



**ENGINEERING  
PROGRAM IN TECHNICAL  
COMMUNICATION**  
UNIVERSITY OF MICHIGAN

# Style: layout choices Based on design principles

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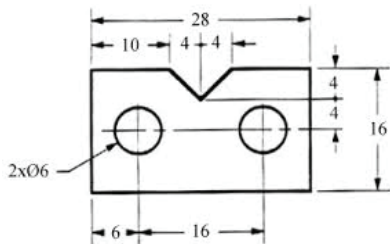
# Style: Layout Choices

## Based on design principles

This guide provides reasons that some choices in layout design are better than others.

The two samples below show two ways to arrange data around a figure. The sample on the left is a common way among student engineers; the sample on the right shows an arrangement used by many journals.

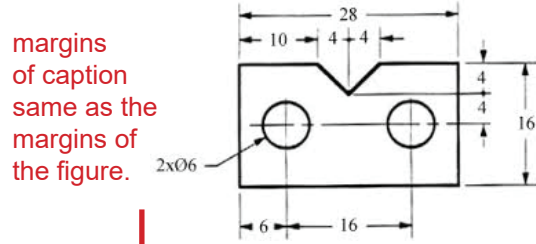
Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet. Duis fringilla ligula in metus pharetra, non interdum ipsum tempor. Praesent iaculis malesuada aliquet.



**Figure 3:** Nam scelerisque urna non nibh varius, eu hendrerit enim facilisis. Cras nisl velit, ornare sit amet sapien sit amet, blandit auctor enim.

Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod. In hac habitasse platea dictumst. Ut tristique eros pellentesque, aliquet orci sit amet, vehicula turpis. Ut nec maximus tortor. Fusce condimentum libero a blandit posuere.

Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet. Duis fringilla ligula in metus pharetra, non interdum ipsum tempor. Praesent iaculis malesuada aliquet.



margins of caption same as the margins of the figure.

font size 2 points smaller than that of the body text.

**Figure 3:** Nam scelerisque urna non nibh varius, eu hendrerit enim facilisis. Cras nisl velit, ornare sit amet sapien sit amet, blandit auctor enim.

caption closer to the figure than to the body text.

Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod. In hac habitasse platea dictumst. Ut tristique eros pellentesque, aliquet orci sit amet, vehicula turpis. Ut nec maximus tortor. Fusce condimentum libero a blandit posuere.

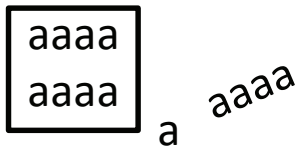
The sample on the right arranges the data better than the sample on the left because items are rearranged spatially to better show relationships. At right, the caption now is closer to the figure than it was at left, and its font size is smaller (2 points) than the font size of the body text. Finally, the margins of the caption at right are the same as the margins of the figure. These three changes in layout at right link the caption to the figure more clearly than the layout shown in the sample at left.

This guide covers five design principles and shows their application in common engineering documents such as a lab report and an IEEE journal article.

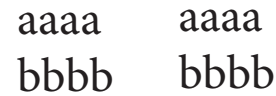
Applying these five principles can improve the visual style of documents and help readers.

# Five principles of document design

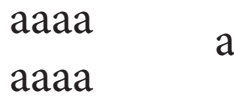
1. Closure: a closed shape defines a group.



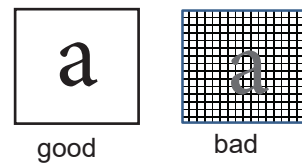
4. Symmetry: balanced items seem complete.



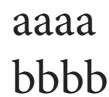
2. Proximity: items close together appear related.



5. Figure/Ground segregation: a figure should be distinct from its ground.



3. Similarity: items that look alike will be grouped together.

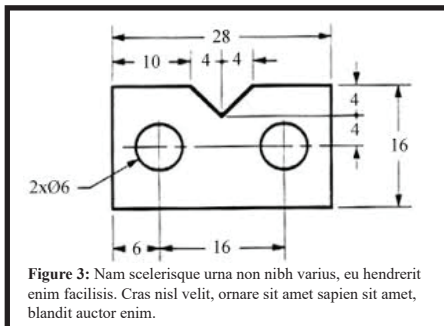


## Common applications in documents

**1. Closure:** A common problem is redundant closure whereby a box is **not** needed because white space already provides the necessary closure separating the figure/caption from the body text. Sometimes a box may be needed for emphasis or to show closure, but if not, then the box may be omitted as shown below, right.

