative half cycle is allowed then the positive half cycle is blocked.





Working



I = Current

D = Diode

R_L = Load resistor

T = Transformer

+ = Positive half cycle

- = Negative half cycle

Half wave rectifier



Characteristics of Half Wave Rectifier

RIPPLE FACTOR

Ripple factor is the ratio of RMS value of the AC component of the output voltage to the DC component of the output voltage.

$$\gamma = \sqrt{\left(\frac{V_{rms}}{V_{DC}}\right)^2 - 1}$$



Characteristics of Half Wave Rectifier

DC Current

$$I_{DC} = \frac{I_{max}}{\pi}$$

I_{max} is the maximum DC load current

DC Output voltage

$$V_{DC} = \frac{V_{Smax}}{\pi}$$

V_{Smax} is the maximum secondary voltage



Characteristics of Half Wave Rectifier

Form Factor

The form factor is the ratio of RMS value to the DC value. For a half-wave rectifier, the form factor is 1.57

Rectifier Efficiency

Rectifier efficiency is the ratio of output DC power to the input AC power. For a half-wave rectifier, rectifier efficiency is 40.6%.



Advantages and Disadvantages



Advantages	Disadvantages
Affordable	Ripple production is more
Simple connections	Harmonics are generated
Easy to use as the connections are simple	Utilization of the transformer is very low
Number of components used are less	The efficiency of rectification is low



