About This E-book

Units in Mathcad

By default, Mathcad uses units from the SI unit system (International System of Units). Mathcad offers several choices of unit systems: SI, CGS, MKS, U.S. customary units, or no unit system. Results will be displayed in the unit system you choose. The MKS unit system has been used for the calculations in this E-book. Please check the Mathcad *User's Guide* for more information on using and converting units in Mathcad.

Changing Equations and Formulas in an E-book

You can change the values of any variables, constants, or other values in an E-book to obtain different results. You can also enter your own equations and access any of the commands on the Math toolbar, including graphing.

About Electrical Power Systems Engineering

The documents in this book carry out common design calculations from electrical power systems engineering. These applications use Mathcad's complex arithmetic, matrix operators, equation solving power, and plotting capabilities to provide a reference source of Mathcad methods and formulas for students and practicing power engineers. This book includes applications in the following areas:

- Power Distribution Problems
- Protection Issues
- Electrical Transient Phenomena

These applications have been developed as tools for solving common problems in the field of power engineering, and as illustrations of a variety of useful Mathcad techniques. The material covered in these documents can be applied to solve practical problems and to review methods and techniques in common practice. It, also, illustrates the implementation of various numerical techniques for solving other problems. You are encouraged to use Mathcad interactively to become more aware of the intrinsic aspects of a problem. References on each topic are listed by section should you require more information regarding the techniques used to solve these problems.

The Layout

The chapters in this book contain a number of sections. These sections are subdivided into multiple subsections, and can sometimes span two or more Mathcad files. If it was necessary to split sections in this way, hyperlinked text is provided to move back and forth between the sections. Solved problems are always contiguous in a single document.

In each application, you will see definitions you can modify, parameters you may want to change, and usually a plot showing the results of the calculation. By changing definitions and parameters in these applications, you can adapt them to your physical constraints and solve your own engineering problems.

About the Authors

Carl J. Spezia
received his B.S. degree in Electrical Engineering from Southern Illinois University at Carbondale in 1980. He worked for eight years in power distribution, generation, and transmission for investor owned utilities and REA cooperatives. During this time, he was responsible for power flow studies, short circuit studies, power metering, substation design, and distribution and transmission line design while serving in various positions.

He completed a M.S. in Electrical Engineering at Southern Illinois University at Carbondale in December 1991 in the areas of power system analysis and power electronics. Since completing this degree, he has worked as a power systems consultant specializing in industrial, municipal, and rural power systems. He currently holds a position as Visiting Assistant Professor at the College of Technical Careers at Southern Illinois University. He is a licensed Professional Engineer in the state of Illinois and a member of the Institute of Electrical and Electronic Engineers.

Constantine I. Hatziadoniu
received his diploma in Electrical Engineering and his Professional Engineers license from the University of Patrae, Greece, in 1983. In 1987, he received his Ph.D. in Electrical Engineering from West Virginia University. He is currently an Associate Professor in the Department of Electrical Engineering at Southern Illinois University at Carbondale. His specialties include power systems transients, power electronics, HVDC systems and power transmission system modeling. He has recently participated in EPRI funded projects on insulation coordination of ac/dc substations and flexible ac transmission systems (FACTS). He has several IEEE journal publications in the areas of power delivery, power systems and circuit modeling. Dr. Hatziadoniu is a member of the IEEE Power Engineering Society, the Sigma Chi honor society, and the Illinois Academy of Science.