

## ELECTRIC CIRCUIT ANALYSIS

### CHAPTER ONE: ELECTRIC CIRCUIT ANALYSIS

#### 1.1 Principles of Complex Quantities

**Definition:** In mathematics, a complex number is an element of a number system that contains the real numbers and a specific element denoted  $j$ , called the imaginary unit, and satisfying the equation  $j^2 = -1$ . It is generally a number of the form  $z = x + jy$

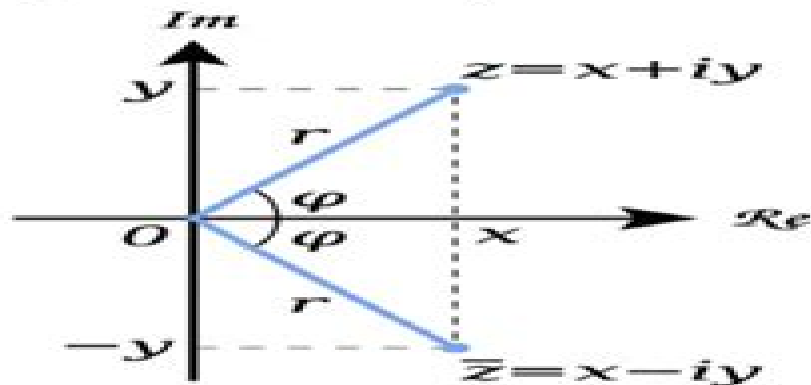
Complex number =  $z$

Real part =  $x$

Imaginary part =  $jy$

For example,  $2 + j3$  is a complex number.

#### Graphical Representation of Complex Numbers



$z = x + jy$  - positive imaginary part

$z = x - jy$  - negative imaginary part

$r$  = magnitude or modulus of  $z$  which is given by:

$$r = |z| = \sqrt{x^2 + y^2}$$

$\Phi$  = angle between  $x$  and  $r$  known as phase angle

#### Ways of expressing complex numbers

##### a) Rectangular form

The number is generally expressed as  $z = a + jb$

Rem:  $a$  and  $b$  are real numbers but due to the presence of imaginary unit  $j$ , the term  $jb$  becomes imaginary number.

##### b) Polar Form

From the graphical representation

$$\cos\Phi = x/r \text{ i.e. } x = r\cos\Phi$$

$$\sin\Phi = y/r \text{ i.e. } y = r\sin\Phi$$

$$z = r\cos\Phi + j r\sin\Phi$$

$$z = r \angle \Phi$$

# Introduction To Electric Circuit Analysis

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Engineering Technology Durham  
College), Karen Craigs, Lauren Fuentes**

## **Introduction To Electric Circuit Analysis:**

**Introduction to Electric Circuits** Herbert W. Jackson, Dale Temple, Brian Kelly, 2007-10-01     [Introduction to Electrical Circuit Analysis](#) Ozgur Ergul, 2017-06-26 A concise and original presentation of the fundamentals for new to the subject electrical engineers This book has been written for students on electrical engineering courses who don't necessarily possess prior knowledge of electrical circuits Based on the author's own teaching experience it covers the analysis of simple electrical circuits consisting of a few essential components using fundamental and well known methods and techniques Although the above content has been included in other circuit analysis books this one aims at teaching young engineers not only from electrical and electronics engineering but also from other areas such as mechanical engineering aerospace engineering mining engineering and chemical engineering with unique pedagogical features such as a puzzle like approach and negative case examples such as the unique When Things Go Wrong section at the end of each chapter Believing that the traditional texts in this area can be overwhelming for beginners the author approaches his subject by providing numerous examples for the student to solve and practice before learning more complicated components and circuits These exercises and problems will provide instructors with in class activities and tutorials thus establishing this book as the perfect complement to the more traditional texts All examples and problems contain detailed analysis of various circuits and are solved using a recipe approach providing a code that motivates students to decode and apply to real life engineering scenarios Covers the basic topics of resistors voltage and current sources capacitors and inductors Ohm's and Kirchhoff's Laws nodal and mesh analysis black box approach and Thevenin Norton equivalent circuits for both DC and AC cases in transient and steady states Aims to stimulate interest and discussion in the basics before moving on to more modern circuits with higher level components Includes more than 130 solved examples and 120 detailed exercises with supplementary solutions Accompanying website to provide supplementary materials [www.wiley.com/go/ergul4412](http://www.wiley.com/go/ergul4412)

**Introduction to Electric Circuit Analysis** Ronald J. Tocci, 1983-01-01     **Introduction to Linear Circuit Analysis and Modelling** Luis Moura, Izzat Darwazeh, 2005-03-05 Luis Moura and Izzat Darwazeh introduce linear circuit modelling and analysis applied to both electrical and electronic circuits starting with DC and progressing up to RF considering noise analysis along the way Avoiding the tendency of current textbooks to focus either on the basic electrical circuit analysis theory DC and low frequency AC frequency range on RF circuit analysis theory or on noise analysis the authors combine these subjects into the one volume to provide a comprehensive set of the main techniques for the analysis of electric circuits in these areas Taking the subject from a modelling angle this text brings together the most common and traditional circuit analysis techniques e.g phasor analysis with system and signal theory e.g the concept of system and transfer function so students can apply the theory for analysis as well as modelling of noise in a broad range of electronic circuits A highly student focused text each chapter contains exercises worked examples and end of chapter problems with an additional glossary and bibliography for

reference A balance between concepts and applications is maintained throughout Luis Moura is a Lecturer in Electronics at the University of Algarve Izzat Darwazeh is Senior Lecturer in Telecommunications at University College London previously at UMIST An innovative approach fully integrates the topics of electrical and RF circuits and noise analysis with circuit modelling Highly student focused the text includes exercises and worked examples throughout along with end of chapter problems to put theory into practice

*Introduction to Electrical Circuits Student Lab Manual* Brian Kelly, Herbert Jackson, 2007-11-12 This manual contains a collection of experiments to accompany the text *Introduction to Electric Circuits Eighth Edition* The experiments in this manual have been chosen to cover the main topics taught in foundation level courses in electrical theory and can be done with inexpensive test equipment and circuit components These experiments have been developed and refined over many years and are written in an easy to follow step by step manner There is a brief discussion at the beginning of each lab covering the theory behind the experiments to be carried out Questions are also included to test the students comprehension of the theoretical concepts verified by the experimental results and the manual is formatted to allow for the questions to be answered on the lab sheet itself if a formal report is not required

*Dorf's Introduction to Electric Circuits* Richard C. Dorf, James A. Svoboda, 2018-03-13 Dorf's *Introduction to Electric Circuits Global Edition* is designed for a one to three term course in electric circuits or linear circuit analysis The book endeavors to help students who are being exposed to electric circuits for the first time and prepares them to solve realistic problems involving these circuits Abundant design examples design problems and the How Can We Check feature illustrate the text's focus on design The Global Edition continues the expanded use of problem solving software such as PSpice and MATLAB

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**An Introduction to Circuit Analysis** Donald E. Scott, 1987-01-01

*An Introduction to Electric Circuit Analysis* Ralph Elmer Armitington, Carl Volz, 1961

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**Introduction to Electrical Circuit Analysis** Robert C. Carter,1975

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**Introduction to Circuit Analysis** John D. Cowan,Herbert S. Kirschbaum,1961

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