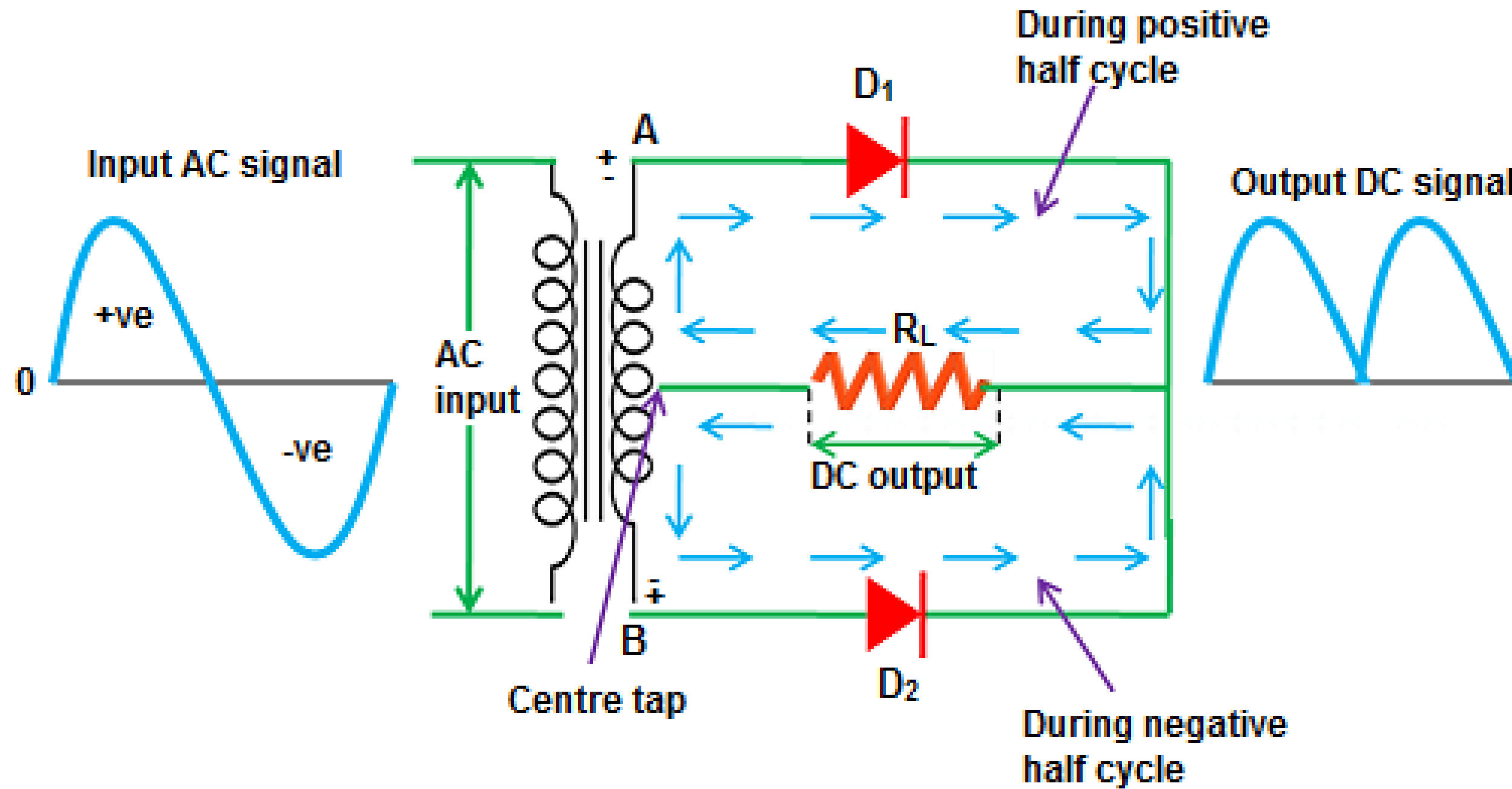
Full Wave Rectifier



- Full-wave rectifier circuits are used for producing an output voltage or output current which is purely DC.
- The main advantage of a full-wave rectifier over half-wave rectifier is that such as the average output voltage is higher in full-wave rectifier, there is less ripple produced in full-wave rectifier when compared to the half-wave rectifier.

