

Thesis title long title very long title indeed a long title so  
long that it goes to next line

*Thesis submitted to the  
Indian Institute of Technology Kharagpur  
In partial fulfillment for the award of the degree*

*of*

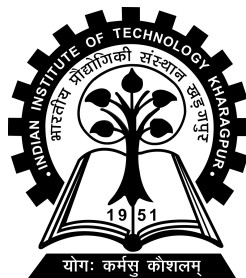
**Degree Title**

*by*

**Mech. Student A and Mech. Student B  
00ME10001 and 00ME10002**

Under the guidance of

**Mech Supervisor**



**MECHANICAL ENGINEERING**

**INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR**

Month 20xx

© Mech. Student A and Mech. Student B. All rights reserved.



# CERTIFICATE

This is to certify that the thesis entitled **Thesis title long title very long title indeed a long title so long that it goes to next line**, submitted by **Mech. Student A and Mech. Student B** to the Indian Institute of Technology Kharagpur, is a record of bona fide research work under my supervision and I consider it worthy of consideration for the award of the degree of **Degree Title** of the Institute.

---

**Supervisor**

**Date:**



## DECLARATION

I certify that

- a. The work contained in the thesis is original and has been done by myself under the general supervision of my supervisor.
- b. The work has not been submitted to any other Institute for any degree or diploma.
- c. I have followed the guidelines provided by the Institute in writing the thesis.
- d. I have conformed to the norms and guidelines in the Ethical Code of Conduct of the Institute.
- e. Whenever I have used materials (data, theoretical analysis, and text) from other sources, I have given due credit to them by citing them in the text of the thesis and giving their details in the references.
- f. Whenever I have quoted written materials from other sources, I have put them under quotation marks and given due credit to the sources by citing them and giving required details in the references.

**Signature of the Student**



# ACKNOWLEDGEMENTS

plenty of waffle, plenty of waffle, plenty of waffle, plenty of waffle, plenty of waffle,  
plenty of waffle, plenty of waffle, plenty of waffle.





# LIST OF SYMBOLS AND ABBREVIATIONS



# ABSTRACT

plenty of waffle, plenty of waffle, plenty of waffle, plenty of waffle, plenty of waffle,  
plenty of waffle, plenty of waffle, plenty of waffle.



# Contents

Certificate	iii
Declaration	v
Acknowledgements	vii
List of Symbols and Abbreviations	ix
Abstract	xi
<b>1 Sample Title</b>	<b>1</b>
1.1 On Referencing . . . . .	1
1.1.1 Citations within the text . . . . .	1
1.1.1.1 Author names form part of the sentence . . . . .	2
1.1.1.2 Author names do not form part of the sentence . . .	3
1.1.2 List of References . . . . .	4
<b>2 Sample Title</b>	<b>7</b>
<b>3 Summary and Conclusions</b>	<b>13</b>
<b>A Sample Title</b>	<b>15</b>
<b>B Sample Title</b>	<b>17</b>
References	18

# Chapter 1

## Sample Title

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

### 1.1 On Referencing

The whole business of referencing has two components to it: the citations within the text and the list of references at the end.

#### 1.1.1 Citations within the text

When you wish to cite a particular reference that you have used to do your research, you have at your disposal various citation styles: the numerical style, the author-year style, the author-number style, and so on. Far too often, I have seen that while at one place in the report, the numerical style of citation, like [1], is used to refer to a paper, at another place in the report, the author-year style is used, like (Cui et al., 2013). At IIT Kharagpur, the recommended style is a particular flavour of the author-year style called the Harvard style.<sup>1</sup>

---

<sup>1</sup>Actually, what IIT Kharagpur prescribes is a slight variation on top of the Harvard style.

A citation to a reference in the author-year style can appear in two primary ways within the text:

- The names of the authors form part of the sentence.
- The names of the authors do not form part of a sentence.

In the following, some important points regarding these two ways of citation, as recommended by IIT Kharagpur, are mentioned:

#### 1.1.1.1 Author names form part of the sentence

In certain sentences you will need to include the names of the author(s) in the sentence itself. For example

“The theory of special relativity was proposed by Einstein (1905).”

There are some finer points involved here:

- Use ONLY the surname of authors. **Do NOT use the full name or abbreviated name. The following are wrong:**

“A. Einstein (1905) proposed the theory of special relativity.”

“The influence of surface mechanics was investigated by Yang-Tse Cheng and M. Verbrugge (2008).”

- For certain sentence constructions, you will need to respect the singular or plural sense. If there is only author, use the singular verb. If there are multiple authors, use the plural verb.

“Einstein (1905) was responsible for proposing the theory of special relativity.”

“Cheng and Verbrugge (2008) have investigated the influence of surface mechanics.”

- If there are three or more authors, use the first author’s surname followed by *et al.* For example:

“Cui et al. (2013) have studied the influence of interface-reaction on lithium diffusion in silicon.”

- If the same author or group of authors have multiple papers, then the following citation style must be used:

“The influence of surface mechanics has been investigated by Cheng and Verbrugge (2008, 2009).”

