BASIC ELECTRICITY AND ELECTRONICS 3

JIM PYTEL

Open Oregon Educational Resources

CONTENTS

UNIT 6: 3 PHASE AC CIRCUIT ANALYSIS

UNIT 7: RESONANCE AND FILTERS

This course is the 3rd installment in a three part series intended to support the flipped classroom approach for traditional basic electronics classes. Basic Electronics 3 covers apparent, real, and reactive power and power factor, power factor correction, ideal and non-ideal transformers, and transformer connection diagrams, AC circuit analysis techniques and theorems like source conversion, the AC superposition theorem, AC Thevenin's Theorem, and the AC Maximum Power Transfer Theorem, 3 phase AC systems including balanced and unbalanced 4 wire Y configurations, 3 wire Y configurations, and delta configurations, the single wattmeter method and the two wattmeter method. These resources are meant to accompany a hands on lab with the guidance of an instructor.

UNIT 1: AC POWER

Objective: Demonstrate understanding of real, reactive, and apparent power. Determine individual and total real, reactive, and apparent power for elements in series, parallel, and series-parallel AC circuits.

AC POWER

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AC Power Study Guide

AC POWER EXAMPLES

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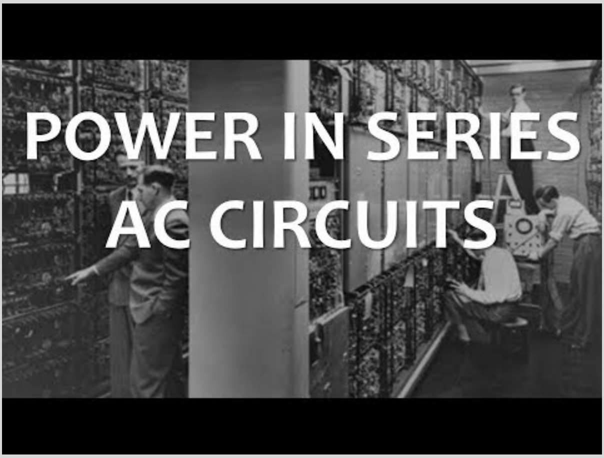
AC Power Examples Study Guide

POWER IN SERIES AC CIRCUITS



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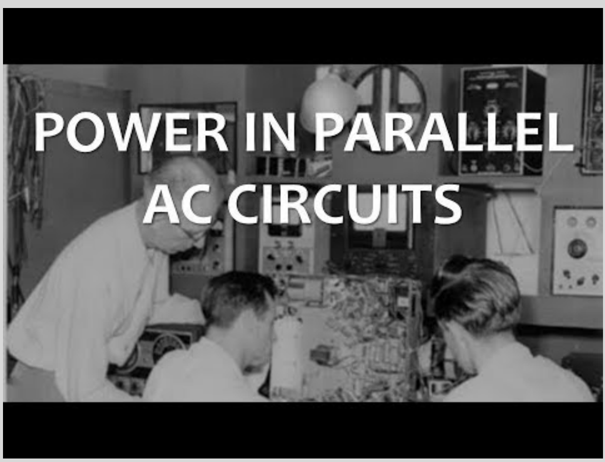
Power in Series AC Circuits Study Guide

POWER IN PARALLEL AC CIRCUITS



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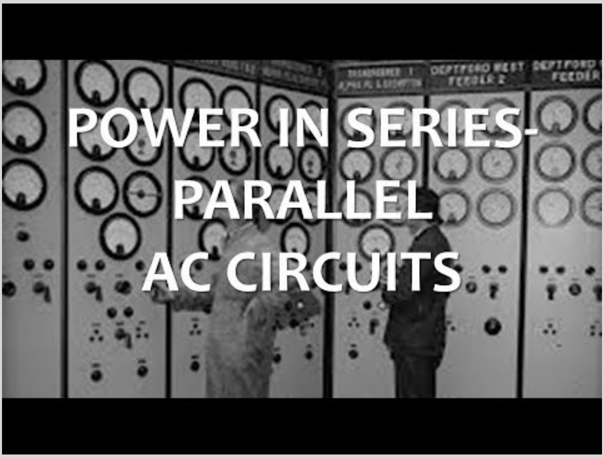
Power in Parallel AC Circuits Study Guide

