



Aalto University

# CHEM-E5145

## Materials for Renewable Energy

Course Intro  
10.1.2019

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If you want to invent something new,  
Do not do what you always do.

By: Albert Einstein

# Workshop timetable

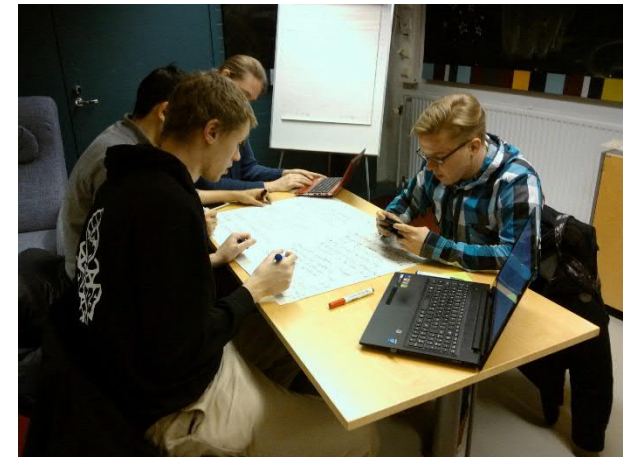
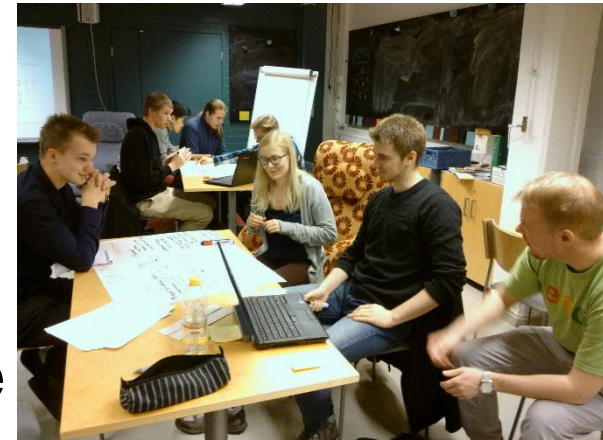
- 8.30- 9.00 Introduction to the course
- 9.00 – 9.30 Teams + Renewable energy production
- 9.30-9.45 Energy production wrap-up

Break 15 min.

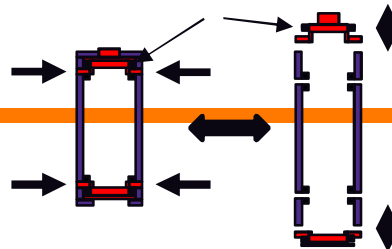
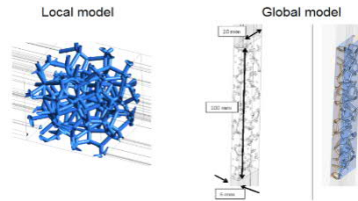
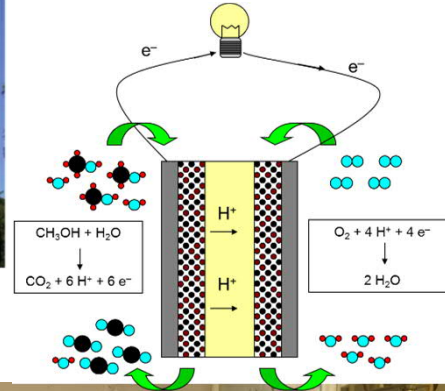
- 10 – 10.20 Energy storage posters
- 10.25-11.00 Energy storage wrap-up

Break 15 min.

