

OUR RESEARCH PAPER: THE LATEST DEVELOPMENTS IN CUTTING-EDGE ENGINEERING

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ABSTRACT

This paper is an example and template for the `asmeconf` class. Papers typeset in this class will follow ASME Conference guidelines for margins, fonts, headings, captions, and reference formats. Standard \LaTeX commands are used. The class is compatible with the `hyperref` package. The class defines new environments for abstract and nomenclature. The optional argument of `\section` has been modified for manually setting pdf bookmarks when macros or complicated mathematics are included in section headings. The class is intended to be used with the `asmeconf.bst` \BibTeX style, which is part of this distribution. The class may be invoked with several options, most of which address math fonts. The class calls a number of packages, all of which are in \TeX LIVE and on CTAN (ctan.org).

Keywords: ASME, Paper, Template, \LaTeX , Research

INTRODUCTION

For ASME conference papers, the labels Figure and Equation should be abbreviated when they do not start a sentence, as in Fig. 1 and Eq. (2). Figure 1 is spelled out when it starts a sentence. Equation (2) is spelled out when it starts a sentence.

References are automatically numbered [1]. They should be inserted at the appropriate point using a `\cite{ref}` command [2, 3]. The references will be automatically sorted and

compressed as well if they are given in a set [1–7]. See the `asmeconf-sample.bib` file for examples of how to enter your references.

Equations are typeset in the usual way. The class file loads the `amsmath` and `mathtools` packages. Further, the `newtxmath` package used for the math fonts includes many additional features.

$$\vec{q} = -k\nabla T \quad (1)$$

ASME does not specify a standard nomenclature list. Be sure to put your symbols into the nomenclature list, including SI units.

Section Headings and Captions

ASME requires that section headings and captions be set in an uppercase, bold face, sans serif font. The class will do this automatically. You can place `\cite{.}`, `\ref{.}`, `\label{.}`, and into headings and captions directly, as you would in the main text. Do not enclose them braces, e.g. `{\cite{.}}`, which will cause errors. You can place `\footnote{.}` into headings, but not into captions.¹

Simple math can be used in either captions or section headings, but see the `asmeconf.tex` source file for examples of how to deal with more complicated expressions.

To get bold math, you can use the `\bm{.}` macro from the `bm` package, which is loaded by the class. To get sans serif math, you can use `\mathsf{.}`. So, you can write `\bm{\mathsf{A+B}}`

¹See `tex-stackexchange` for various approaches to footnotes in captions, if you really want to have them.

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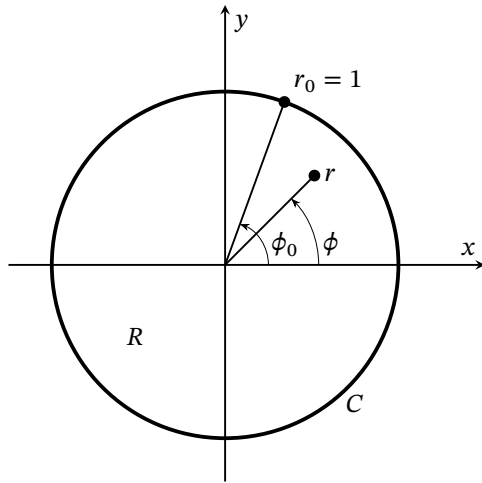


FIGURE 1. A FIGURE CAPTION WITH MATH, $z = (r, \phi)$ [8]

to put a bold, sans serif expression in a caption. The class file provides for sans serif greek letters by using `\sfa\alpha` and similar expressions (e.g. $\alpha, \beta, \gamma, \delta \dots$) for use in captions and headings (see Fig. 1).

For a section heading that includes more complicated math (and macros), you may use the optional argument of `\section[...]{...}` to create a pdf bookmark without losing characters or producing warnings or errors. See the `asmeconf.tex` source file for examples of this. These bookmarks should usually be text expressions, although some math is supported.

Text in section headings and captions will not be capitalized if enclosed in a `\NoCaseChange{...}` command.

Subsection Headings in Title Case. Subsections and subsection headings should be in title case (first letter of primary words capitalized). The rest of this text uses Latin to show layout and usage. Refer to the `.tex` file for further details.

Latin for Layout. Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultricies tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetur.

TABLE 1. A SIMPLE TABLE

Experiment	u [m/s]	T [°C]
Run 11	12.5	103.4
Run 12	24	68.3

TABLE 2. TABLE WITH MORE COMPLICATED COLUMNS

Experiment	u [m/s]	T [°C]
The first test we ran this morning	124.3	68.3
The second test we ran this morning	82.50	103.46
Our competitor's test	72.321	141.384

MATH IN A SECTION HEADING: $\vec{u} \cdot \vec{\omega} = 0$

Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu. Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel, nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium, ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas vel, odio.

