

Methods Training

Scholarship, Posters and Thesis

(English)

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Spring 2018

Day	Date	Session	Topic
1	13-02-2019	Morning (9:00 – 12:00)	Introduction
1	13-02-2019	Morning	Scholarship and research
1	13-02-2019	Morning	Taking notes
1	13-02-2019	Afternoon (13:00 – 15:30)	Posters
1	13-02-2019	Afternoon	Intro to Linux, desktop, command line
1	13-02-2019	Afternoon (15:30 – 18:00)	Personal working time (poster)
2	14-02-2019	Morning	Citations
2	14-02-2019	Morning	Literature searching and bibtex files
2	14-02-2019	Morning	Reference management (Citavi and Jabref)
2	14-02-2019	Afternoon	Inkscape & (Python3 ?)
2	14-02-2019	Afternoon	Personal working time (poster)
3	15-02-2019	Morning	Research questions and hypotheses
3	15-02-2019	Morning	Writing your thesis and personal time line
3	15-02-2019	Morning	FAQ thesis, L ^A T _E X
3	15-02-2019	Afternoon	Personal working time (poster)
	17-02-2019	Night (21:00)	Final PDF uploaded to LEA
4	18-02-2019	Morning 9:00	Poster PDF must be delivered to printshop
4	18-02-2019	Morning (1 hr)	FAQ thesis
4	18-02-2019	Morning 10:00	Library seminar
4	18-02-2019	Afternoon	Significant figures and rounding
4	18-02-2019	Afternoon	Course evaluations, Python3
5	19-02-2019	Morning	Ethics
5	19-02-2019	Morning	Poster Advertisement
5	19-02-2019	Afternoon	Poster presentation
	??-??-2019	08:00-11:00	Poster Session at the Niehl training center

Questions or comments from last lecture(s)?

German and English Thesis Examples and Template:

https://gitlab.com/k.n.kirschner/H-BRS_Thesis_Template.git

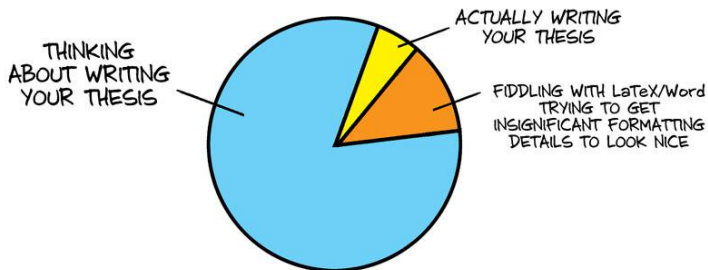
FAQ About Thesis:

LEA → EMT-Studieninfos → Prüfungen → FAQ →
Häufige Fragen zu Prüfungsangelegenheiten →
Prüfungsinformationen für alle EMT-Studiengänge: →
Fragen zur Abschlusssarbeit und zum Kolloquim

Bib-Cloud – <https://www.h-brs.de/en/bib/cloud-storage-keep-your-files-safe-bibcloud>

Your Bachelor Thesis

WRITING YOUR THESIS:



JORGE CHAM © 2015

WWW.PHDCOMICS.COM

Online Location:

LEA → EMT-Studieninfos → Prüfungen → FAQ → Häufige Fragen zu Prüfungsangelegenheiten → Prüfungsinformationen für alle EMT-Studiengänge:
→ Fragen zur Abschlusssarbeit und zum Kolloquim

**Ultimately, YOU are responsible for getting
information for finishing
your degree and thesis.**

(e.g. forms, deadlines & dates, requirements, etc.)

1 Wie finde ich ein Thema für meine Abschlussarbeit? How do I find a topic for my thesis?

- From problems that arise during a practical semester - ask your host company
- Search the website of companies that you are interest in
- LEA → EMT-Studieninfos → Stellenbörse (Job Market)
- On the wall next to the department head's office & on often on professor walls/doors
- Contact individual professor/researchers (they have idea or you have an idea)

2 Was muss ich beim Start meiner Abschlussarbeit beachten?
What do I have to consider when starting my thesis?

- Apply for admission at least 3 weeks before your desired start date (SIS [Das Studierendeninformationssystem] → “Zulassung/Anmeldung Abschlussarbeit”)
- From the date of issue, you have 4 months to finish.

3 Ich benötige eine Verlängerung der Bearbeitungszeit für meine Abschlussarbeit. Was muss ich tun?

I need an extension of the processing time for my thesis. What do I have to do?