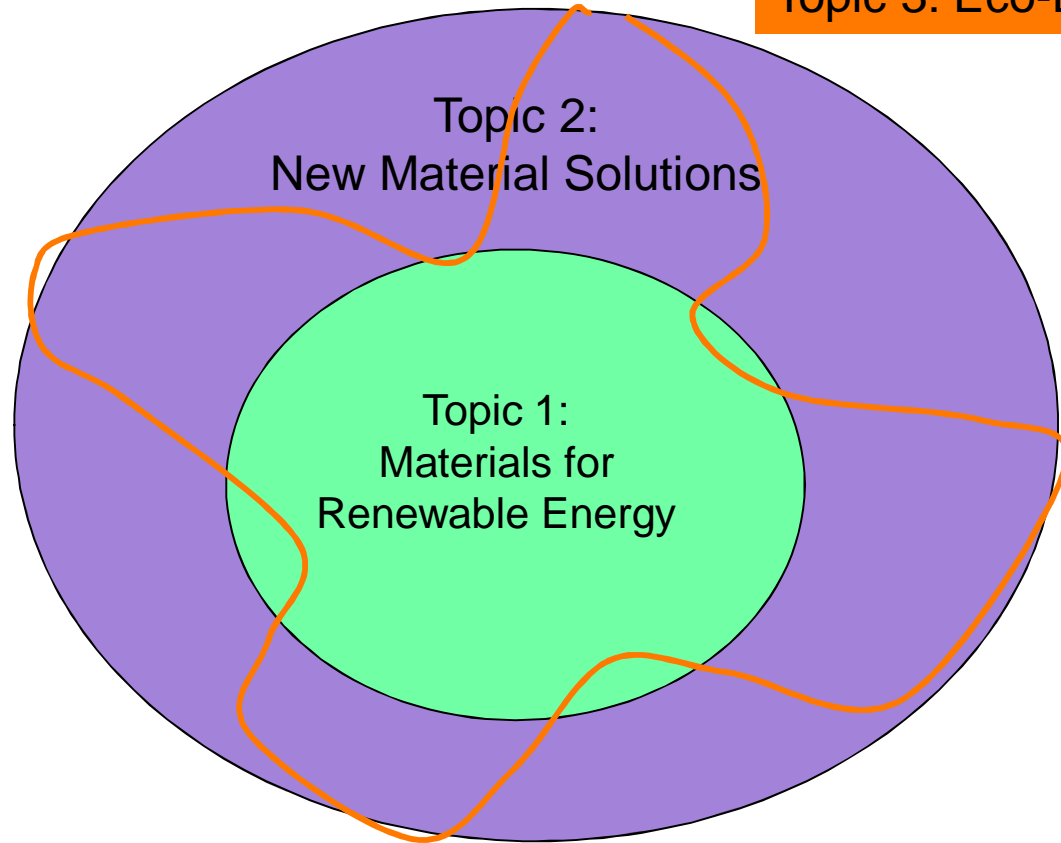
- 11.15-12.00 Task 1 and 2 Topics  
Task 1 instructions



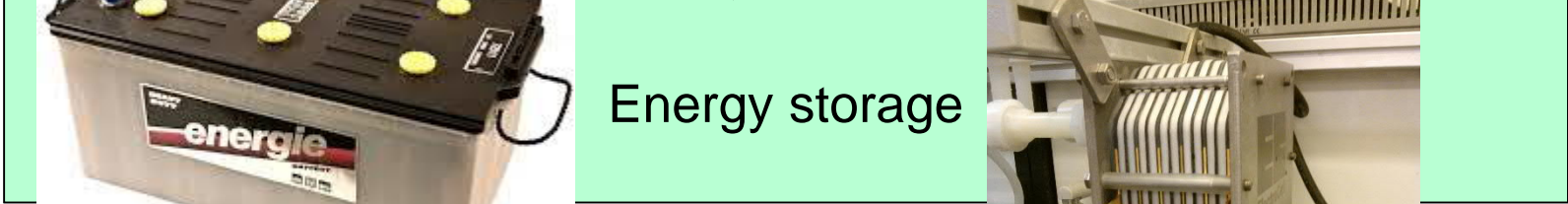
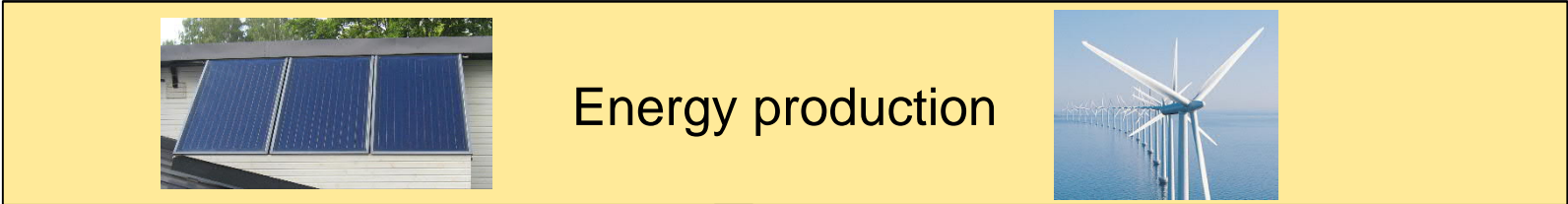
# Annikka Santasalo-Aarnio, Energy Conversion and Storage