**no**

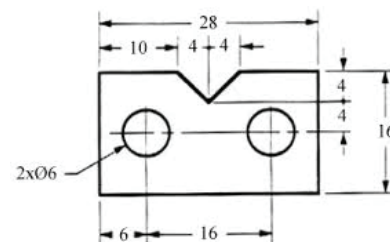
Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet.



Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod.

**yes**

Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet.



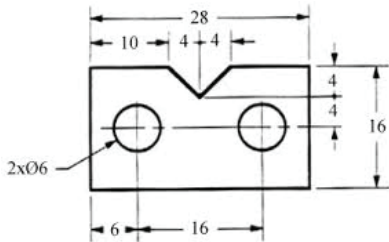
**Figure 3:** Nam scelerisque urna non nibh varius, eu hendrerit enim facilisis. Cras nisl velit, ornare sit amet sapien sit amet, blandit auctor enim.

Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod.

**2 & 3. Proximity and Similarity:** the samples from the previous page are repeated below with the added labels of proximity and similarity that identify these two principles in the improved sample at right.

**no**

Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet.



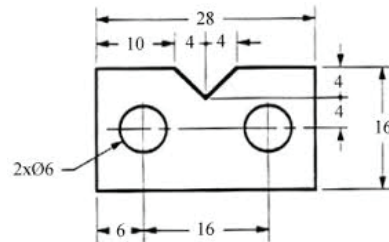
**Figure 3:** Nam scelerisque urna non nibh varius, eu hendrerit enim facilisis. Cras nisl velit, ornare sit amet sapien sit amet, blandit auctor enim.

Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod. In hac habitasse platea dictumst.

**yes**

Vestibulum ac nisi magna. Nam porttitor felis ut accumsan rutrum. Phasellus suscipit, est lacinia rhoncus cursus, turpis lorem bibendum arcu, nec viverra leo enim eget massa. Nullam blandit orci ipsum, id lacinia erat ornare sit amet.

**Similarity:** margins of caption same as that of the figure.



Font size 2 points smaller than the body text to **not** be similar

**Figure 3:** Nam scelerisque urna non nibh varius, eu hendrerit enim facilisis. Cras nisl velit, ornare sit amet sapien sit amet, blandit auctor enim.

**Proximity:** Caption closer to the figure than to the body text

Suspendisse consequat felis tortor, eu auctor nisi feugiat sed. Etiam commodo est bibendum, congue mauris vitae, eleifend lorem. Cras posuere dapibus sem tincidunt gravida. Phasellus posuere lorem ut orci sagittis, ac congue lectus euismod. In hac habitasse platea dictumst.

**4. Symmetry (balance):** Balanced titles.

**no**

A Competitive Robot for Playing Air Hockey with Human Beings

**yes**

A Competitive Robot for Playing Air Hockey with Human Beings

These five design principles often overlap. In the sample at left, the unit “human beings” is split onto the next line, thus violating closure and proximity. The revision at right thus corrects three principles: symmetry, closure, and proximity.

**5. Figure/Ground segregation**

**no**

Shading Can Often Cause Problems

**yes**

Shading Can Often Cause Problems

The sample at left shows a common problem among engineers: the temptation to over-design. Many options are available to embellish text and visuals, yet some options distract from the content and from good readability. At left, more ink is given to the design than to the data.

**6. Design principles in context:** The spread on the next two pages shows these design principles in context. Some engineering professors prescribe the IEEE format for students’ final reports. The left-facing page shows violations of the principles (with commentary) on the first page of an IEEE-style report, and the right-facing page shows the corrections.