- Can be extended by a maximum of four weeks **when justified (i.e. the delay's cause was not seen in advance)**. Not included in this are company holidays (ie. known in advance)
- To the first examiner - send an informal but well-formed application for extension in good time (i.e. 2 weeks before due thesis due date)
- From there, it will be forwarded to a committee and you will then receive a letter.
- **This can only be done once.**

- 4 Ich bin während der Bearbeitung meiner Abschlussarbeit erkrankt.
Was ist dabei zu beachten?
I am ill while working on my thesis. What is to be considered?

- Must have a doctor's note (ärztliche Bescheinigung)
- Submit informally to Prüfungssekretariat or Vorsitzenden des Prüfungsausschusses
- For very serious illness/hospital stays, contact Prüfungssekretariat or the Prüfungsausschussvorsitzenden to figure out what to do next

5 Welche Vorgaben gibt es hinsichtlich Umfang, Form und Gestaltung der Abschlussarbeit?

What are the requirements with regard to the scope, form and design of the thesis?

- Talk to your examiners
- Final thesis binding requirement: must be formally bound (talk to the print shop) (glue, metal binding is good) (plastic binding is not)
- See template (later) and talk to adviser for fontsize, spacing, etc.

6 Wie muss mein Deckblatt gestaltet sein?

How must my title page be designed?

The title page is the first page (i.e. not the cover)

It must contain:

- Bonn-Rhein-Sieg University of Applied Sciences
- Department of Electrical Engineering, Mechanical Engineering and Technical Journalism
- Bachelor or Master thesis
- Final title (**must be identical to Ausgabeschreiben** - if not, then it will not be accepted)
- Your first and last name (including titles)
- Matrikelnummer (matriculation number)
- First and last name (including titles) of first and second examiner
- Month of submission

6 Wie muss mein Deckblatt gestaltet sein?

It may contain:

- H-BRS's logo
- Specialization of the program
- Your contact information (address, email, cell phone)
- Company and supervisor
- Full date of delivery (e.g. 28.02.2019)

- 7 Was bedeutet die “Erklärung zur Abschlussarbeit” und wo finde ich eine Vorlage?

What does the "Declaration on the final thesis" mean and where can I find a template?

- A statement that you did the thesis work and writing yourself. It also specifies ethical code of conduct (i.e. no plagiarism and proper citations).

8 Was ist ein Sperrvermerk und was ist dabei zu beachten?
What is a blocking notice and what must be observed? (Intellectual Property)

- When registering for the thesis, you indicate if your thesis is confidential
- Put the “Sperrvermerk” after the title page
- You can only do this if you have a Sperrvereinbarung signed by all parties (i.e. the company) and attached at the end of the thesis. (i.e. you can't decide this on your own as a student.)
- This includes statements about what is subject to secrecy and for how long (i.e. time period)
- A sticker will be placed upon your thesis's envelope to protect the IP

9 Was ist der Kulanzmonat? What is the month of goodwill?

- A month of goodwill to give your colloquium
- Usually ends in February/August, but can do your final test (oral) in March/September, without being charged an extra semester.
- If you want to go into a master's study, it must be done by March 31st/September 30th (note: at H-BRS, the technical master only starts in the summer term).
- Form and info: <https://www.h-brs.de/de/rueckmeldung>

10 Sie möchten auf “Nummer sicher” gehen und Ihre offizielle Bearbeitungszeit erst starten, wenn Ihre Arbeit fast fertig ist?
You want to be on the safe side and only start your official processing time when your work is almost finished?

- Thesis needs a designated start and stop date – you must be finished within 4 months + the 1 month Kulanzmonat
- Avoid cheating on this time (i.e. prolonging without declaring) - it is unethical

11 Was muss ich bei der Abgabe meiner Abschlussarbeit beachten?
What do I have to consider when submitting my thesis?

- Hand in your thesis at Prüfungssekretariat FB03 (Raum B019)
- By mail - must be postmarked on the due date
- Hand in 3 copies (one for 1st & 2nd examiner each, and one for archiving)
 - 1 The delivery date must be good
 - 2 The cover sheet must be complete
 - 3 Erklärung zur Bachelorthesis is given and signed
 - 4 Sperrvermerk
 - 5 A CD must be included in each copy that is the electronic form of the thesis

- 12 Meine firmenseitige Betreuung möchte am Kolloquium teilnehmen.
Geht das?