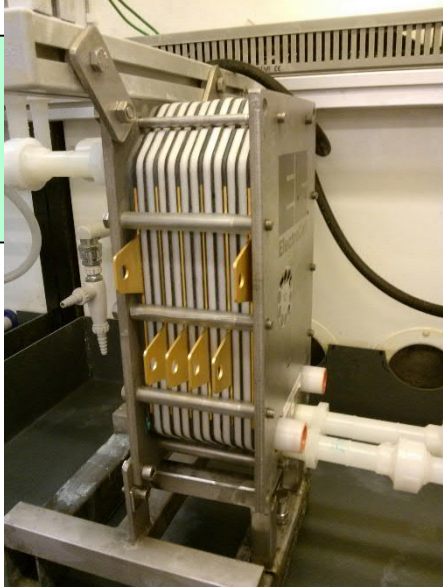
Topic 3: Eco-Design



# Topic 1 – Materials for Renewable Energy

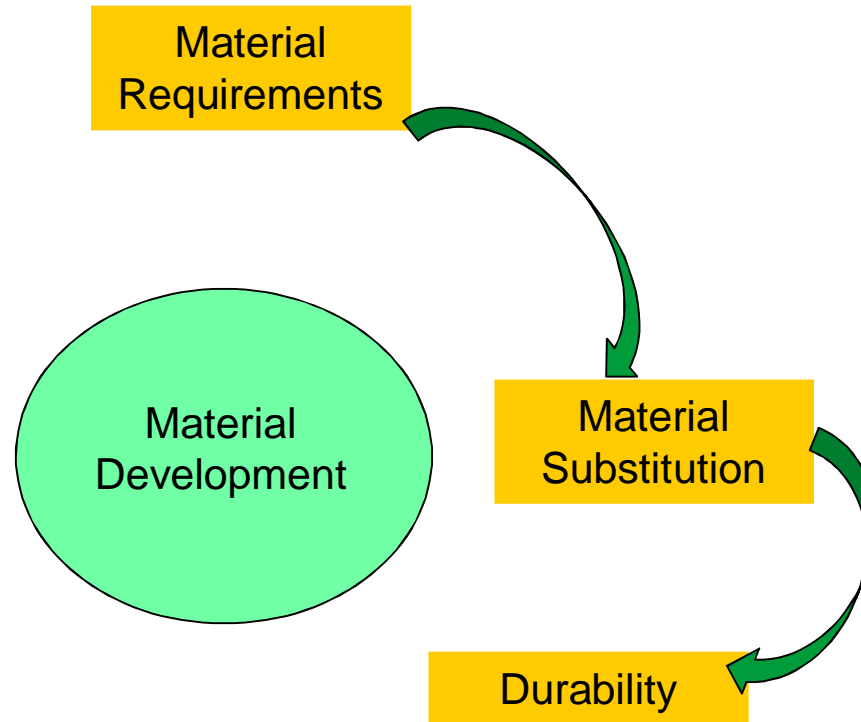


[www.akkutalo.fi](http://www.akkutalo.fi)

