

# Equations

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**Abstract—This handout describes the IEEE guidelines for formatting equations and mathematical symbols. It also tells you how to add Microsoft Word’s “Equation Editor” to your toolbar.**

## I. FORMATTING EQUATIONS

Equations in a scientific paper should be visibly differentiated from the rest of the text. Set the equation off from the text by inserting a blank line both above and below the equation, which is usually centered on the line. Number each equation consecutively with equation numbers in parentheses flush with the right margin, as in (1) below.

$$a + b = c \tag{1}$$

To create a single line of text with different alignments, as in (1) above, start a new line and allow the I-beam pointer to hover across the line until a small alignment icon shows up. (When the I-beam is toward the left margin, the left justify icon will show; when it is in the center, the center icon will show; etc.) When you see the icon in the desired spot, double-click your mouse button and start typing. To get help from Microsoft Word for this feature, type “Vary alignment within a single line of text” within the help menu search box.

If the equation is too long for one line, it may be broken up into two or more lines, and the labeling number may be placed one line below (but still flush right). In this case, the first part of the equation is indented from the left, with each subsequent part tabbed further right:

$$\begin{aligned} L_k(x_k, d_k, \lambda_k) \\ = U(x_k) + \lambda_k(1 - l_k(x_k, d_k)) \\ + E_{x_{k+1} | x_k, d_k} \left\{ \max_{L_{k+1}(x_{k+1}, d_{k+1}, \lambda_{k+1}(x_{k+1}))} \right\} \end{aligned} \tag{2}$$

## II. EXPLAINING EQUATIONS

Equations must be introduced before inserting them in your text. You might do this by explaining the purpose of the equation or what type of equation it is. Remember also to define the symbols you are using either before the equation or immediately following. After inserting the equation in the text, it is often appropriate to discuss important aspects or specific elements of the equation. Refer to the equation simply as (1), not “Eq. (1)” or “equation (1),” unless you are beginning a sentence with “Equation (1) is...”

- *Example:* The kinematic states evolve dynamically according to a linear state space model (3):

$$\xi_i(t+t) = F(T)\xi_i(t) + w_i(T) \tag{3}$$

where  $F(T)$  is the state transition matrix of the target state model, and  $w_i(T)$  is the driving maneuver input.

### III. IEEE Rules for Mathematical Notation

Symbols that look like each other are not interchangeable with each other. Authors must distinguish clearly between the following terms:

- Capital and lowercase letters, when used as symbols
- Zero and the letter “O”
- Lowercase letter “l,” numeral one (1), and the prime sign ( $\rho$ )
- The letters “k” and  $\kappa$  (kappa), “u” and  $\mu$  (mu), “v” and  $\nu$  (nu), and “n” and  $\theta$  (eta)

Also, brackets must be used carefully and in the proper order:  $\{\}()$

Remember that your equation is part of the explanatory sentence that precedes it in your text. If your equation appears at the end of a sentence, you should place a period there. No other punctuation is permitted at the end of an equation. In the middle of an equation, or between an equation and its condition, other punctuation symbols, such as commas, are permitted.

### IV. USING MATHEMATICAL SYMBOLS IN MICROSOFT WORD

There are several ways to insert mathematical symbols while working in Microsoft Word. The easiest way is to click “Insert” on the toolbar, then “Symbol.” Scroll through the “Fonts” choices to find symbol sets like Arial Unicode, WP Greek Century, or WP Math. A set of pre-designed symbols will appear. Click on the symbol you want, then on “Insert” and “Close.” The symbol will appear in your text. (You may have to italicize or bold these symbols.)

A second way is to use Microsoft’s “Equations Editor,” which may or may not already be on your computer. To figure out whether you have this feature, type “Insert an equation” into the Word Help Search box. Follow the directions. If “Equation Editor” does not appear on the designated menu, you must install it from your original disk. Instructions for this may be found by typing “Troubleshoot Equation Editor” into the Word Help Search box.

Once you have the Equation Editor on your computer, you could add a shortcut to your toolbar so that you don’t have to go through the “Insert” menu every time. To add the shortcut, click on the “View” menu, then on “Toolbars.” At the bottom of the toolbars list, select “Customize.” On that menu, select “Commands.” In the Categories box on the left, select “Insert.” In the Commands box on the right, scroll down until you find “Equations Editor.” Click on that and drag it up to your toolbar. An icon should appear in your toolbar. Close the “Customize” box.

When you click on the shortcut icon, the Equation Editor will create a special equation box at any point in your text. A special toolbar will also appear on your screen. Use the toolbar to select symbols, brackets, etc. to place in the box. You may also type numbers and letters into this box. At the top of the screen, a simplified toolbar lets you select font size (including subscript and sub-subscript), style, and alignment.