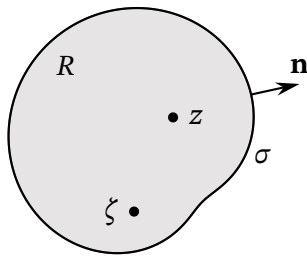
Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

ENTROPY GENERATION² IS ALWAYS INTERESTING AND IMPORTANT [9]

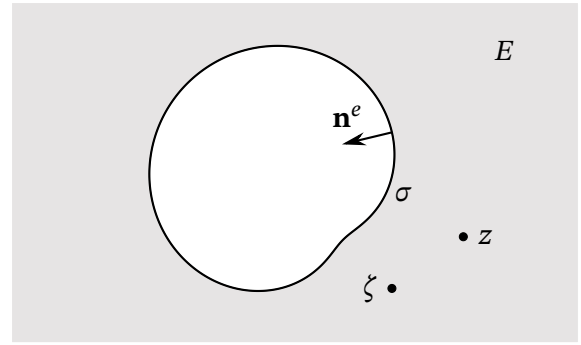
Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Donec odio elit, dictum in,

²If you have text in a section heading or caption that you do not want to be capitalized, enclose it in a `\NoCaseChange` command.



(a) Interior region



(b) Exterior region

FIGURE 2. A FIGURE WITH TWO SUBFIGURES [8]

hendrerit sit amet, egestas sed, leo. Praesent feugiat sapien aliquet odio. Integer vitae justo. Aliquam vestibulum fringilla lorem. Sed neque lectus, consectetur at, consectetur sed, eleifend ac, lectus. Nulla facilisi. Pellentesque eget lectus. Proin eu metus. Sed porttitor. In hac habitasse platea dictumst. Suspendisse eu lectus. Ut mi mi, lacinia sit amet, placerat et, mollis vitae, dui. Sed ante tellus, tristique ut, iaculis eu, malesuada ac, dui. Mauris nibh leo, facilisis non, adipiscing quis, ultrices a, dui.

Subsection with Math: \dot{S}_{gen} [9].

Suspendisse vitae elit. Aliquam arcu neque, ornare in, ullamcorper quis, commodo eu, libero. Fusce sagittis erat at erat tristique mollis. Maecenas sapien libero, molestie et, lobortis in, sodales eget, dui. Morbi ultrices rutrum lorem. Nam elementum ullamcorper leo. Morbi dui. Aliquam sagittis. Nunc placerat. Pellentesque tristique sodales est. Maecenas imperdiet lacinia velit. Cras non urna. Morbi eros pede, suscipit ac, varius vel, egestas non, eros. Praesent malesuada, diam id pretium elementum, eros sem dictum tortor, vel consectetur odio sem sed wisi.

Sub-subsection³ Heading. Etiam euismod. Fusce facilisis lacinia dui. Suspendisse potenti. In mi erat, cursus id, nonummy sed, ullamcorper eget, sapien. Praesent pretium, magna in eleifend egestas, pede pede pretium lorem, quis consectetur tortor sapien facilisis magna. Mauris quis magna varius nulla scelerisque imperdiet. Aliquam non quam. Aliquam porttitor quam a lacus. Praesent vel arcu ut tortor cursus volutpat. In vitae pede quis diam bibendum placerat. Fusce elementum convallis neque. Sed dolor orci, scelerisque ac, dapibus nec, ultricies ut, mi. Duis nec dui quis leo sagittis commodo.

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum

³Another longer footnote to show the leading and line breaking, and how it will sit at the bottom of a column. Another longer footnote to show the leading and line breaking, and how it will sit at the bottom of a column.

ut, massa. Fusce ultrices nulla et nisl.

$$d\vec{w} = \begin{pmatrix} du \\ dv \end{pmatrix} = \underbrace{\begin{pmatrix} \partial u/\partial x & \partial u/\partial y \\ \partial v/\partial x & \partial v/\partial y \end{pmatrix}}_{=J_1} \begin{pmatrix} dx \\ dy \end{pmatrix} \quad (2)$$

Nulla mattis luctus nulla. Duis commodo velit at leo. Aliquam vulputate magna et leo. Nam vestibulum ullamcorper leo. Vestibulum condimentum rutrum mauris. Donec id mauris. Morbi molestie justo et pede. Vivamus eget turpis sed nisl cursus tempor. Curabitur mollis sapien condimentum nunc. In wisi nisl, malesuada at, dignissim sit amet, lobortis in, odio. Aenean consequat arcu a ante. Pellentesque porta elit sit amet orci. Etiam at turpis nec elit ultricies imperdiet. Nulla facilisi. In hac habitasse platea dictumst. Suspendisse viverra aliquam risus. Nullam pede justo, molestie nonummy, scelerisque eu, facilisis vel, arcu.