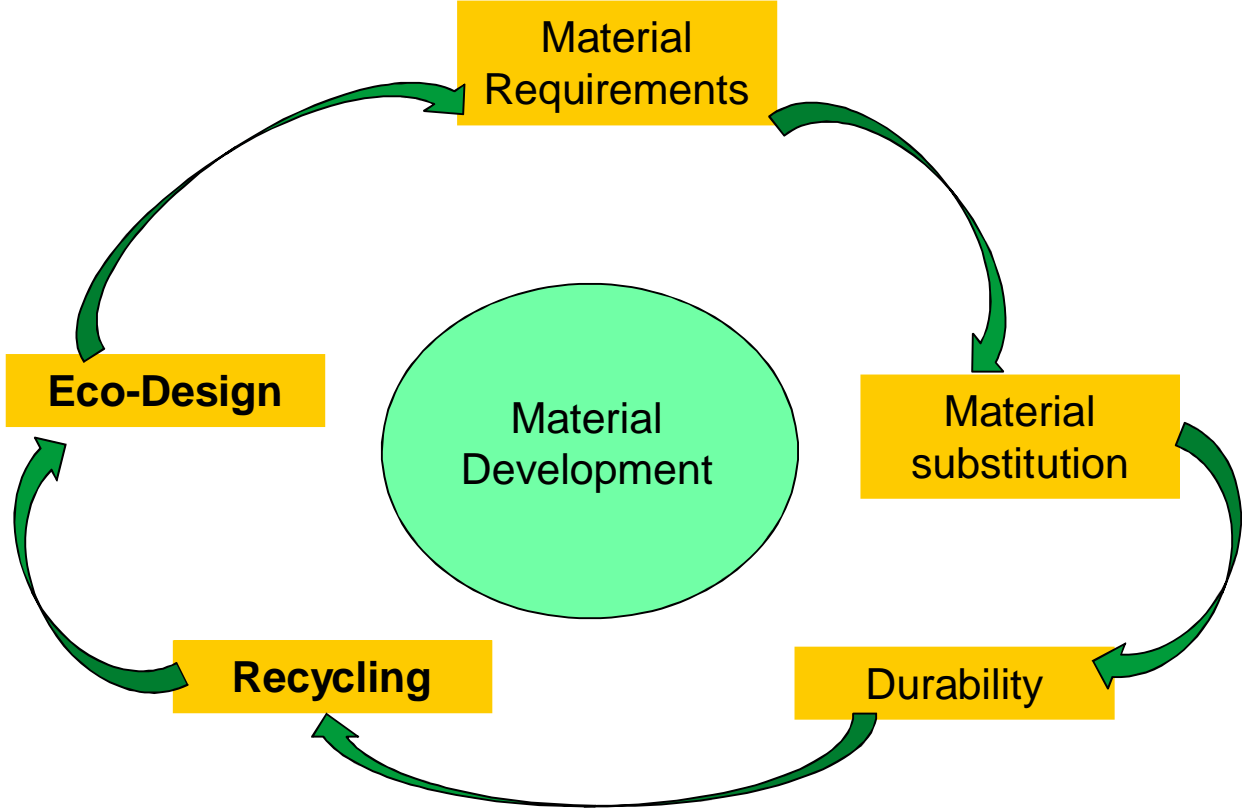




# Topic 2 – New Materials Solutions



# Topic 3 – Eco-Design





# Indentent learning outcomes (ILO)

Recognize state-of-the-art materials currently used in renewable energy systems

Identify common degradation mechanisms in these applications

Develop new material solutions and eco-designs

Share the expertise of ones field in a heterogenius team

Justify material selection with scientific argumentation

## Other Energy Material courses

- **CHEM-E4255 Electrochemical Energy Conversion**  
Period II  
Department of Chemistry and Material Science
- **CHEM-E5215 Materials for Nuclear Power Plants**  
Periods III and IV  
Department of Chemistry and Material Science