POWER IN SERIES-PARALLEL AC CIRCUITS



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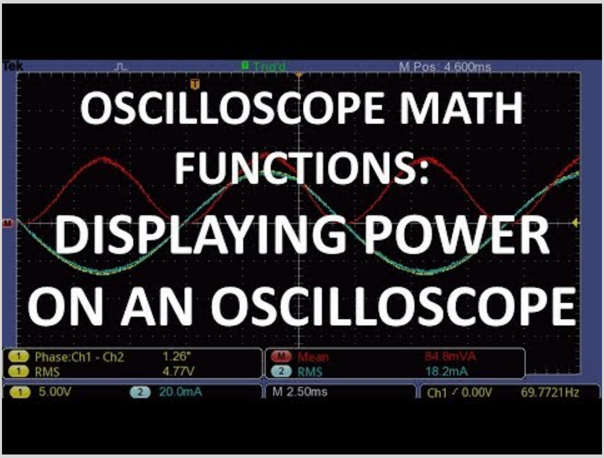
Power in Series Parallel AC Circuits Study Guide

OSCILLOSCOPE MATH FUNCTIONS: MEASURING POWER ON AN OSCILLOSCOPE



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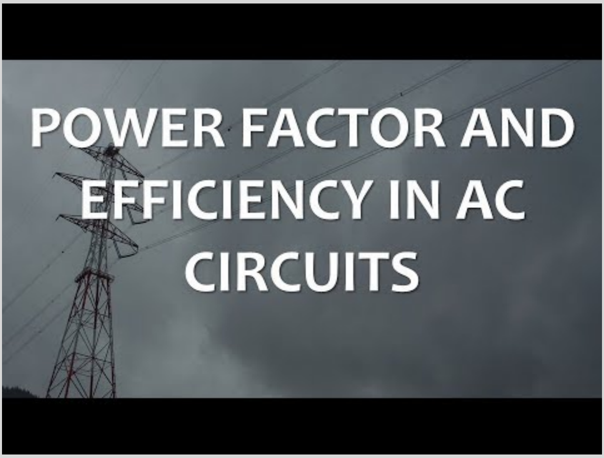
Oscilloscope MATH Functions Measuring Power with an Oscilloscope Study Guide

UNIT 2 POWER FACTOR CORRECTION

Objective: Demonstrate understanding of power factor and efficiency. Power factor correct a system. Identify characteristics of non-power factor corrected and power factor corrected systems.

POWER FACTOR AND EFFICIENCY IN AC CIRCUITS



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Power Factor and Efficiency in AC Circuits Study Guide

POWER FACTOR CORRECTION

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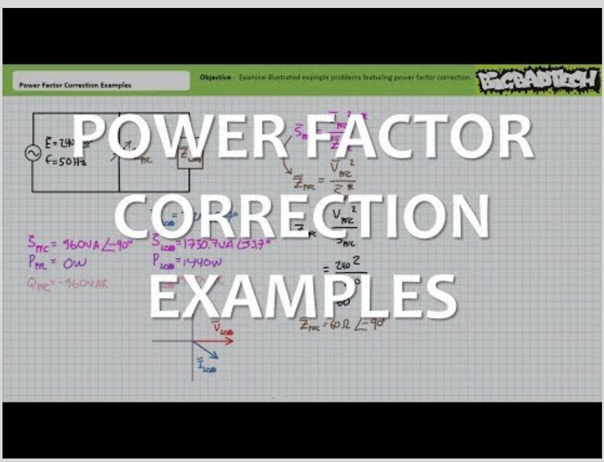
Power Factor Correction Study Guide