Notice, in the above, that the different years are separated by comma. The years **MUST** be in chronological order.

- If the same author or group of authors have multiple papers in the same year, the the following citation style must be used:

“Two important structural issues in cylindrical anode particles were investigated by Chakraborty et al. (2015*a,b*).”

#### **1.1.1.2 Author names do not form part of the sentence**

If the sentence you are writing is such that it just needs to be supported by a reference, the citation must be placed within parentheses. For example:

“An entire field of research was opened in physics by the proposition of the theory of relativity (Einstein, 1905).”

Some finer points are described below:

- Notice, in the above example, that there is a comma between the surname and the year.
- Again, **ONLY** the surnames of author(s) must be used.
- Notice, again in the above example, that even if the citation is removed, the sentence is grammatically correct and makes complete sense. It is a major point of difference from the previous style where the names of the authors were part of the sentence.
- **The following examples are NOT correct:**

“An entirely new field of physics was opened by (Einstein, 1905).”

“The paper by (Einstein, 1905) opened an entirely new field of physics.”



- It is not necessary that the citation be placed at the end of the sentence. A citation may appear at any appropriate place within the sentence. There may be multiple sets of references spread throughout the sentence. For example:

“Various facets associated with diffusion-induced stresses have been studied ranging from surface mechanics (Cheng and Verbrugge, 2008), buckling (Chakraborty et al., 2015*a*), and length increase (Chakraborty et al., 2015*b*).”

- If you need to put more than one reference within parentheses, use semi-colons to separate them. For example:

“Mathematical models of silicon anodes in lithium-ion batteries have included various features like diffusion-induced stress and stress-influenced diffusion (Cheng and Verbrugge, 2008; Cui et al., 2013).”

**VERY IMPORTANT:** Overall, every reference that is cited within the text must correspondingly appear in the Reference list at the end. Conversely, every reference appearing in the Reference list must have been cited at least once somewhere in the text.

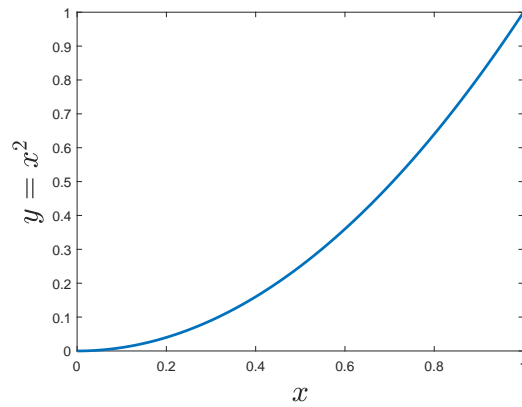
### 1.1.2 List of References

Please go through the list of References at the end of this document very carefully and note the following sequence of items:

- The surnames appear first, followed by the initials.
- The names are followed by the year of publication (within brackets).
- Then the title of the paper appears within single quotes. Capital letters should not be arbitrarily sprinkled within the title. Capital letters **MUST** be used where necessary; for example, “Li-ion battery”.
- The next item is the name of the journal (in italics) where appropriate capitalization has been used. Not every word is capitalized. For example, “of”, “the”, “and” are in small letters.

- The journal name is followed by the volume number in bold.
- Finally, the page numbers appear. Certain journals assign only an article number instead of page numbers.

The sequence described above with proper punctuations and formatting **MUST** be maintained uniformly across all references.





# Chapter 2

## Sample Title

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.

A number of different conventions are used by different authors to denote scalars, vectors, and tensors and other mathematical entities. However, there are ISO standard specifications for these. In the following, some of these specifications are mentioned in addition to some well-established rules of mathematical typesetting:

- The overarching rule is that symbols representing variables or physical quantities are in italics.
- Scalars are in italics. For example:

length:  $l$   
temperature:  $T$

- Vectors are in bold italics. For example:

velocity:  $\mathbf{v}$ ,  
position vector in the reference configuration:  $\mathbf{X}$ ,  
position vector in the current configuration:  $\mathbf{x}$ .

- Tensors are in sans-serif bold italics. For example:

deformation gradient:  $\boldsymbol{F}$ ,  
 finite strain tensor:  $\boldsymbol{E}$ ,  
 stress tensor:  $\boldsymbol{\sigma}$  (sans serif is not applicable here).

- Mathematical constants are upright. For example:

pi:  $\pi = 3.1416\dots$  (note the difference with  $\pi$ ),  
 Euler number:  $e = 2.7182\dots$ ,  
 the imaginary unit:  $i = \sqrt{-1}$ .

- Mathematical operators are upright. For example:

ordinary differential:  $d$  (as in  $\frac{dy}{dx}$ ),  
 variational operator:  $\delta$  (note the difference with  $\delta$ ).

- Partial derivatives should be expressed using the  $\partial$  operator, never the  $\delta$  operator or anything else:  $\frac{\partial y}{\partial x}$

- Mathematical functions are upright. For example:

$\sin x$     (**never**  $\sin x$ ),  
 $\cos x$     (**never**  $\cos x$ ),  
 $\log x$     (**never**  $\log x$ ),  
 $\sinh x$     (**never**  $\sinh x$ ) and so on.