# Teaching schedule – Periode III

Week	Flip reports	Topic	Group work
1	-	Course Intro + Renewable Energy Systems	Energy calculations
2	Flip I	WS: New Material Solutions (NMS)	Energy calculations
3	Flip II	WS: Degradation	NMS
4	Flip III	WS: Material Substitution	NMS
5	Flip IV	WS: Recycling challenge Excursion (TBA)	Eco-design
6	Flip V	WS: Eco-Design	Eco-design
8	-	Presenting the final work	Eco-design

# Flip the classroom – Teaching method

You read the material beforehand

We will process the material at the workshop

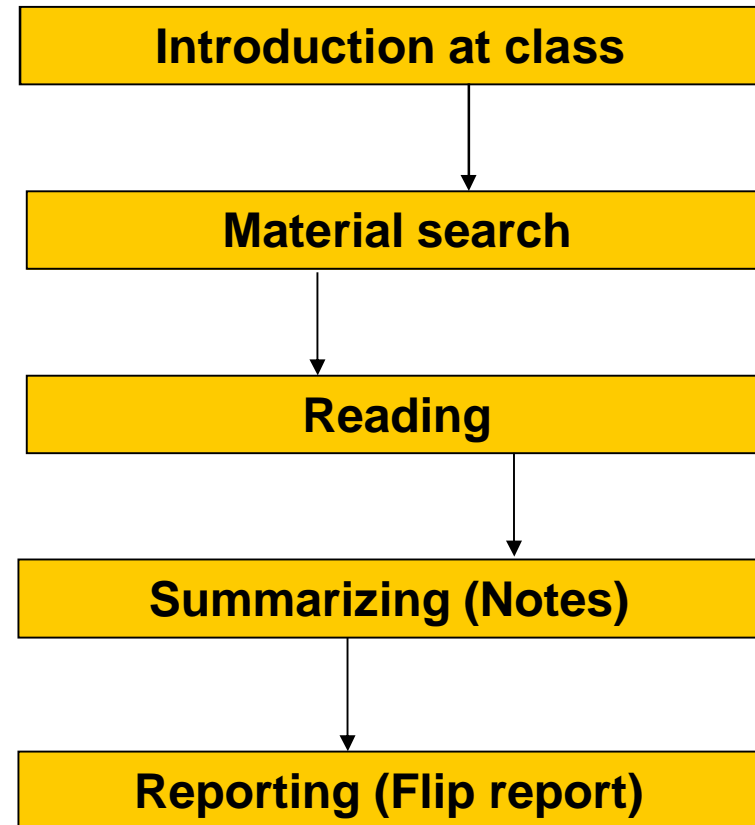
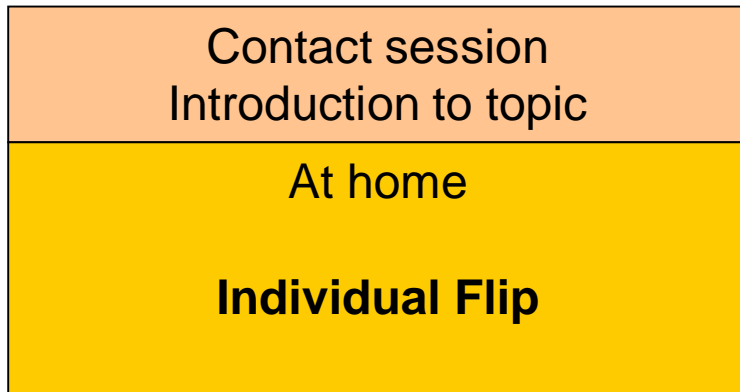
Reserve 3 h for the Flip assignment