My company-related support would like to take part in the colloquium.
Is that possible?

Yes, in one ways (a disadvantage to you)

- You must arrange it first with your first examiner (due to the longer time period that is required → presentation + 40 minutes)
- They attend the oral presentation of your work, but then leave for the questioning and answer session. Then the formal examination begins by a discussion and question/answer time that is 40 minutes long. Note that the presentation itself will no longer count.

Instead present the work to the company itself, and use this as a practice session for the university tests.

13 Was muss ich vor meinem Kolloquium beachten?
What do I have to consider before my colloquium?

- Note: You must be enrolled at the time of your colloquium.
- You can borrow a presenter, and obtain compatible cables for connecting to the beamer)

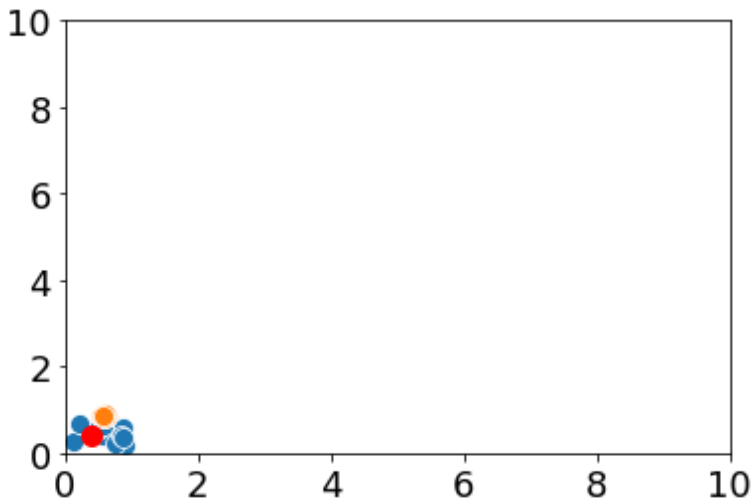


Photo by Alexander Muzenhardt on Unsplash

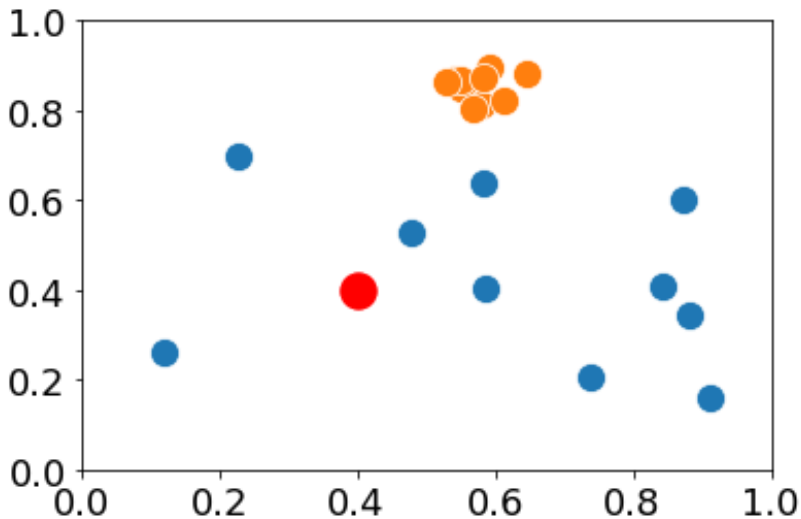
Accuracy versus Precision (and Placed into Context)

Red = target value

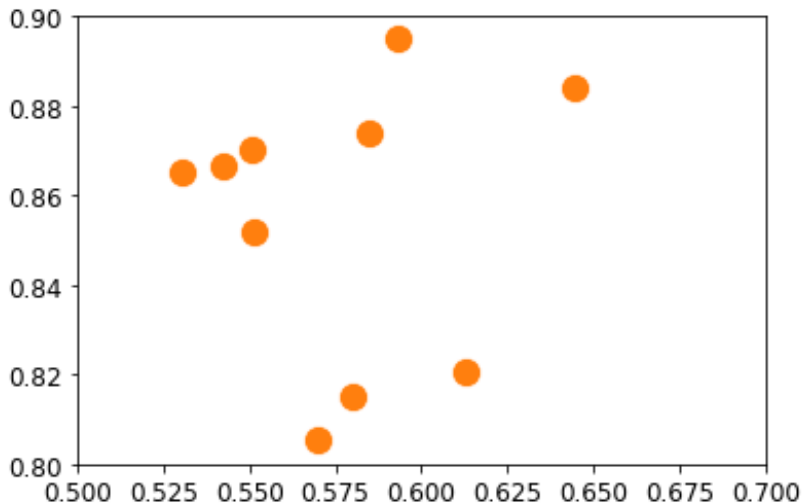
Blue and Orange = two different data sets, measure by two different people