# Lorem ipsum dolor sit amet consectetur adipiscing

figure/ground segregation  
(whispering title).  
Not as distinct as it could  
be from the body text.

bad symmetry elit bad closure  
(split unit)

First A. Author, Second B. Author, Third C. Author, Fourth D.

bad symmetry Author bad closure  
(split unit)

bad similarity, symmetry  
(jumping horizon)

**Abstract**—Duis a auctor augue. Vivamus in pretium risus. Curabitur sit amet vulputate mi, eu mattis urna. Fusce augue magna, bibendum rhoncus tincidunt eget, suscipit vitae mi. Fusce augue nibh, eleifend in erat id, dapibus congue libero. Aliquam vel aliquam neque, id cursus nibh. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Fusce vitae facilisis odio, ut auctor sem. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos. Maecenas suscipit ex a cursus semper. Sed consequat dolor quis aliquam pharetra. Aliquam sagittis quam et pulvinar interdum. Morbi fermentum enim nec tempor feugiat. Morbi mi erat, cursus posuere gravida ac, cursus at ligula. Nam mattis aliquam lacus nec ultricies. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Cras ac purus mattis, tristique sapien eget, aliquet justo. Nullam eget cursus diam, eu pellentesque sem. Donec eros ante, scelerisque eget leo at, euismod pharetra lacus.

Duis a auctor augue. Vivamus in pretium risus. Curabitur sit amet vulputate mi, eu mattis urna. Fusce augue magna, bibendum rhoncus tincidunt eget, suscipit vitae mi. Fusce augue nibh, eleifend in erat id, dapibus congue libero. Aliquam vel aliquam neque, id cursus nibh. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.

bad similarity: same level of heading  
but at different indentation

## II. FUSCE VITAE FACILISIS ODIO

Aliquam erat volutpat. Nunc et fermentum sem. Proin luctus arcu posuere ullamcorper dapibus. Mauris auctor, dolor a luctus laoreet, lorem purus lobortis sapien, id bibendum libero urna et urna. Quisque fermentum dolor eu metus dictum, quis venenatis.

bad similarity, shift  
in right justification

### A. Proin egestas faucibus quam

Aliquam ornare risus non sagittis vestibulum. Mauris suscipit nunc vel tristique feugiat. Nullam commodo nibh ut mauris vestibulum hendrerit. fringilla condimentum purus leo non felis (Figure 1). Maecenas tristique dapibus ligula, sed consequat ipsum. Morbi dignissim consequat auctor. Aliquam erat volutpat. Phasellus at tortor id tortor imperdiet tristique. Suspendisse egestas, nulla sit um metus, fringilla condimentum purus leo non felis.

Figure 1: Donec in feugiat augue. Pellentesque et tristique tortor. Ut lobortis lorem pellentesque risus tempor tempor. Praesent nisl purus, gravida a velit a, molestie consectetur erat.  
bad proximity: caption closer to body text than to figure.  
bad similarity: caption same font size as body text.



### B. Praesent nisl purus, gravida a velit a faucibus

Nulla arcu sapien, pellentesque ut malesuada ut, porttitor vitae ante. Proin vehicula velit libero, non faucibus mauris congue id. Fusce efficitur quis mauris vel iaculis. Curabitur sit amet sem gravida, sollicitudin lacus non, ultrices risus. In hac habitasse platea dictumst. Phasellus at tortor id tortor imperdiet tristique. Suspendisse egestas, nulla sit amet gravida pellentesque, metus urna fermentum metus, fringilla condimentum

Index Terms—Abacus, Botticelli, Caiphaz, Demothenes, Euripedes. Franconian, Grancel, Holothenes, Iphigenia.  
bad similarity to IEEE style;  
drop cap too large  
unequal spacing  
among words  
(bad similarity)

## I. INTRODUCTION

**C**RAS PELLENTESQUE vulputate enim, convallis aliquam nisi malesuada a. Sed blandit, turpis at molestie laoreet, diam nisl cursus nunc, sed ultricies eros arcu sit amet nibh. Vestibulum iaculis erat a arcu rutrum malesuada. Aliquam erat volutpat. Nunc et fermentum sem. Proin luctus arcu posuere ullamcorper dapibus. Mauris auctor, dolor a luctus laoreet, lorem purus lobortis sapien, id bibendum libero urna et urna. Quisque fermentum dolor eu metus dictum, quis venenatis