POWER FACTOR CORRECTION EXAMPLES



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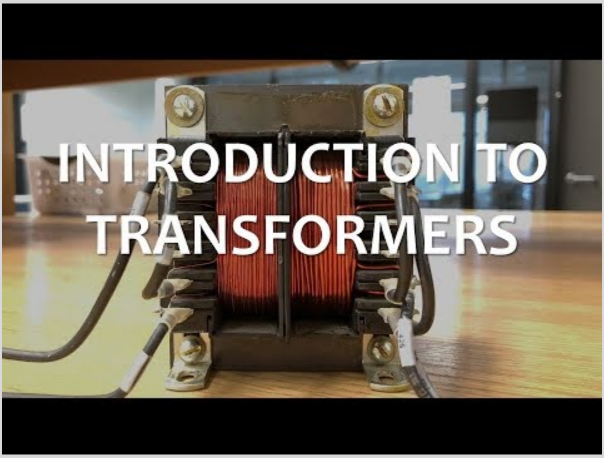
Power Factor Correction Examples Study Guide

UNIT 3: TRANSFORMERS

Objectives: Demonstrate understanding of the theory of operation and construction of transformers. Demonstrate understanding of turns ratio, voltage, current, and power transformation in transformers. Demonstrate understanding of transformer connection diagrams, transformer ratings, phase dot notation, parallel connections of transformer windings, series aiding connections of transformer windings, and series opposing connections of transformer windings. Demonstrate understanding of copper losses, iron losses (hysteresis and eddy currents), and magnetizing current. Demonstrate understanding of transformer efficiency and voltage regulation.

TRANSFORMERS



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Introduction to Transformers Study Guide

TRANSFORMER CONNECTION DIAGRAMS

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Transformer Connection Diagrams Study Guides

NON-IDEAL TRANSFORMERS

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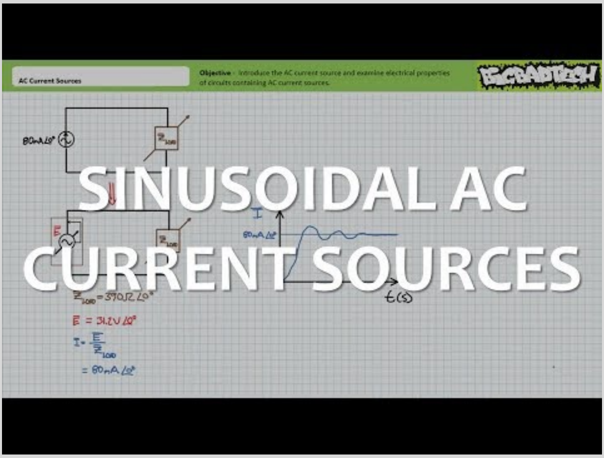
Non Ideal Transformers Study Guide

UNIT 4: AC CIRCUIT ANALYSIS TECHNIQUES

Objectives: Demonstrate understanding of current sources, source conversions, and delta/Y conversions using complex impedances.

AC CURRENT SOURCES



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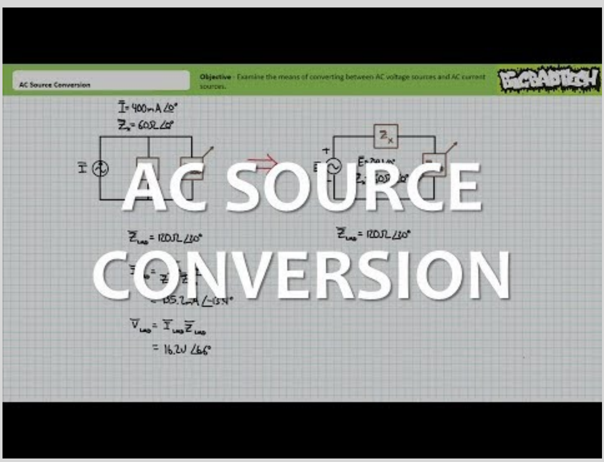
AC Current Sources Study Guide