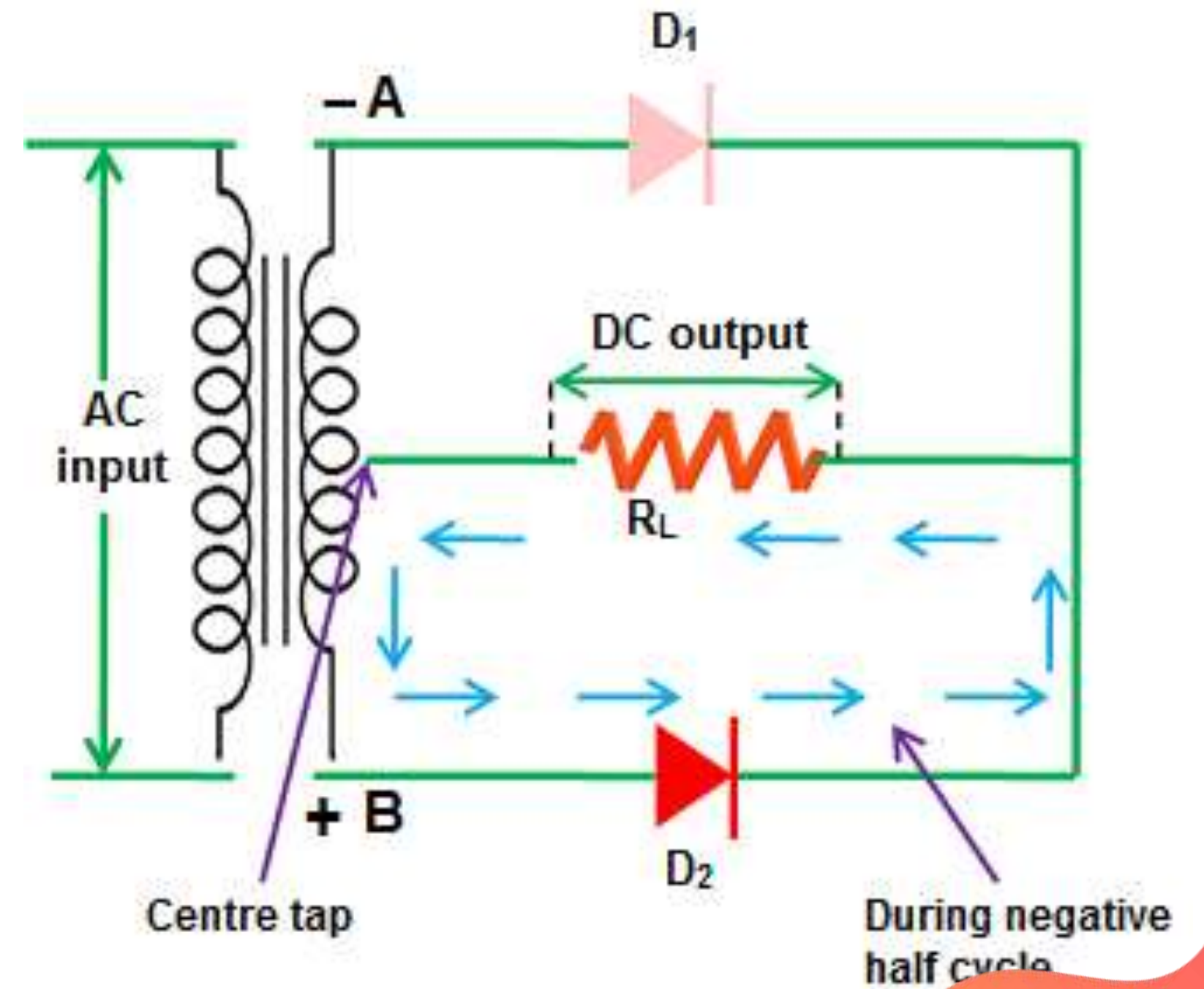
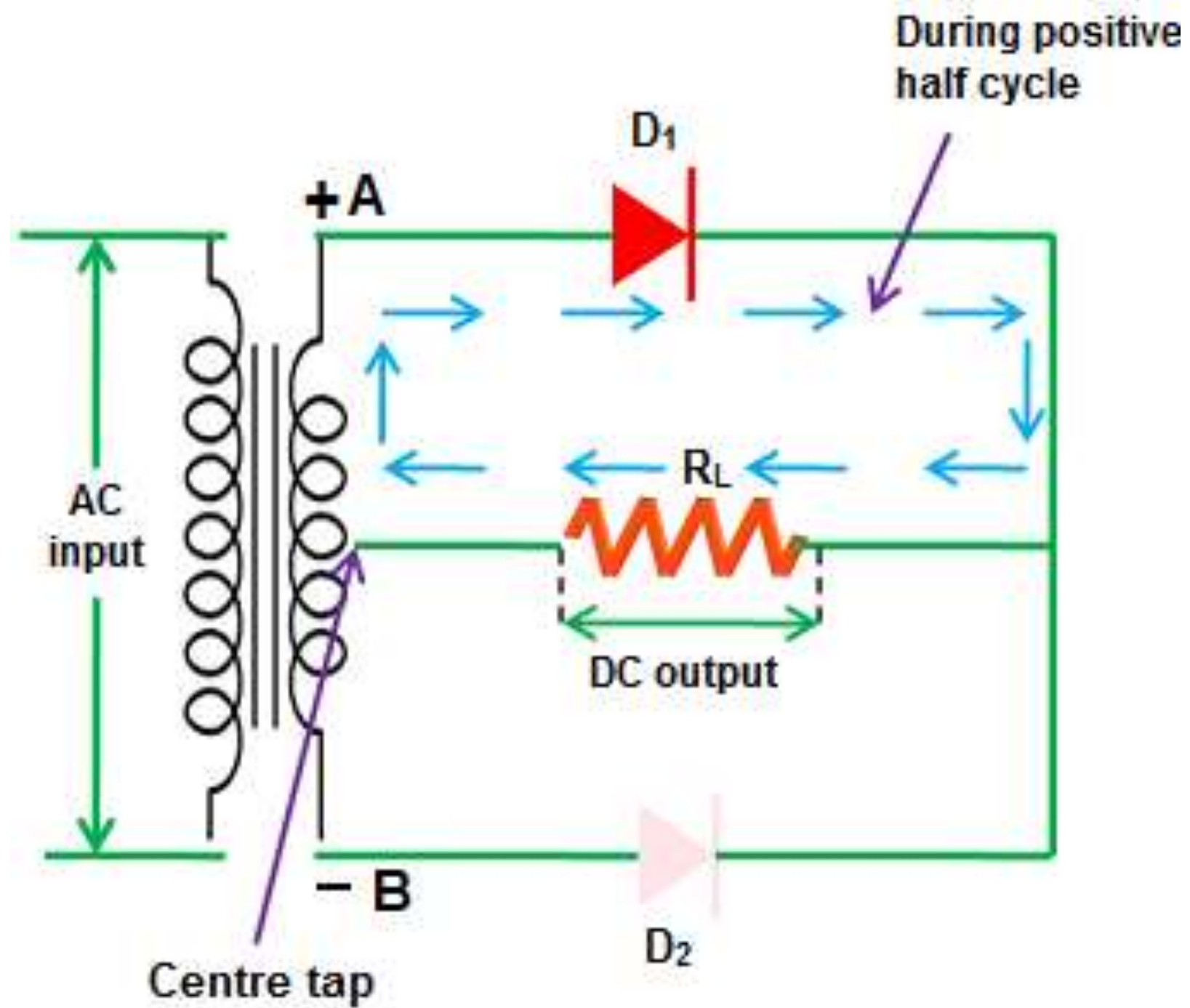