Accuracy versus Precision



Accuracy versus Precision



Question

Three researchers are measuring the size of a device that will be fitted onto a satellite, doing this independently from one another.

One measures it to be 10.39 cm, another measures it to be 10.3 cm and the last measure it to be 10.37 cm. To give their boss their best measurement value, they average their values.

What is the average value that they should report?

Question

What about the following data:

Researcher 1: 10.36

Researcher 2: 10.3

Researcher 3: 10.35

What value is reported to the boss?

Question

"Plug and Chug" using a calculator or Python3:

$$\frac{10.39 + 10.3 + 10.37}{3} = 10.35\bar{3} \quad (1)$$

$$\frac{10.36 + 10.3 + 10.35}{3} = 10.33\bar{6} \quad (2)$$

or, heaven forbid:

$$\frac{10.4 + 10.3 + 10.4}{3} = 10.3\bar{6} \quad (3)$$

Question

However the correct answers are:

$$\frac{10.39 + 10.3 + 10.37}{3} = 10.4 \quad (4)$$

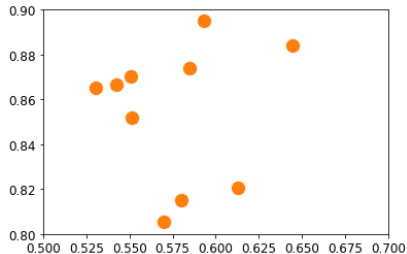
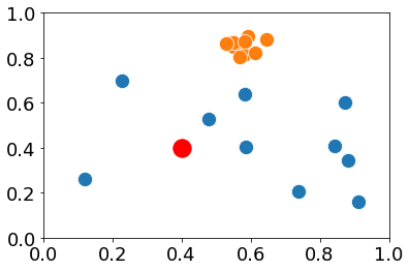
$$\frac{10.36 + 10.3 + 10.35}{3} = 10.3 \quad (5)$$

(notice the rounding to the 10^{th} decimal place)

Why report the number as XX.Y?

What are they?

Significant figures corresponds to how **precise** a measurement is.



(Hint: Look at how the numbers are reported.)

Firm Rules for Sigfigs

Rules:

- All non-zero digits are significant: 1, 2, 3, 4, 5, 6, 7, 8, 9
- Zeros between non-zero digits are significant: 102, 2005, 50009
(However the total number of sigfigs is actually unclear - we will come to this soon.)
- Leading zeros are never significant: 001, 0.02, 001.887, 0.000515
They are placeholders, putting the decimal point in the right place
(in scientific notation, they disappear: 5.15×10^{-4})
- Decimals - trailing (i.e. after a significant number) zeros are significant: 0.020

Most **number with zero at the end** are complicated.

Ask: are they or are they not place holders?

- Zeros after a decimal (e.g. 120.00) - always significant if there is a significant number before the decimal
(i.e. 0.01 has one sigfig since the leading zero is not significant)
- With a decimal (e.g. 120.) - then the zero is significant (i.e. 3 sigfigs.) This states that all of the values to the right of the decimal are exact (i.e. no rounding has occurred).

Issues surrounding zeros cont.

- Without a decimal in *inexact* numbers (e.g. 120) - the zero is formally not significant, leading to 2 sigfigs. This leads to uncertainty, because one questions if there should or should not be a decimal place.

Example: a measured weight of 100 g. How precise is this number?
Have two numbers been average to give this number?

Often it is **assumed** to be at the one's place, but it could be 100.0 or 99.8 g.