AC SOURCE CONVERSION



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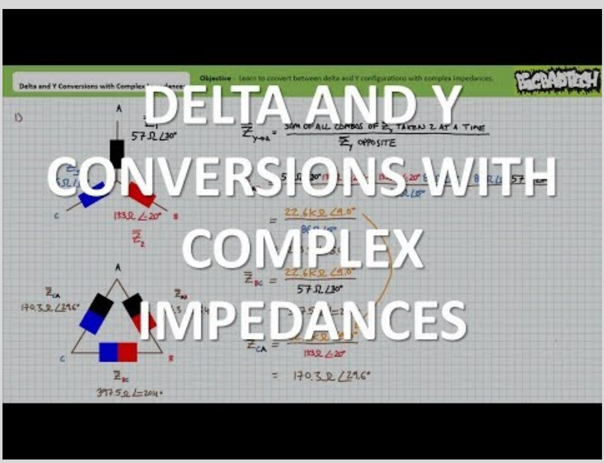
AC Source Conversion Study Guide

DELTA AND Y CONVERSIONS WITH COMPLEX IMPEDANCES



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Impedance Delta Y Conversion Study Guide

UNIT 5: AC CIRCUIT ANALYSIS THEOREMS

Objectives: Demonstrate understanding of the Superposition Theorem, Thevenin's Theorem, Norton's Theorem, and the Maximum Power Transfer Theorem as applied to AC circuits. Demonstrate understanding of impedance matching transformers. Demonstrate understanding of bridge circuit analysis.

AC SUPERPOSITION THEOREM

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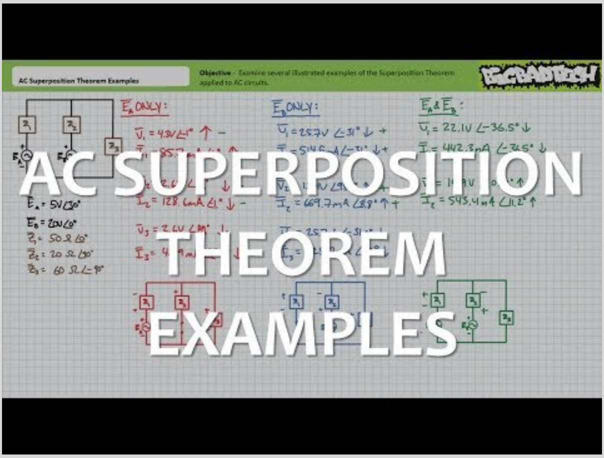
AC Superposition Theorem Study Guide

AC SUPERPOSITION THEOREM EXAMPLES



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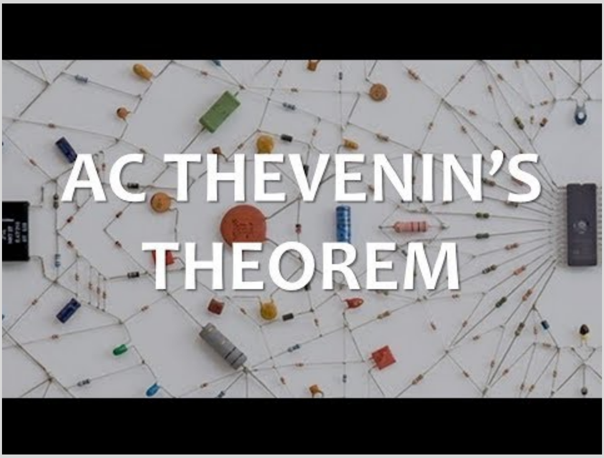
AC Superposition Theorem Examples Study Guide

AC THEVENIN'S THEOREM



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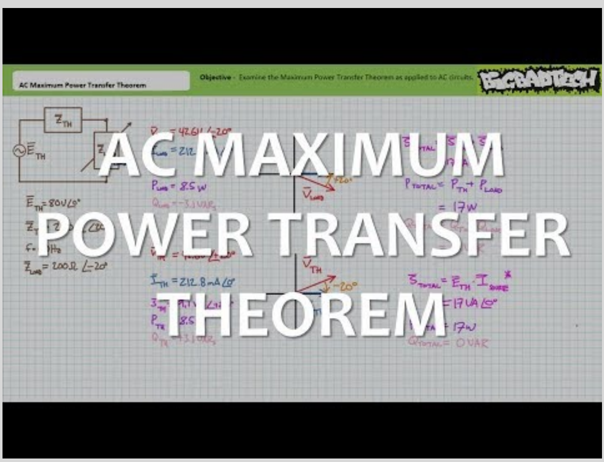
AC Thevenins Theorem Study Guide