Full Wave Rectifier





Full Wave Rectifier





Characteristics of Full Wave Rectifier

RIPPLE FACTOR

Ripple factor is the ratio of RMS value of the AC component of the output voltage to the DC component of the output voltage.

$$\gamma = \sqrt{\left(\frac{V_{rms}}{V_{DC}}\right)^2 - 1}$$



Characteristics of Half Wave Rectifier

DC Current

$$I_{DC} = \frac{2I_{max}}{\pi}$$

I_{max} is the maximum DC load current

DC Output voltage

$$V_{DC} = \frac{2V_{max}}{\pi}$$

V_{max} is the maximum secondary voltage



Characteristics of Full Wave Rectifier

Form Factor

The form factor is the ratio of RMS value to the DC value. For a half-wave rectifier, the form factor is 1.11

Rectifier Efficiency

Rectifier efficiency is the ratio of output DC power to the input AC power. For a half-wave rectifier, rectifier efficiency is 81.2%.

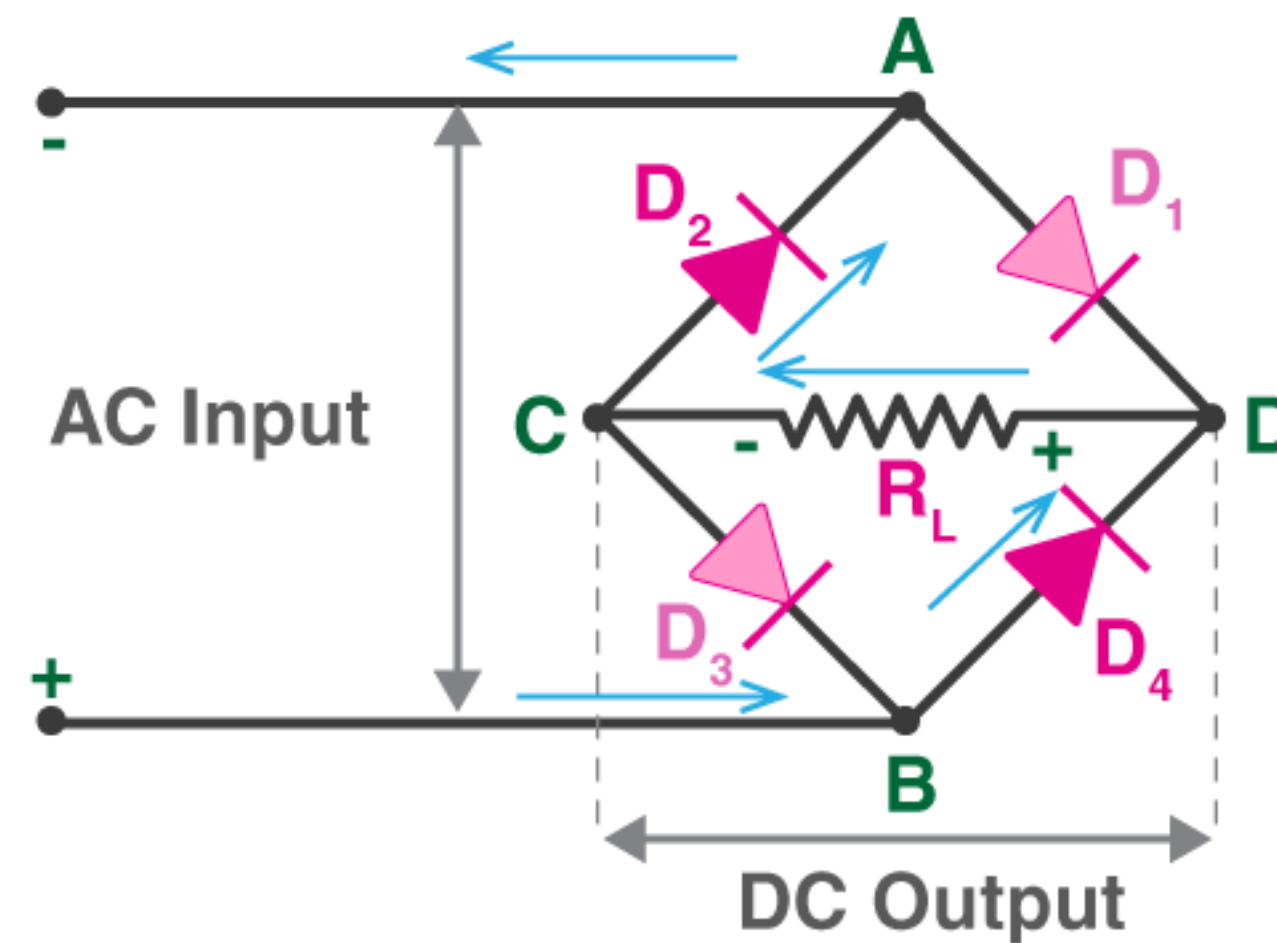
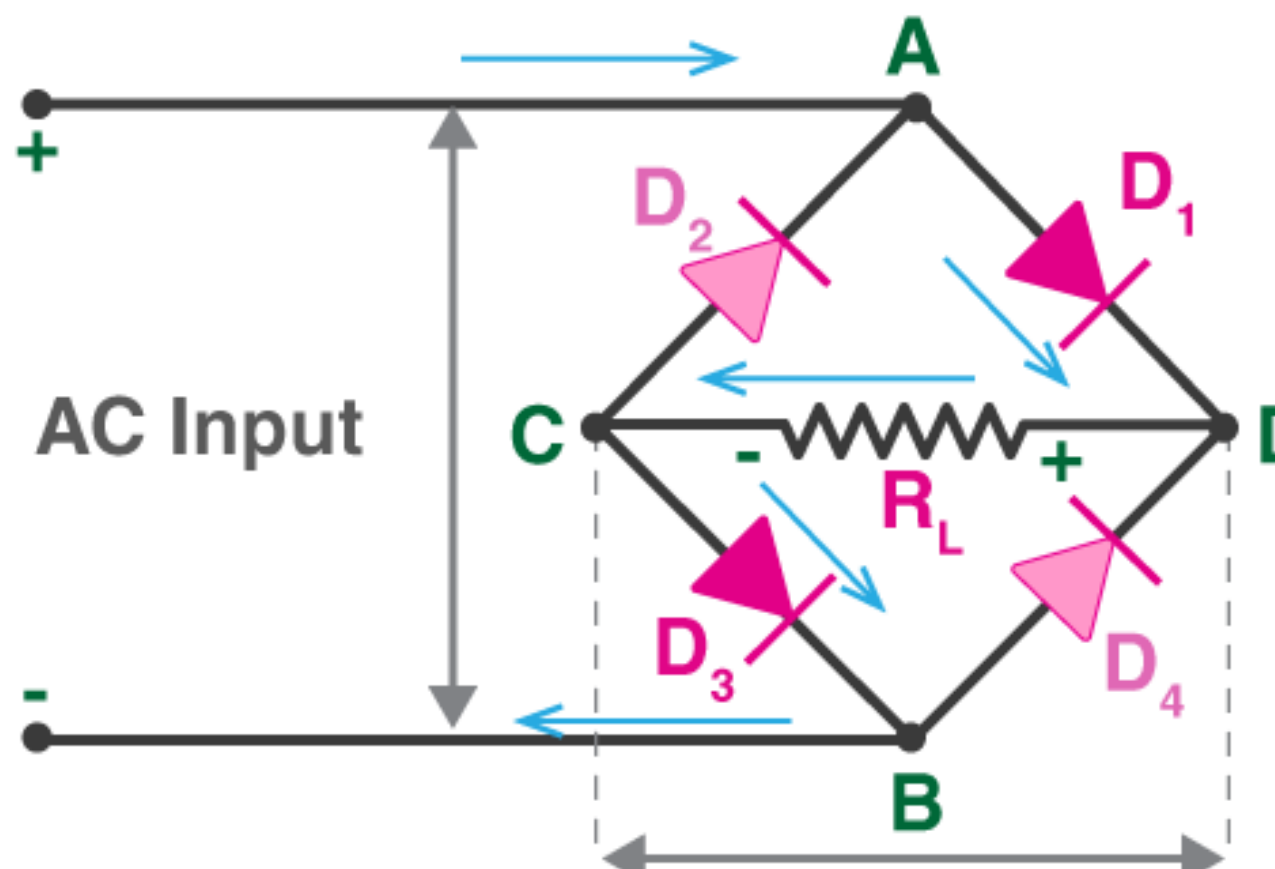


