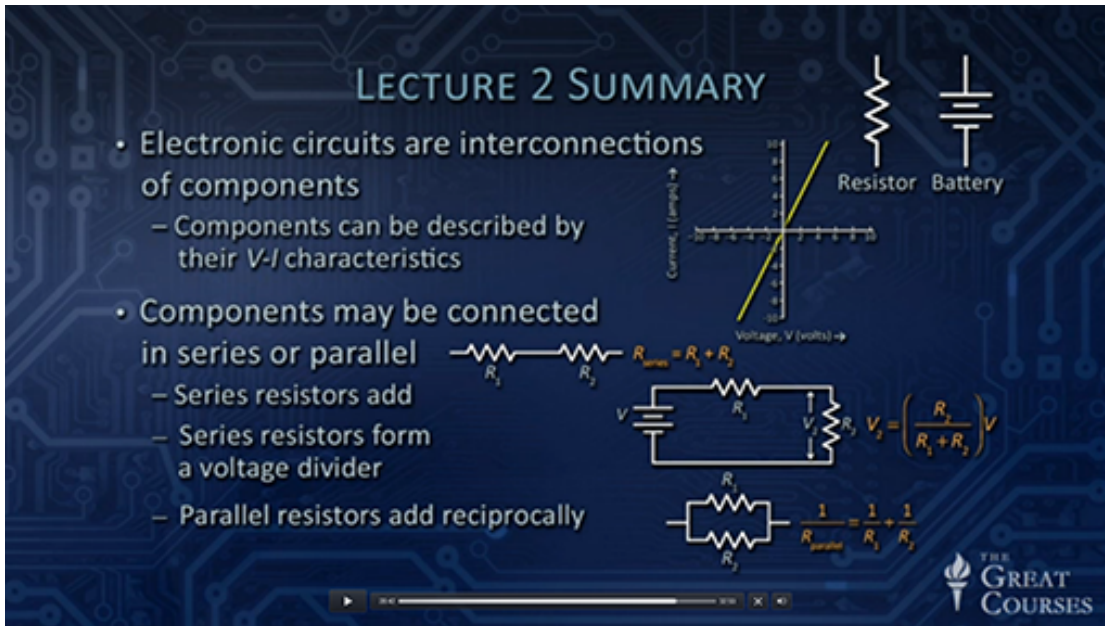


Electronics (Great Courses)

Lecture 2

LECTURE 2 SUMMARY

- Electronic circuits are interconnections of components
 - Components can be described by their V - I characteristics
- Components may be connected in series or parallel
 - Series resistors add
 - Series resistors form a voltage divider
 - Parallel resistors add reciprocally