ACKNOWLEDGEMENTS

Curabitur tellus magna, porttitor a, commodo a, commodo in, tortor. Donec interdum. Praesent scelerisque. Maecenas posuere sodales odio. Vivamus metus lacus, varius quis, imperdiet quis, rhoncus a, turpis. Etiam ligula arcu, elementum a, venenatis quis, sollicitudin sed, metus. Donec nunc pede, tincidunt in, venenatis vitae, faucibus vel, nibh. Pellentesque wisi. Nullam malesuada. Morbi ut tellus ut pede tincidunt porta. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam congue neque id dolor.

NOMENCLATURE

Roman letters

- k Thermal conductivity [W m⁻¹ K⁻¹]
 \vec{q} Heat flux vector [W m⁻²]

Greek letters

- α Thermal diffusivity [m² s⁻¹]
 ν Kinematic viscosity [m² s⁻¹]

Dimensionless groups

- Pr Prandtl number, ν/α

Superscripts and subscripts

- b bulk value
 ∞ free stream value

TABLE 3. A TABLE SPANNING TWO COLUMNS

x	$\text{erf}(x)$	$\text{erfc}(x)$	x	$\text{erf}(x)$	$\text{erfc}(x)$
0.00	0.00000	1.00000	1.10	0.88021	0.11980
0.05	0.05637	0.94363	1.20	0.91031	0.08969
0.10	0.11246	0.88754	1.30	0.93401	0.06599
0.15	0.16800	0.83200	1.40	0.95229	0.04771
0.20	0.22270	0.77730	1.50	0.96611	0.03389
0.30	0.32863	0.67137	1.60	0.97635	0.02365
0.40	0.42839	0.57161	1.70	0.98379	0.01621
0.50	0.52050	0.47950	1.80	0.98909	0.01091
0.60	0.60386	0.39614	1.8214	0.99000	0.01000
0.70	0.67780	0.32220	1.90	0.99279	0.00721
0.80	0.74210	0.25790	2.00	0.99532	0.00468
0.90	0.79691	0.20309	2.50	0.99959	0.00041
1.00	0.84270	0.15730	3.00	0.99998	0.00002

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APPENDIX A: THE VECTOR PRODUCT $\vec{A} \times \vec{B}$

Etiam pede massa, dapibus vitae, rhoncus in, placerat posuere, odio. Vestibulum luctus commodo lacus. Morbi lacus dui, tempor sed, euismod eget, condimentum at, tortor. Phasellus aliquet odio ac lacus tempor faucibus. Praesent sed sem. Praesent iaculis. Cras rhoncus tellus sed justo ullamcorper sagittis. Donec quis orci. Sed ut tortor quis tellus euismod tincidunt. Suspendisse congue nisl eu elit. Aliquam tortor diam, tempus id, tristique eget, sodales vel, nulla. Praesent tellus mi, condimentum sed, viverra at, consectetur quis, lectus. In auctor vehicula orci. Sed pede sapien, euismod in, suscipit in, pharetra placerat, metus. Vivamus commodo dui non odio. Donec et felis.

$$\frac{d\Gamma}{dt} = \int_C \frac{D\mathbf{u}}{Dt} \cdot d\mathbf{r} \quad (3)$$

$$= \iint_S \nabla \times \frac{D\mathbf{u}}{Dt} \cdot d\mathbf{A} \quad (4)$$

$$= \iint_S \nabla p \times \nabla \left(\frac{1}{\rho} \right) \cdot d\mathbf{A} \quad (5)$$

Subsection Heading

Etiam suscipit aliquam arcu. Aliquam sit amet est ac purus bibendum congue. Sed in eros. Morbi non orci. Pellentesque mattis lacinia elit. Fusce molestie velit in ligula. Nullam et orci vitae nibh vulputate auctor. Aliquam eget purus. Nulla auctor wisi sed ipsum. Morbi porttitor tellus ac enim. Fusce ornare. Proin ipsum enim, tincidunt in, ornare venenatis, molestie a, augue. Donec vel pede in lacus sagittis porta. Sed hendrerit ipsum quis nisl. Suspendisse quis massa ac nibh pretium cursus. Sed sodales. Nam eu neque quis pede dignissim ornare. Maecenas eu purus ac urna tincidunt congue.