- In lists where ellipsis (...) are used, commas should be used after each term in the list and also after the ellipsis points if the list ends with a final term. For example:

$n = 0, 1, 2, \dots$     (**not**  $n = 0, 1, 2 \dots$ ),  
 $x_1, x_2, \dots, x_n$     (**not**  $x_1, x_2, \dots x_n$ ).

Notice, in the above, that the ellipsis points are on the baseline. Compare the difference with the next point.

- In long sums or relations involving ellipsis, the symbols should be appear on either side of the ellipsis points. Furthermore, the ellipsis points should be vertically centered between the symbols. For example:

$$x_1 + x_2 + \cdots + x_n \quad (\text{not } x_1 + x_2 + \cdots + x_n),$$

$$a_1 < a_2 < \cdots < a_n \quad (\text{not } a_1 < a_2 < \cdots < a_n).$$

- Multiplication is usually signified by placing the factors side-by-side without the explicit use of any dot or ‘ $\times$ ’ sign. Thus,

$abc$  means the product of  $a$ ,  $b$ , and  $c$ .

- The ‘ $\times$ ’ sign may sometimes be used to represent product, depending on the context. However, note the particular sign; it is **not ‘ $\times$ ’ or the ‘ $*$ ’ sign.**
- When the vector cross product is to be represented, the bold ‘ $\times$ ’ must be used. For example:

$$\mathbf{a} \times \mathbf{b} \quad (\text{not } \mathbf{a} \times \mathbf{b})$$

- When the dot product is to be represented, the bold centred dot ‘ $\cdot$ ’ must be used. For example:

$$\mathbf{a} \cdot \mathbf{b} \quad (\text{not } \mathbf{a} \cdot \mathbf{b} \text{ or } \mathbf{a}.\mathbf{b})$$

- When operations using the gradient operator are to be used, the bold ‘ $\nabla$ ’ instead of the plain ‘ $\nabla$ ’ must be used. For example:

Curl of a vector:  $\nabla \times \mathbf{v}$ ,

Divergence of a vector:  $\nabla \cdot \mathbf{v}$ ,

Gradient of a scalar:  $\nabla \varphi$ .

- There are subtle differences between the minus sign ‘ $-$ ’, the hyphen ‘ $-$ ’, and what are referred to in typography as the en dash ‘ $-$ ’ and the em dash ‘ $—$ ’. Let us set them side by side: the minus, the hyphen, the en dash, and the em dash, respectively:

$-$ ,  $-$ ,  $-$ ,  $—$

From the above, it may appear that there is barely any difference between the minus sign and the en dash. But the spacing around them is supposed to be different. You can use Unicode to typeset these. If you are on MS Word, type 2212 and then press Alt+X; it will display the minus sign. For the en dash, type 2013 and then press Alt+X. For the em dash, it is 2014. Unless you are a typography geek, don’t worry too much about the difference between the minus sign and the en dash. In any case, the *very* subtle differences between the minus sign and the en dash may not even display properly depending on the hardware and/or software you are using! So go ahead and use them interchangeably.<sup>1</sup>

- There is a tendency among many people to use the hyphen ‘ $-$ ’ interchangeably with the minus sign ‘ $-$ ’. That’s completely wrong, and please don’t do it.<sup>2</sup>

$$-2, -v \quad (\text{not } -2 \text{ or } -v).$$

---

<sup>1</sup>The world will *not* burn.

<sup>2</sup>The world will *still* not burn if you do. But, why shy away from adding a little beauty to the world?

## Chapter 3

# Summary and Conclusions

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.





# Appendix A

## Sample Title

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.



# Appendix B

## Sample Title

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.



# Bibliography

- Chakraborty, J., Please, C. P., Goriely, A. and Chapman, S. J. (2015*a*), ‘Combining mechanical and chemical effects in the deformation and failure of a cylindrical electrode particle in a Li-ion battery’, *International Journal of Solids and Structures* **54**, 66–81.
- Chakraborty, J., Please, C. P., Goriely, A. and Chapman, S. J. (2015*b*), ‘Influence of constraints on axial growth reduction of cylindrical Li-ion battery electrode particles’, *Journal of Power Sources* **279**, 746–758.
- Cheng, Y.-T. and Verbrugge, M. W. (2008), ‘The influence of surface mechanics on diffusion induced stresses within spherical nanoparticles’, *Journal of Applied Physics* **104**, 083521.
- Cheng, Y.-T. and Verbrugge, M. W. (2009), ‘Evolution of stress within a spherical insertion electrode particle under potentiostatic and galvanostatic operation’, *Journal of Power Sources* **190**, 453–460.
- Cui, Z., Gao, F. and Qu, J. (2013), ‘Interface-reaction controlled diffusion in binary solids with applications to lithiation of silicon in lithium-ion batteries’, *Journal of the Mechanics and Physics of Solids* **61**, 293–310.
- Einstein, A. (1905), ‘Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]’, *Annalen der Physik* **322**(10), 891–921.