AC MAXIMUM POWER TRANSFER THEOREM



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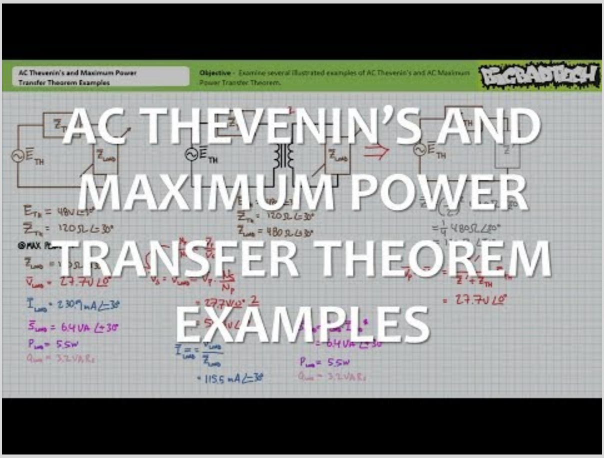
AC Maximum Power Transfer Theorem Study Guide

AC THEVENIN'S THEOREM AND AC MAXIMUM POWER TRANSFER THEOREM EXAMPLES



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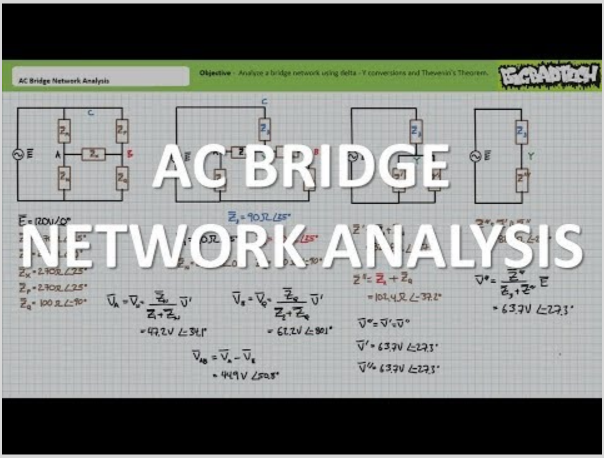
AC Thevenins Theorem and Maximum Power Transfer Theorem Examples Study Guide

AC BRIDGE NETWORK ANALYSIS



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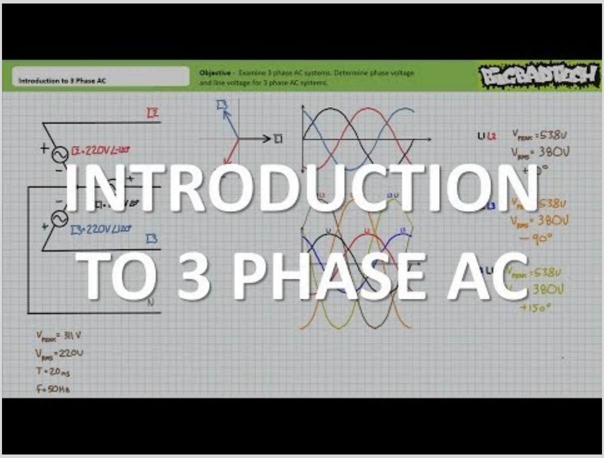
AC Bridge Network Analysis Study Guide

UNIT 6: 3 PHASE AC CIRCUIT ANALYSIS

Objectives: Demonstrate understanding of line to neutral voltage and line to line voltage. Analyze balanced and unbalanced 4 and 3 wire Y and delta configured loads in 3 phase AC systems. Examine the 3 wattmeter, single wattmeter, and two wattmeter method in 3 phase AC systems.