Material available for all topics

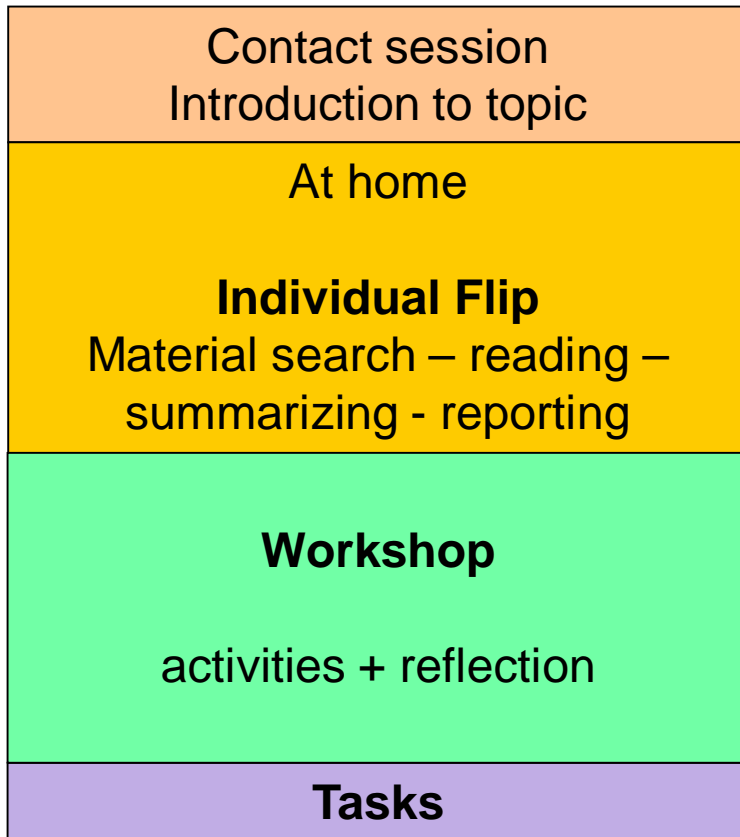
Course book

MyCourses – Material

# Teaching activities

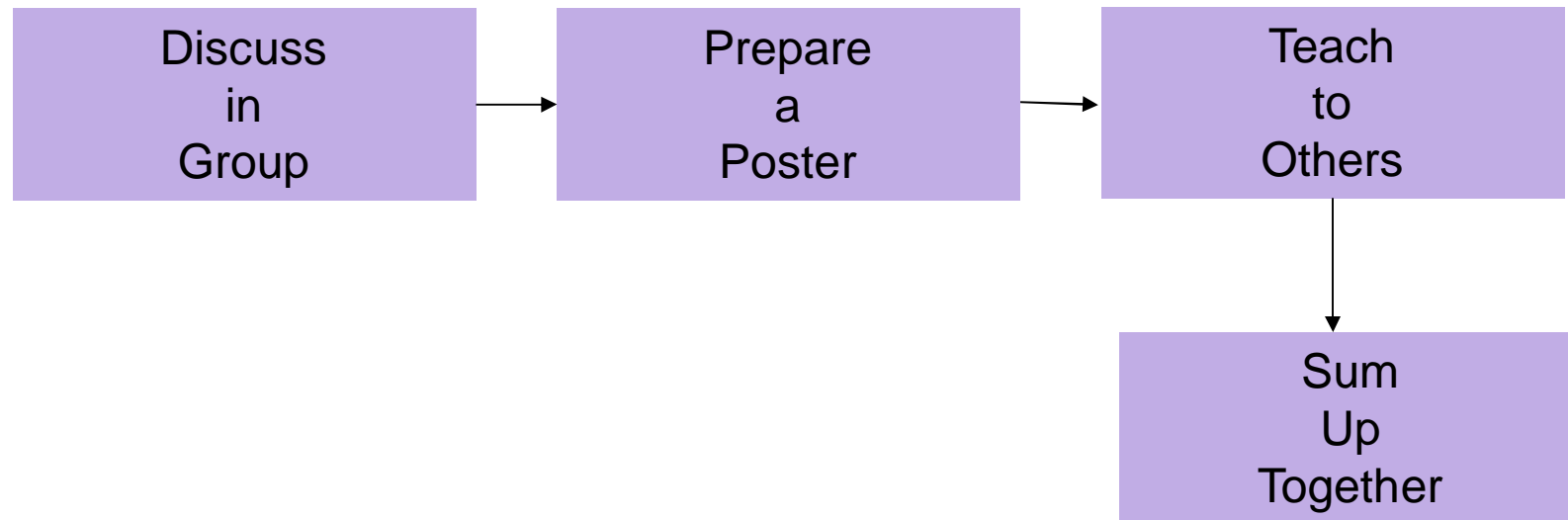


# Teaching activities



# Flip the classroom at contact session

- Bring your notes and all the papers/material with you
- The papers can be in electronic/printed format





# Flip the classroom - Material

You should read at least have

- 1 General reference, provided  
(Course book or paper at MC)
- 1 news paper clip  
(On your own country – can be with your own language)
- 1 journal paper of your topic  
(Might be provided in MC or found by yourself)

# Flip the classroom - report

There is a template at [MyCourses – Assignments](#)

- Topic (of the paper/chapter/newspaper)
- Reference information (+ link if a website)
- Short summary (why is it important for the course point of view, critically evaluate), do Not copy-paste intro, but what is relevant from course point of view
- The most interesting fact
  
- 1 - 2 pages

# Flip the classroom – report submission

Submit before the workshop to **MC**

- Also bring **printed version** to class

Write your student number at first page –NO name

- You will peer review the reports at class
- Report will be 0-3 p.
- Late submission will cause -1 p./assignment

# Assessment

## 1. Personal tasks

Flip reports (5 x 3 p.)	15
Workshops (6 x 4 p.)	24
Excursion report	2
Peer assessment	2
<u>Course feedback (Wepropol)</u>	<u>2</u>
	45 p.

## 2. Group tasks

Energy calculation	10
NMS	20
<u>Eco-design</u>	<u>25</u>
	55 p.

100 p. total, 60 p. needed to pass the course

Grading table provided at the end of the course

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## Group tasks (55 % of grade)



<https://joshsherin.wordpress.com/tag/group-work/>

- There are no Exam on the course
- You will work in groups/peers to prepare
  - **Task I:** How long do you need to operate a device to obtain the energy that was needed to produce the raw materials of the device?
  - **Task II:** Create a New Material Solution for your application
  - **Task III:** Create a Eco-Design for your application
- You will work with a different team on these tasks

# Task I: Energy Calculation

## -> Iterative work

How long do you need to operate a device to obtain the energy that was needed to produce the raw materials of the device?