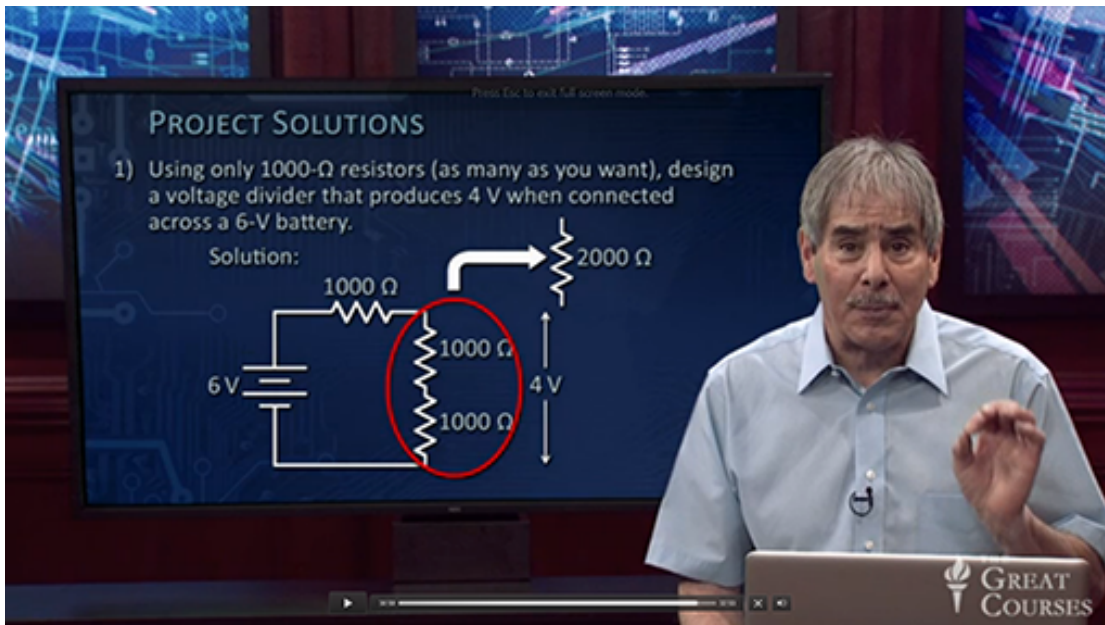


Project

PROJECT SOLUTIONS

1) Using only 1000- Ω resistors (as many as you want), design a voltage divider that produces 4 V when connected across a 6-V battery.

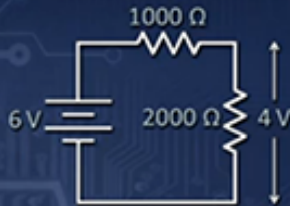
Solution:



PROJECT SOLUTIONS

1) Using only 1000-Ω resistors (as many as you want), design a voltage divider that produces 4 V when connected across a 6-V battery.

Voltage divider equation:



$$V_2 = \left(\frac{R_2}{R_1 + R_2} \right) V$$

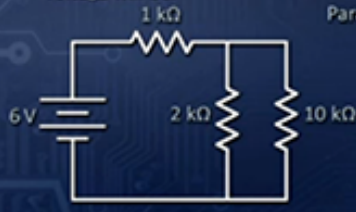
$$= \left(\frac{2000 \, \Omega}{3000 \, \Omega} \right) (6 \, \text{V})$$

$$= \left(\frac{2}{3} \right) (6 \, \text{V}) = 4 \, \text{V}$$

GREAT COURSES

PROJECT SOLUTIONS

2) Suppose you connect a 10,000-Ω resistor (10 kΩ) across your voltage divider, between the points where you're supposed to have 4 V. Will the voltage across this resistor be exactly 4 V? If so, explain why. If not, explain why not and determine what the actual voltage will be.



Parallel resistors

$$\frac{1}{R_{\text{parallel}}} = \frac{1}{R_1} + \frac{1}{R_2}$$

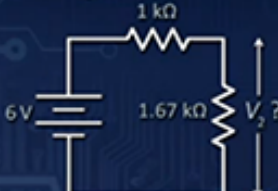
$$\frac{1}{R_{\text{parallel}}} = \frac{1}{2 \, \text{k}\Omega} + \frac{1}{10 \, \text{k}\Omega}$$

$$R_{\text{parallel}} = \frac{10}{6} \, \text{k}\Omega = 1.67 \, \text{k}\Omega$$

GREAT COURSES

PROJECT SOLUTIONS

2) Suppose you connect a 10,000-Ω resistor (10 kΩ) across your voltage divider, between the points where you're supposed to have 4 V. Will the voltage across this resistor be exactly 4 V? If so, explain why. If not, explain why not and determine what the actual voltage will be.

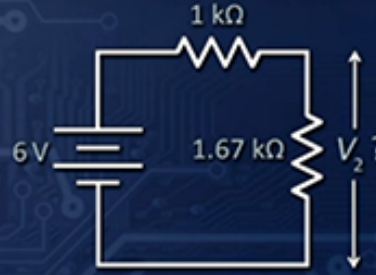


1 kΩ
6 V
1.67 kΩ
 $V_2?$

GREAT COURSES

PROJECT SOLUTIONS

2) Suppose you connect a 10,000-Ω resistor (10 kΩ) across your voltage divider, between the points where you're supposed to have 4 V. Will the voltage across this resistor be exactly 4 V? If so, explain why. If not, explain why not and determine what the actual voltage will be.



1 kΩ
6 V
1.67 kΩ
 $V_2?$

Voltage divider

$$V_2 = \left(\frac{R_2}{R_1 + R_2} \right) V$$

$$= \left(\frac{1.67 \text{ k}\Omega}{2.67 \text{ k}\Omega} \right) (6 \text{ V})$$

$$= 3.75 \text{ V}$$

GREAT COURSES