In non nisl sit amet risus tristique luctus id id lectus. Nullam venenatis ex odio, eu sodales lorem varius et. Donec in feugiat augue. Pellentesque et tristique tortor. Ut lobortis lorem pellentesque risus tempor tempor. Praesent nisl purus, gravida a velit

a, molestie consectetur erat. Donec est tellus, convallis in lacus eget, consectetur tristique elit. Maecenas finibus diam pharetra, faucibus sapien in, accumsan velit. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae.

bad similarity (space between paragraph)

Aliquam erat volutpat. Vestibulum pharetra, tellus mollis lacinia cursus, purus velit sodales augue, in mattis ipsum nunc sed libero. Aliquam laoreet magna dui, et laoreet justo interdum a. Duis aliquam nec lorem vel pharetra.

Nulla arcu sapien, pellentesque ut malesuada ut, porttitor vitae ante. Proin vehicula velit libero, non faucibus mauris congue id Praesent nisl purus, gravida a velit a, molestie consectetur erat.

# Lorem ipsum dolor sit amet consectetur adipiscing elit

First A. Author, Second B. Author, Third C. Author, Fourth D. Author

**Abstract**—Duis a auctor augue. Vivamus in pretium risus. Curabitur sit amet vulputate mi, eu mattis urna. Fusce augue magna, bibendum rhoncus tincidunt eget, suscipit vitae mi. Fusce augue nibh, eleifend in erat id, dapibus congue libero. Aliquam vel aliquam neque, id cursus nibh. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Fusce vitae facilisis odio, ut auctor sem. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos. Maecenas suscipit ex a cursus semper. Sed consequat dolor quis aliquam pharetra. Aliquam sagittis quam et pulvinar interdum. Morbi fermentum enim nec tempor feugiat. Nulla ac placerat magna. Morbi mi erat, cursus posuere gravida ac, cursus at ligula. Nam mattis aliquam lacus nec ultricies. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Cras ac purus mattis, tristique sapien eget, aliquet justo. Nullam eget cursus diam, eu pellentesque sem. Donec eros ante, scelerisque eget leo at, euismod pharetra lacus.

**Index terms**—Abacus, Botticelli, Caiphaz, Demothenes, Euripedes, Franconian, Grancel, Holothenes, Iphigenia.

## I. INTRODUCTION

CRAS PELLENTESQUE vulputate enim, convallis aliquam nisi malesuada a. Sed blandit, turpis at molestie laoreet, diam nisl cursus nunc, sed ultricies eros arcu sit amet nibh. Vestibulum iaculis erat a arcu rutrum malesuada. Aliquam erat volutpat. Nunc et fermentum sem. Proin luctus arcu posuere ullamcorper dapibus. Mauris auctor, dolor a luctus laoreet, lorem purus lobortis sapien, id bibendum libero urna et urna. Quisque fermentum dolor eu metus dictum, quis venenatis

In non nisl sit amet risus tristique luctus id id lectus. Nullam venenatis ex odio, eu sodales lorem varius et. Donec in feugiat augue. Pellentesque et tristique tortor. Ut lobortis lorem pellentesque risus tempor tempor. Praesent nisl purus, gravida a velit a, molestie consectetur erat. Donec est tellus, convallis in lacus eget, consectetur tristique elit. Maecenas finibus diam pharetra, faucibus sapien in, accumsan velit. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae.

Aliquam erat volutpat. Vestibulum pharetra, tellus mollis lacinia cursus, purus velit sodales augue, in mattis ipsum nunc sed libero. Aliquam laoreet magna dui, et laoreet justo interdum a. Duis aliquam nec lorem vel pharetra.

Nulla arcu sapien, pellentesque ut malesuada ut, porttitor vitae ante. Proin vehicula velit libero, non faucibus mauris congue id Praesent nisl purus, gravida a velit a, molestie consectetur erat. Donec est tellus, convallis in lacus eget, consectetur tristique elit. Maecenas finibus diam pharetra, faucibus sapien in, accumsan velit. Vestibulum ante ipsum

Duis a auctor augue. Vivamus in pretium risus. Curabitur sit amet vulputate mi, eu mattis urna. Fusce augue magna, bibendum rhoncus tincidunt eget, suscipit vitae mi. Fusce augue nibh, eleifend in erat id, dapibus congue libero. Aliquam vel aliquam neque, id cursus nibh. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.