Bridge Rectifier

- Bridge rectifiers are defined as a type of full-wave rectifier that uses four or more diodes in a bridge circuit configuration to efficiently convert alternating (AC) current to a direct (DC) current.
- In bridge rectifier, center tap is not required. If stepping down or stepping up of voltage is not required, then even the transformer can be eliminated in the bridge rectifier.
- The four diodes are arranged in such a way that only two diodes conduct electricity during each half cycle



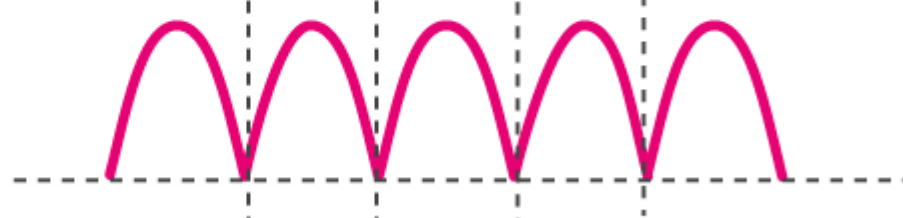
Bridge Rectifier



AC Input



DC output
(pulsating form)





SUMMARY

Definition, Macro and Micro Economics, Nature and Scope of Economics



KEEP
LEARNING..
Thank u

SEE YOU IN NEXT CLASS