INTRODUCTION TO 3 PHASE AC SYSTEMS



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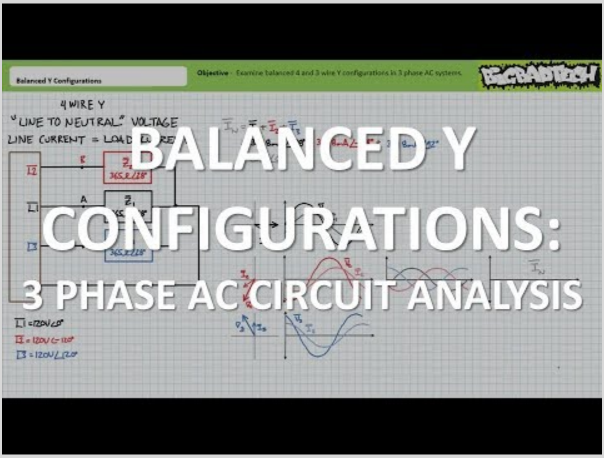
Introduction to 3 Phase AC Study Guide

BALANCED Y CONFIGURATIONS



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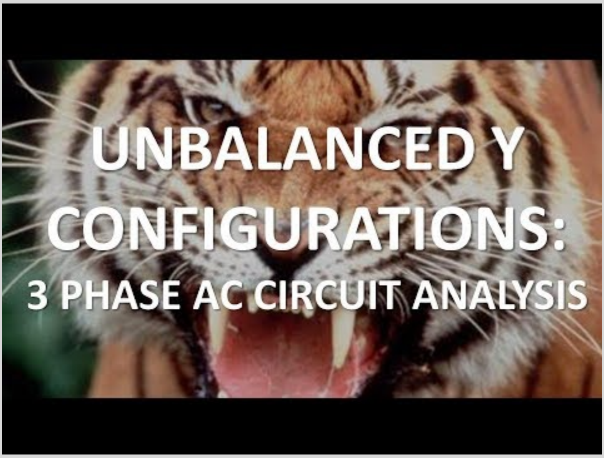
Balanced Y Configurations Study Guide

UNBALANCED Y CONFIGURATIONS



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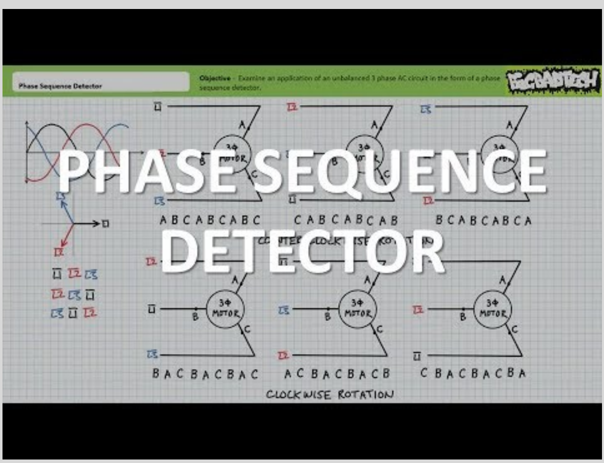
Unbalanced Y Configurations Study Guide

PHASE SEQUENCE AND PHASE SEQUENCE DETECTION



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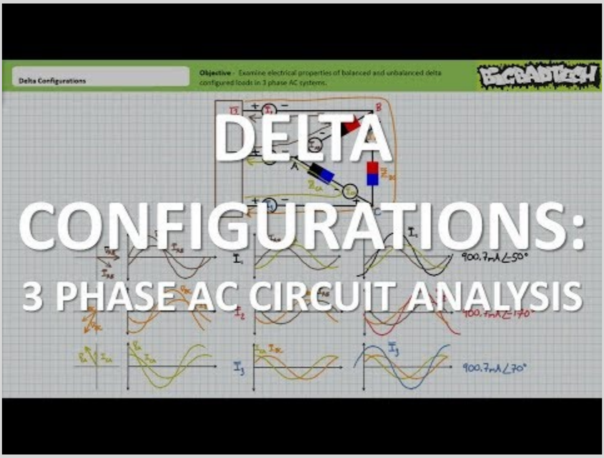
Phase Sequence Detector Study Guide