## II. FUSCE VITAE FACILISIS ODIO

Aliquam erat volutpat. Nunc et fermentum sem. Proin luctus arcu posuere ullamcorper dapibus. Mauris auctor, dolor a luctus laoreet, lorem purus lobortis sapien, id bibendum libero urna et urna. Quisque fermentum dolor eu metus dictum, quis venenatis .

### A. Proin egestas faucibus quam

Aliquam ornare risus non sagittis vestibulum. Mauris suscipit nunc vel tristique feugiat. Nullam commodo nibh ut mauris vestibulum hendrerit. Phasellus at tortor id tortor imperdiet tristique. Suspendisse egestas, nulla sit amet gravida pellentesque, metus urna fermentum metus, fringilla condimentum purus leo non felis (Figure 1). Maecenas tristique dapibus ligula, sed consequat ipsum. Morbi dignissim consequat auctor. Aliquam erat volutpat. Phasellus at tortor id tortor imperdiet tristique. Suspendisse egestas, nulla sit um metus, fringilla condimentum purus leo non felis.

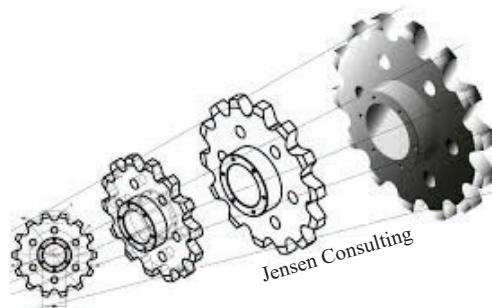


Figure 1: Donec in feugiat augue. Pellentesque et tristique tortor. Ut lobortis lorem pellentesque risus tempor tempor. Praesent nisl purus, gravida a velit a, molestie consectetur erat.

### B. Praesent nisl purus, gravida a velit a faucibus

Nulla arcu sapien, pellentesque ut malesuada ut, porttitor vitae ante. Proin vehicula velit libero, non faucibus mauris congue id. Fusce efficitur quis mauris vel iaculis. Curabitur sit amet sem gravida, sollicitudin lacus non, ultrices risus. In hac habitasse platea dictumst. Phasellus at tortor id tortor imperdiet tristique. Suspendisse egestas, nulla sit amet gravida pellentesque, metus urna fermentum metus, fringilla condimentum

## Comments

1. A common feature in student texts is unequal spacing among the words, known as bad tracking. It is caused in Microsoft products when authors justify the right margins to have the text look professional. This phenomenon is more frequent in narrow columns of text, especially in two-column text.

Writers can correct bad tracking by setting the right margin as ragged (shown at right) or by using professional-grade software such as Adobe InDesign.

bad tracking (spaces among words and not equal, similar)

Donec eu erat in sapien ultrices feugiat. Sed magna dui, dignissim sed pulvinar et, dignissim ut metus. Nam eros metus, maximus a rcu eget, viverra rutrum urna. Integer nec ligula vel eros dapibus lobortis vitae ac sapien. Maecenas congue sit amet libero eget venenatis. Praesent fermentum lacus ut bibendum laoreet. Curabitur hendrerit fringilla dui, id convallis diam commodo ac. Integer maximus dui orci, eget semper risus vehicula nec.

unequal spacing fixed by setting a ragged right margin

Donec eu erat in sapien ultrices feugiat. Sed magna dui, dignissim sed pulvinar et, dignissim ut metus. Nam eros metus, maximus a arcu eget, viverra rutrum urna. Integer nec ligula vel eros dapibus lobortis vitae ac sapien. Maecenas congue sit amet libero eget venenatis. Praesent fermentum lacus ut bibendum laoreet. Curabitur hendrerit fringilla dui, id convallis diam commodo ac. Integer maximus dui orci, eget semper risus vehicula nec.

2. The five design principles are based on “Gestalt Theory and Instructional Design” by Patrick Moore and Chad Fitz, *JTWC* vol. 23(2) 137-157, 1993.