Possibilities:

$$\frac{120+80}{2} = 100 \text{ (imprecise due to the following examples)}$$

$$\frac{119.7+80.0}{2} \approx 100 \text{ (rounding the final value of 99.85 up to 100)}$$

$$\frac{120.+80.}{2} = 100. \text{ (i.e. precise to the one's place)}$$

$$\frac{120.0+80.0}{2} = 100.0 \text{ (i.e. precise to the tenth's place)}$$

Examples

- 1.23×10^2 and 110. \leftarrow 3 sigfigs
- 123.00 and 0.0012300 \leftarrow both have 5 sigfigs
- 100 versus 100. or 1.00×10^2 \leftarrow 1 (unclear) versus 3 sigfigs
- 120 versus 1.2×10^2 \leftarrow 2 (but unclear) versus 2 (clear) sigfigs
(alternative scientific notation: 1.2E+2)

Addition and Subtraction - requires that the answer's number has places after the decimal that is equal to the least number of decimals present in the sum

Examples:

- $7.1 + 2.3 = 9.4$
- $5,500.000 + 111.111 = 5,611.111$
- $1.6 + 12.4 = 14.0$
- $10.4 + 10. = 2.0 \times 10^1$ (convert 10. to 1.0×10^1)

- $0.003 + 0.02 = 0.02$
- $2,333.3333 + 22.22 = 2,355.55$

Multiplication and Division - requires that the answer's number has places equal to the number of least amount of significant figures used in the calculation

Examples:

- $8.21 \times 2.32 = 19.0$ (unrounded value = 19.0472)
- $8.210 \times 2.32 = 19.0$
- $8.210 \times 2.320 = 19.05$
- $1230 \times 2.000 = 2.46 \times 10^2$
- $1230. \times 2.00 = 2.46 \times 10^2$
- $1.00 \times 20.07 = 20.1$
- $8.2 \times 12.3 = 1.0 \times 10^2$ (unrounded value = 100.86)

Exact Numbers; Mathematical and Physical Constants

Exact Number: have an infinite number of significant figures

- 100 cm in 1 m - both numbers are exact
- 2 molecules (e.g. a quantity without fractions)
- 2 times c

Mathematical Constants: are infinite or approximate provided:

- π (Pi): ca. 3.14159 26535 89793 23846
- e (Euler's constant): ca. 2.71828 18284 59045 23536
- $\sqrt{2}$ (Pythagoras's constant): ca. 1.41421 35623 73095 04880

Physical constants: measured to a specific precision

- c (speed of light in a vacuum): 299 792 458 m s^{-1} (exact)
- h (Planck constant): 6.626 070 040(81) $\times 10^{-34}$ J s
- <https://physics.nist.gov/cuu/Constants>

(Parenthesis: one-standard-deviation uncertainty in the last 2 digits of the value.)

Rounding Numbers

Round Half Up

(i.e. more positive)

■ $7.6 \rightarrow 8$

■ $7.5 \rightarrow 8$

■ $7.4 \rightarrow 7$

■ $-7.6 \rightarrow -8$

■ $-7.5 \rightarrow -7$

■ $-7.4 \rightarrow -7$

Round Half Down

(i.e. more negative)

■ $7.5 \rightarrow 7$

■ $-7.5 \rightarrow -8$

Round Half To Zero

(i.e. bias towards zero)

■ $7.5 \rightarrow 7$

■ $-7.5 \rightarrow -7$

Round Half Away Zero

(i.e. bias towards infinities)

■ $7.5 \rightarrow 8$

■ $-7.5 \rightarrow -8$

https://en.wikipedia.org/wiki/Rounding#Types_of_rounding

Rounding Numbers

Free from positive/negative bias and bias toward/away from zero

Round Half To Even

(i.e. zero is considered even)

- $7.5 \rightarrow 8$
- $8.5 \rightarrow 8$
- $-7.5 \rightarrow -8$
- $-8.5 \rightarrow -8$

Round Half To Odd

(i.e. zero is considered even)

- $7.5 \rightarrow 7$
 - $8.5 \rightarrow 9$
 - $-7.5 \rightarrow -7$
 - $-8.5 \rightarrow -9$
-

Python3:

```
print( round(2.5) ) → 2
```

```
print( round(1.5) ) → 2
```

```
print( round(2.51) ) → 3
```

Thus, Python3's round function uses **Round Half To Even**

Rounding Numbers

Python3:

`print(round(2.5))` → 2

`print(round(1.5))` → 2

`print(round(2.51))` → 3

Thus, Python3's built in round function uses **Round Half To Even**

Numpy's around `print(numpy.around(1.5))` → 2

`print(numpy.around(2.5))` → 2

`print(numpy.around(2.51))` → 2

Thus, Numpy's around function uses Round Half To Even