DELTA CONFIGURATIONS



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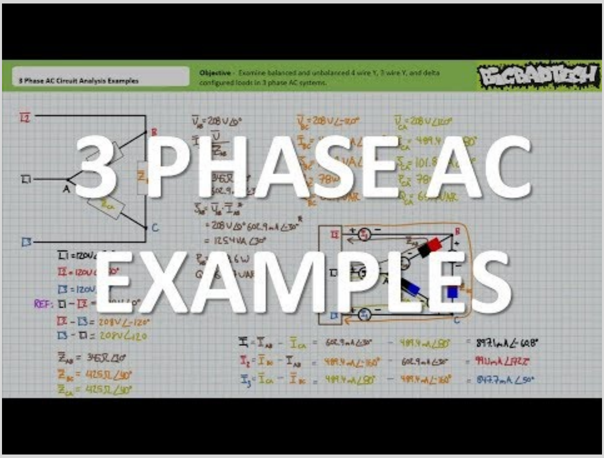
Delta Configurations Study Guide

3 PHASE AC CIRCUIT ANALYSIS EXAMPLES



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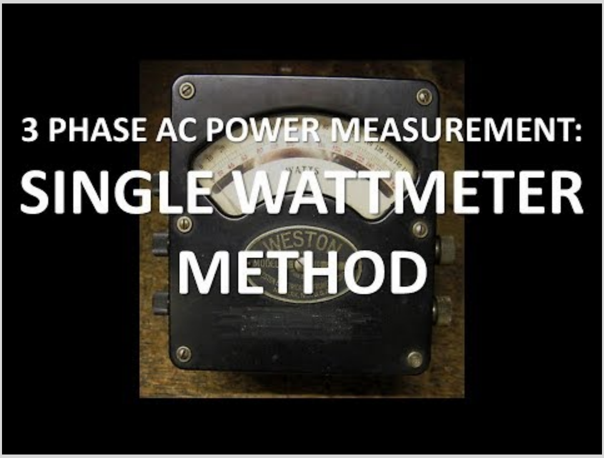
3 Phase AC Examples Study Guide

SINGLE WATTMETER METHOD



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Single Wattmeter Method Study Guide

TWO WATTMETER METHOD

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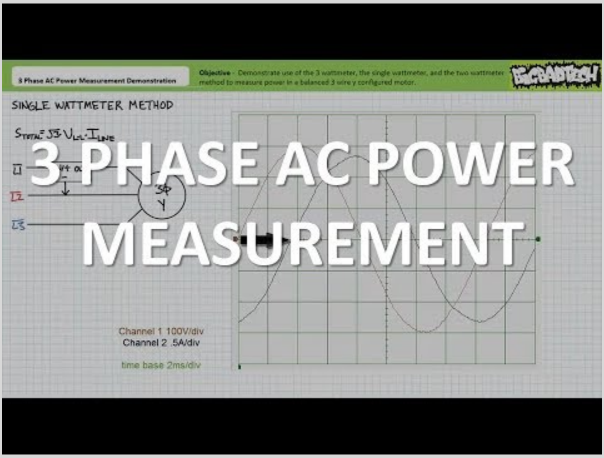
2 Wattmeter Method Study Guide

3 PHASE AC POWER MEASUREMENT EXAMPLES



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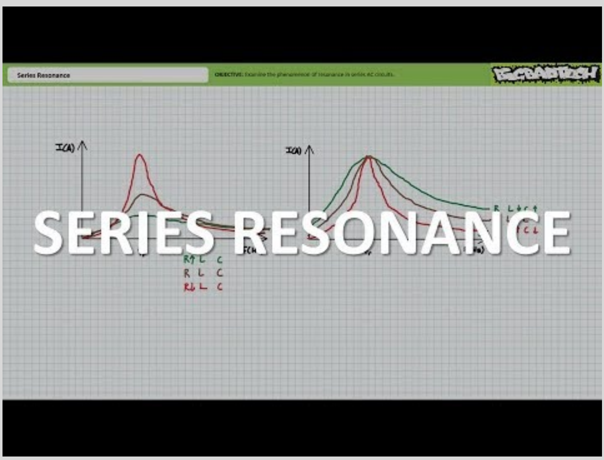
3 Phase AC Power Measurement Application Study Guide

UNIT 7: RESONANCE AND FILTERS

Objectives: Determine the resonant frequency of a series AC circuit. Evaluate electrical properties of series AC circuit at resonant and at other than resonant conditions. Determine bandwidth and quality factor of a resonant circuit. Calculate common logarithms. Use semi-log plots. Calculate gain in unit of decibels (dB). Determine the critical frequency for an RC filter. Evaluate electrical properties of RC filters below, at, and above the critical frequency. Differentiate between low and high pass RC filters.