# Task I: Energy Calculation

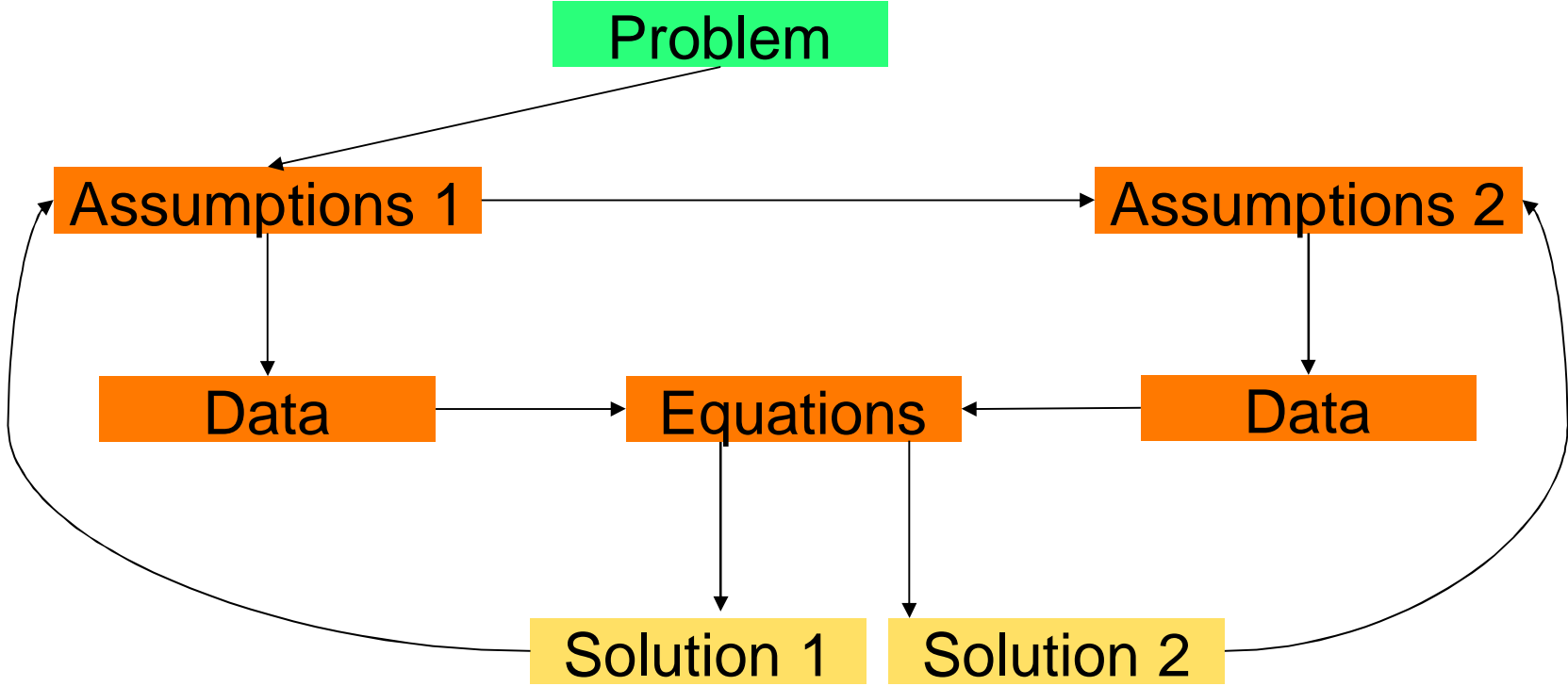
## -> Iterative work

- The main idea is **dialogue** (that is why this is done with pairs/three students)
- Problem definition is very broad...
- How to start to tackle this type of a problem?



# Task I: Energy Calculation

-> Iterative work



# Material

All the course material will be at

**MyCourses**

Assignments will be also submitted

I will add the lecture slides **AFTER** the lectures  
As well as the material produced during lectures

# Course Book

## Electrochemical Technologies for Energy Storage and Conversion (1) *by*

Zhang, Jiujun, Zhang, Lei & Liu, Hansan, 2011 (ebook)

<http://site.ebrary.com/lib/aalto/reader.action?docID=10575560>

Link from **MyCourses – Materials**

Does not cover the whole course – but is utilized when possible  
Additional references offered on MyCourses

# Missing a Workshop

- If you are unable to participate to a workshop
  - you can compensate max. 2 session
  - Prepare “missing the workshop report” that you will post to MyCourses before the next workshop to replace the workshop points
- What to do and write to compensate:
  - Ask from your team, what would be an additional contribution to the project that you can deliver – write one paragraph: explain the challenge the team gave you and the main facts that you found.
  - Look the poster videos from the session and write short feedback from each of them (with assessment from 1-4 p.)
  - Read the slides of the session and prepare answers to questions presented in slides (1 paragraph/each question)

# Missing half a Workshop

- Most important is leaning – how do you learn?
- There will be instructions for the missing part, you will do the rest of the work distantly
- Team will be divided so that there should be a possibility to complete the group task and provide feedback after the session

# Questions?