SERIES RESONANCE



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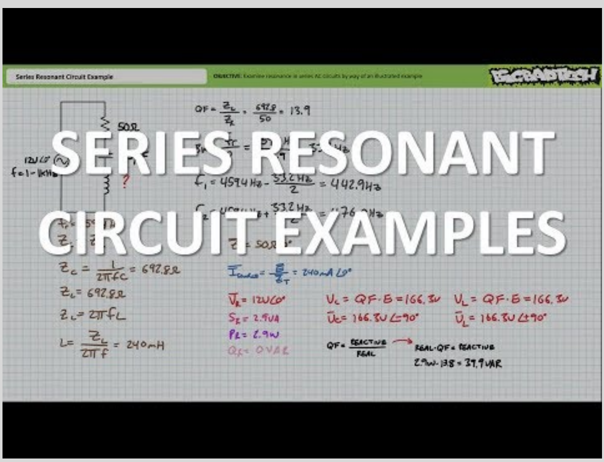
Series Resonance Study Guide

SERIES RESONANT CIRCUIT EXAMPLES



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Series Resonant Circuit Example Study Guide

LOGARITHMS AND DECIBELS

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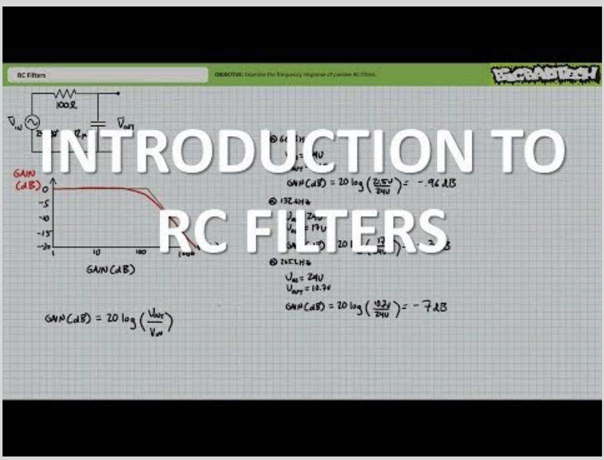
Logarithms and Decibels Study Guide

RC FILTERS



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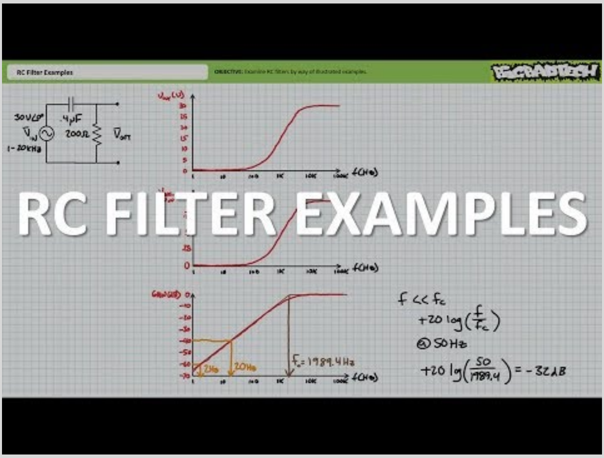
RC Filters Study Guide

RC FILTER EXAMPLES



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RC Filter Examples Study Guide

This is where you can add appendices or other back matter.

ABOUT THE AUTHOR

Jim Pytel is currently an instructor at Columbia Gorge Community College's Electro-Mechanical Technology program where he teaches basic electronics, hydraulics and pneumatics, motor control, PLCs, digital logic, and power generation and transmission. He is a former Captain in the US Army and has worked in the semiconductor manufacturing and wind power generation industries. To see more of his online content check out his YouTube channel at: https://www.youtube.com/user/bigbadtech